Sacramento County
Multi-jurisdictional Local Hazard Mitigation Plan Update
September 2021

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Executive Summary

This 2021 Local Hazard Mitigation Plan (LHMP) Update serves to update the 2016 Federal Emergency Management Agency (FEMA) approved Sacramento County LHMP. The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Sacramento County, 7 incorporated communities, and 24 special districts prepared this LHMP Update to the FEMA approved 2016 Sacramento County LHMP, in order to make the County and its residents less vulnerable to future hazard events.

This LHMP Update demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This LHMP Update was also developed, among other things, to ensure Sacramento County and participating jurisdictions' continued eligibility for certain federal disaster assistance: specifically, the FEMA Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA).

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses to insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated. The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards.

LHMP Plan Development Process

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. This LHMP Update documents the hazard mitigation planning process and identifies relevant hazards and vulnerabilities and strategies the County will use to decrease vulnerability and increase resiliency and sustainability in the community.

This is a multi-jurisdictional plan with the following seeking approval of the plan by FEMA:

- City of Citrus Heights*
- City of Elk Grove*
- City of Folsom*
- City of Galt*
- City of Isleton*
- City of Rancho Cordova*
- City of Sacramento*
- American River Flood Control District
- Citrus Heights Water District
- Cosumnes Community Services District Fire*
- Los Rios Community College*
- Reclamation District 3*

- Reclamation District 341*
- Reclamation District 349
- Reclamation District 369*
- Reclamation District 551*
- Reclamation District 554*
- Reclamation District 556*
- Reclamation District 563*
- Reclamation District 800*
- Reclamation District 1000*
- Reclamation District 1002*
- Reclamation District 1601*
- Reclamation District 2111*
- Sacramento County Water Agency
- Sac Metro Fire
- Sacramento Regional County Sanitation District*
- Sacramento Area Sewer District*
- Southgate Recreation and Park District*
- Twin Rivers School District*

* Participated in 2016 Sacramento County LHMP

This LHMP Update was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. The County and all participating jurisdictions followed a planning process prescribed by FEMA as detailed in Table ES-1.

Table ES-1 Local Hazard Mitigation Planning Process

DMA Process	Modified CRS Process
1) Organize Resources	
201.6(c)(1)	1) Organize the Planning Effort
201.6(b)(1)	2) Involve the Public
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies
2) Assess Risks	
201.6(c)(2)(i)	4) Identify the Hazards
201.6(c)(2)(ii)	5) Assess the Risks
3) Develop the Mitigation Plan	
201.6(c)(3)(i)	6) Set Goals
201.6(c)(3)(ii)	7) Review Possible Activities
201.6(c)(3)(iii)	8) Draft an Action Plan
4) Implement the Plan and Monitor Progress	
201.6(c)(5)	9) Adopt the Plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan

The planning process began with the organizational phase to establish the Hazard Mitigation Planning Committee (HMPC) comprised of key County representatives, and other local and regional stakeholders; to involve the public; and to coordinate with other departments and agencies. A detailed risk assessment was then conducted followed by the development of a focused mitigation strategy by all participating jurisdictions or the Sacramento County Planning Area. Once approved by Cal OES and FEMA, this LHMP Update will be adopted and implemented by the County and all participating jurisdictions over the next five years.

Risk Assessment

The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to the County and participating jurisdictions, assessed the vulnerability of the Sacramento County Planning Area to these hazards, and examined the existing capabilities to mitigate them.

The Sacramento County Planning Area is vulnerable to numerous hazards that are identified, profiled, and analyzed in this Plan. Floods, earthquakes, drought, levee failures, landslides, wildfires, and other severe weather events are among the hazards that can have a significant impact on the County. Table ES-2 details the hazards identified for this Sacramento County LHMP Update.

Table ES-2 Sacramento County Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Significant	Occasional	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Medium	High
Earthquake	Extensive	Occasional	Catastrophic	Medium	Low
Earthquake Liquefaction	Limited	Occasional	Critical	Medium	Low
Floods: 1%/0.2% annual chance	Significant	Likely	Catastrophic	High	Medium
Floods: Localized Stormwater	Extensive	Highly Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Occasional	Limited	Low	Medium
Levee Failure	Extensive	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Medium	Low
Subsidence	Significant	Highly Likely	Limited	Medium	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Critical	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Mitigation Strategy

Based on the results of the risk assessment, the participating jurisdictions and the HMPC developed a mitigation strategy for reducing the County's and all participating jurisdictions' risk and vulnerability to hazards. The resulting Mitigation Strategy for the Sacramento County Planning Area is comprised of LHMP goals and objectives and a mitigation action plan which includes a series of mitigation action projects and implementation measures. Based on the risk assessment, the HMPC identified goals and objectives for reducing the Sacramento County Planning Area's vulnerability to hazards. The goals and objectives of this multi-hazard mitigation plan are:

GOAL 1: Minimize risk and vulnerability of the Sacramento County community to the impacts of natural hazards, including consideration of the exacerbation of natural hazards and unique hazards due to climate change; and protect lives and reduce damages and losses to property, public health, economy, and the environment.

Goal 2: Provide protection for critical facilities, infrastructure, utilities, and services from hazard impacts, to include hardening and other efforts to establish redundancy and reliability, to prevent or minimize loss, and to facilitate recovery.

GOAL 3: Enhance public outreach, education, awareness, and preparedness for all hazards to minimize hazard related losses and to include effective strategies for reaching underserved communities and vulnerable populations.

GOAL 4: Increase community capabilities and leverage interagency and public-private coordination and resources to mitigate losses and to be prepared for, respond to, and recover from a disaster event.

GOAL 5: Assure conformance to federal and state hazard mitigation initiatives and maximize potential for mitigation implementation.

Actions to support these goals are shown on Table ES-3.

Table ES-3 Sacramento County Planning Area Mitigation Actions

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Sacramento County						
Multi-Hazard Actions						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	Unincorporated Sacramento County	2016 Action	X	X		Prevention
Action 2. Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	Unincorporated Sacramento County	2016 Action	X	X		Public Information
Action 3. County-wide Mass Care and Shelter Plan Update	Unincorporated Sacramento County	New Action	X	X		Emergency Services
Action 4. County-wide Evacuation Annex Update	Unincorporated Sacramento County	New Action	X	X		Emergency Services
Action 5. Evacuation Planning Countywide	Unincorporated Sacramento County	New Action	X	X		Prevention Emergency Services
Action 6. Expand Broadband/Wifi Access	Unincorporated Sacramento County	New Action	X	X		Emergency Services
Climate Change and Pandemic Actions						
Action 7. Implement and improve telecommuting and remote work access for County operations	Unincorporated Sacramento County	New Action	X	X		Prevention
Action 8. Implement the actions contained within the Sacramento County Climate Action/Adaptation Plan	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection Public Information Emergency Services
Action 9. Develop and incentivize carbon sequestration plans and programs	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 10. Update the Sacramento County Climate Action for carbon neutrality by 2030	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Natural Resource Protection
Dam Failure, Earthquake (and liquefaction), Flood: 1%, 0.5%, 0.2% annual chance, Flood: Localized Flood, Levee Failure, Subsidence, and Severe Weather: Heavy Rains and Storms Actions						
Action 11. Bicycle/pedestrian bridge across Discovery Park connecting Garden Highway to the Jibboom Street bridge	Unincorporated Sacramento County	New Action	X	X	X	Prevention Structural Projects Natural Resource Protection Emergency Services
Action 12. Acquire Floodprone Properties	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects
Action 13. Maintain and improve railroad embankment levee from south of Freeport to south of Hood, a reach owned by CA Parks Department (Railroad Museum)	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 14. McCormack Williamson flood control weir	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 15. Flood risk mitigation for mobile home and recreational vehicle parks	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects
Action 16. Plan for Public Information (PPI)	Unincorporated Sacramento County	2016 Action	X	X	X	Public Information
Action 17. Mitigation of repetitive loss flood areas and properties	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects
Action 18. Flood risk mapping	Unincorporated Sacramento County	New Action	X	X	X	Prevention
Action 19. Storm Ready	Unincorporated Sacramento County	2016 Action	X	X	X	Prevention Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 20. Alder Creek flood hazard mitigation	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 21. Operational protocol for American River pump stations that are affected by the reoperation of Folsom Dam	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Emergency Services
Action 22. Arcade Creek flood control	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 23. Beach Stone Lakes area flood risk reduction program	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 24. Protect critical facilities from flooding	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Emergency Services
Action 25. Dam Safety (Activity 630)	Unincorporated Sacramento County	New Action	X	X	X	Public Information Emergency Services
Action 26. Flood fighting for Delta legacy communities: Hood, Courtland, Locke, Walnut Grove	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection Emergency Services
Action 27. Implement Delta Small Communities	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information
Action 28. Elevate houses to reduce flood risk	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 29. Flood emergency management exercises	Unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
Action 30. Flood evacuation mapping	Unincorporated Sacramento County	2016 Action	X	X	X	Prevention Emergency Services
Action 31. Floodproofing non-residential structures	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects
Action 32. Flood insurance studies (modeling and mapping the special flood hazard area)	Unincorporated Sacramento County	New Action	X	X	X	Prevention
Action 33. Update Hydrology Standards	Unincorporated Sacramento County	2016 Action	X	X	X	Prevention
Action 34. Laguna Creek flood control, modeling, and mapping	Unincorporated Sacramento County	New Action	X	X	X	Prevention
Action 35. Update County GIS aerial photography and LiDAR topography	Unincorporated Sacramento County	New Action	X	X	X	Prevention
Action 36. Maintain and improve Sacramento River levee from south of Freeport to south of Hood, a reach owned and operated by CA DWR Maintenance Area 9	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 37. Use existing Aggregate Mining Pits for Flood Control	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 38. Implement Storm Drain Capital Improvement Plan	Unincorporated Sacramento County	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information
Action 39. Woodside Condominiums Flood Risk Reduction	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 40. Implement Actions In The Courtland Flood Risk Reduction Plan 2021	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information
Action 41. Implement Actions In The Walnut Grove West Flood Risk Reduction Plan 2021	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information
Action 42. Implement Actions In The Locke Flood Risk Reduction Plan 2021	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information
Drought & Water Shortage, Severe Weather: Extreme Heat, and Wildfire Actions						
Action 43. Reduce the urban heat island effect through the implementation of "cool communities" strategies, including but not limited to, increasing tree plantings, using cool/green roofs and cool/pervious pavements	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 44. Defensible Space and Vegetation Management; Development of Areas of Refuge	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 45. Wildfire Suppression - Regional Parks and Open Space (urban interface)	Unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 46. Wildfire Fighting - Support	Unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Natural Resource Protection
Action 47. Wildfire Suppression	Unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Natural Resource Protection
Severe Weather: Extreme Cold and Freeze and High Wind and Tornado Actions						
Action 48. Establish Warming Centers with Backup Power	Unincorporated Sacramento County	New Action	X	X		Emergency Services Public Information
City of Citrus Heights						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Citrus Heights	2016 Action	X	X		Prevention
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Citrus Heights	New Action	X	X	X	Public Information
Action 3. Cable Trellis w/ Vines Shading Project	City of Citrus Heights	New Action	X	X	X	Property Protection
Action 4. Trash Racks and Debris Cages Project	City of Citrus Heights	New Action	X	X	X	Property Protection
Action 5. Protection of Transportation Infrastructure Project	City of Citrus Heights	New Action	X	X	X	Property Protection Structural Projects
Action 6. Neighborhood Storm Drain Project	City of Citrus Heights	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 7. Neighborhood Storm Drain Master Plan	City of Citrus Heights	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 8. Storm Drain Inlet Retrofit Project	City of Citrus Heights	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 9. Reduce Citrus Heights extreme heat events and associated hazards by Increase tree planting/canopy preservation/enhancement (this is in general plan) Project	City of Citrus Heights	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 10. Increase pedestrian and bicycle evacuation routes by constructing regional bike/pedestrian trail infrastructure, and expanding connection to neighborhoods (particularly in vulnerable areas) Project	City of Citrus Heights	New Action	X	X		Emergency Services Public Information
Action 11. Interconnected Transportation System Project	City of Citrus Heights	New Action	X	X	X	Emergency Services
Action 12. Critical Facility Generator Project	City of Citrus Heights	New Action	X	X	X	Emergency Services
Action 13. Critical Street Floodproofing Project	City of Citrus Heights	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 14. Creek Maintenance and Restoration Project	City of Citrus Heights	New Action	X	X	X	Property Protection Natural Resource Protection
Action 15. CMP Storm Drain Replacement Project	City of Citrus Heights	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
City of Elk Grove						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Elk Grove	2016 Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Elk Grove	New Action	X	X		Public Information
Action 3. Elk Grove Green Street Project: Repurposing Urban Runoff with Green Instructure Technologies	City of Elk Grove	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Mutual Aid Agreements	City of Elk Grove	2016 Action	X	X	X	Emergency Service
Action 5. City of Elk Grove's Storm Drainage Master Plan (SDMP)	City of Elk Grove	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 6. Create a Climate-Smart Stormwater Management System	City of Elk Grove	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 7. Implement a Comprehensive and Climate-Smart Green Infrastructure Strategy	City of Elk Grove	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 8. Upgrade the City's Laguna West Levee System to Mitigate Climate-Related Flood Impacts	City of Elk Grove	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 9. Establish a Resilient Pedestrian and Bicycle Infrastructure Network	City of Elk Grove	New Action	X	X		Emergency Services
City of Folsom						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Folsom	2016 Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Folsom	2016 Action	X	X		Public Information
Action 3. Redevelopment Area Drainage Improvements	City of Folsom	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Stormwater Basin Maintenance and Operation Project	City of Folsom	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 5. Stormwater Utility Fee	City of Folsom	2016 Action	X	X	X	Prevention Property Protection
Action 6. Fuel Reduction and Modification	City of Folsom	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 7. Comprehensive Cooling City Strategy	City of Folsom	2016 Action	X	X		Prevention Property Protection
Action 8. Identification and Upgrades to Heating and Cooling Centers	City of Folsom	2016 Action	X	X		Prevention Emergency Services
Action 9. Landscape and Irrigation Modifications	City of Folsom	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 10. Landscape Ordinance and Model Water Efficient Landscape Ordinance Implementation	City of Folsom	New Action	X	X		Prevention
Action 11. Post Disaster Staff Training	City of Folsom	New Action	X	X		Emergency Services
Action 12. Weed Abatement Program	City of Folsom	2016	X	X		Prevention Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
City of Galt						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Galt	2016 Action	X	X		Prevention
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Galt	New Action	X	X		Public Information
Action 3. Future Development Projects shall complete a Climate Action Plan Consistency Review Checklist.	City of Galt	New Action	X	X		Prevention
Action 4. Develop a Robust Geographic Based System (GIS) to Geographically Locate Issues/Actions/Mitigation in the City.	City of Galt	New Action	X	X		Prevention
Action 5. Perform Vegetative Control of City Drainages and Channels by Natural Methods	City of Galt	New Action	X	X		Property Protection Natural Resource Protection
Action 6. Continue Work with the Other Groundwater Sustainability Agencies (GSAs) in the Cosumnes Subbasin of the San Joaquin Valley Basin (DWR Basin No. 5-022.16) who are Working Together to Develop a Single Groundwater Sustainability Plan (GSP).	City of Galt	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 7. Increase Resiliency of City Critical Infrastructure and Emergency Operations and against Hazards.	City of Galt	New Action	X	X		Emergency Service
Action 8. Maintain City Drainages, Channels and Open Spaces	City of Galt	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
City of Isleton						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Isleton	2016 Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Isleton	New Action	X	X		Public Information
Action 3. Support climate change mitigation laws	City of Isleton	New Action	X	X		Prevention
Action 4. Support drought mitigation laws. Establish RWIP (Redundant Water for Isleton Plan)	City of Isleton	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 5. Levee Reinforcement Projects	City of Isleton	New Action	X	X	X	Property Protection Natural Resource Protection Structural Projects
Action 6. Implement IFIP (Isleton Flood Improvement Plan) and create and activate IFMA (Isleton Flood Management Agency)	City of Isleton	New Action	X	X	X	Prevention Property Protection Natural Resource Protection Structural Projects
Action 8. Activate Emergency Operation Plan (Cooling Center)	City of Isleton	New Action	X	X	X	Emergency Services
Action 9. Storm Water Runoff Rehabilitation Project	City of Isleton	2016 Action	X	X	X	Property Protection Natural Resource Protection Structural Projects
Action 10. Wastewater Treatment Plant Pond Levee Elevation Raise to 200-year Flood Standard	City of Isleton	2016 Action	X	X	X	Property Protection Natural Resource Protection Structural Projects
City of Sacramento						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Sacramento	2016 Action	X	X		Prevention
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Sacramento	New Action	X	X	X	Public Information

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 3. Coordination with Relevant Organizations and Agencies to Consider the Impacts of Urbanization and Climate Change on Long-Term Natural Hazard Safety	City of Sacramento	2016 Action	X	X		Prevention
Action 4. Maintain and Identify Changes in Critical Facilities GIS Layer to Support Emergency Management Efforts	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services
Action 5. Community Outreach on Multi-Hazard Preparation & Pre-mitigation	City of Sacramento	2016 Action	X	X	X	Public Information
Action 6. Evaluation and Mitigation of Critical Facilities in Identified Hazard Areas	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services
Action 7. Retrofit of Repetitive Loss Properties	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects
Action 8. Safeguard Essential Communication Services	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services
Action 9. Multi-lingual Disaster Education	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services Public Information
Action 10. Cal OES Safety Assessment Program Evaluators	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services
Action 11. National Flood Insurance Program & Community Rating System Continuation	City of Sacramento	2016 Action	X	X	X	Prevention
Action 12. Develop a Master Generation Plan for Pump Stations	City of Sacramento	2016 Action	X	X	X	Prevention Property Protection
Action 13. Develop a Disaster Housing Plan	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 14. Disaster Resistant Business Program	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 15. Develop Enhanced Emergency Planning for Special Needs Populations in the City of Sacramento Emergency Operations Plan and Other Planning Documents	City of Sacramento	2016 Action	X	X		Prevention Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 16. Establish a Post-Disaster Action Plan	City of Sacramento	2016 Action	X	X		Emergency Services
Action 17. Flood Recovery Plan	City of Sacramento	2016 Action	X	X	X	Emergency Services
Action 18. Public Information Flood Response Plan (Action #18 from 2016)	City of Sacramento	2016 Action	X	X	X	Public Information
Action 19. Construction of a New Emergency Operation Center (EOC) (Action 19 from 2016 plan)	City of Sacramento	2016 Action	X	X		Emergency Services
Action 20. Emergency Operation Center (EOC) Expansion and Information Technology Upgrade (Action 20 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 21. Protection of Transportation Infrastructure (Action 21 from 2016 plan)	City of Sacramento	2016 Action	X	X		Emergency Services Property Protection Structural Projects
Action 22. Public Education Campaign for Everbridge System (Action 22 from 2016 plan)	City of Sacramento	2016 Action	X	X		Public Information Emergency Services
Action 23. Regional Emergency and Disaster Preparedness Exercises to Test Operational & Emergency Plans (Action 23 from the 2016 plan)	City of Sacramento	2016 Action	X	X		Emergency Services
Action 24. Special Needs and Critical Facilities Database and Advanced Warning System (Action 24 from 2016 plan)	City of Sacramento	2016 Action	X	X	X	Emergency Services Public Information
Action 25. Asset Inventory	City of Sacramento	2016 Action	X	X		Prevention
Action 26. Protection of City Information Technology Infrastructure (Action 27 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 27. Travel Time Model for Lower American and Sacramento Rivers and their Major Tributaries (Action 29 from 2016 plan)	City of Sacramento	2016 Action	X	X	X	Prevention
Action 28. Watershed Spill Contamination to Drinking Water Quality: Preparedness for Events and Recovery	City of Sacramento	2016 Action	X	X		Prevention Property Protection
Action 29. Purchase Drones for Use in Disaster Preparedness, Mitigation, and Response	City of Sacramento	2016 Action	X	X	X	Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 30. Map and Assess Vulnerability to Sea Level Rise (Action 32 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention
Action 31. Emission Study of City Sump and Pump Stations (Action 33 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention
Action 32. Climate Change Mitigation Actions/Climate Change Adaptation Plan for Drinking Water Quality (Action 34 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention Property Protection
Action 33. Harmful Algal Bloom (HAB) Surveillance and Response Planning (Action 35 from 2016 plan	City of Sacramento	2016 Action	X	X		Prevention Property Protection
Action 34. Perform a Groundwater Recharge Feasibility Study (Action 37 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention Property Protection Natural Resource Protection
Action 35. Retrofit Historical Buildings	City of Sacramento	2016 Action	X	X		Prevention Property Protection Structural Projects
Action 36. Heating Centers in High Priority Locations	City of Sacramento	2016 Action	X	X		Prevention Emergency Services Public Information
Action 37. Cooling Centers in High Priority Locations	City of Sacramento	2016 Action	X	X		Prevention Emergency Services Public Information
Action 38. Extreme Weather Outreach Strategy	City of Sacramento	2016 Action	X	X		Prevention Emergency Services Public Information
Action 39. Severe Weather Action Plan	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 40. Coordinate with Stakeholder on Proposed Flood Control Project on Magpie Creek	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 41. Adopt Additional Floodplain Development Standards	City of Sacramento	2016 Action	X	X	X	Prevention
Action 42. Drainage Projects for Repetitive Loss Properties	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 43. Emergency Notification and Evacuation Planning	City of Sacramento	2016 Action	X	X	X	Emergency Services Public Information
Action 44. Historic Magpie Creek	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 45. Natomas Internal Drainage Canals/Levees	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 46. Drainage Projects from the City's Priority Drainage Project List	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 47. Projects Identified in the Combined Sewer System Improvement Plan Update	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 48. Easements for Open Land Along Levees	City of Sacramento	2016 Action	X	X	X	Prevention
Action 49. Emergency Management Planning and Levee Security	City of Sacramento	2016 Action	X	X	X	Emergency Services
Action 50. Flood Fighting Equipment	City of Sacramento	2016 Action	X	X	X	Emergency Services
Action 51. Flood Management Land Use Planning and Development	City of Sacramento	2016 Action	X	X	X	Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 52. Florin Creek Pump at Pomegranate Avenue	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 53. Internal Drainage System Improvements	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 54. Levee and Structural Flood Management Improvements	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 55. Master planning to identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding	City of Sacramento	2016 Action	X	X	X	Prevention
Action 56. Retrofit Pumping Plans with Discharge Monitoring Devices	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 57. Risk Communication and NFIP/CRS Projects	City of Sacramento	2016 Action	X	X	X	Prevention Public Information
Action 58. Trash Racks and Debris Cages	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 59. Multi-Jurisdictional Modeling for Drainage Watersheds Greater than 10 Square Miles	City of Sacramento	2016 Action	X	X	X	Prevention
Action 60. Post-Flood Water Treatment Facility Recovery	City of Sacramento	2016 Action	X	X	X	Emergency Services Property Protection
Action 61. Tree Trimming & Debris Removal	City of Sacramento	2016 Action	X	X		Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 62. Install redundancies and Loop Feeds for Power Lines & Infrastructure	City of Sacramento	2016 Action	X	X		Property Protection
Action 63. Stabilization of Erosion Hazard Areas	City of Sacramento	2016 Action	X	X		Property Protection Structural Projects
Action 64. Implement a Fire Education and Information Program	City of Sacramento	2016 Action	X	X		Prevention Public Information
Action 65. Fuels Reduction on the American River Parkway	City of Sacramento	2016 Action	X	X		Property Protection Structural Projects Natural Resource Protection
Action 66. Outreach on the Effects of Smoke on Air Quality	City of Sacramento	2016 Action	X	X		Public Information
Action 67. Implement 2040 Climate Action and Adaptation Plan	City of Sacramento	New Action	X	X		Property Protection Natural Resource Protection
City of Rancho Cordova						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Rancho Cordova	2016 Action	X	X		Prevention
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Rancho Cordova	New Action	X	X		Public Information
Action 3. Sunrise Blvd Widening Kiefer to Jackson	City of Rancho Cordova	2016 Action	X	X	X	Property Protection Structural Projects
Action 4. City of Rancho Cordova Disaster Debris Management Plan	City of Rancho Cordova	New Action	X	X		Emergency Services
Action 5. Transportation Interconnectivity	City of Rancho Cordova	2016 Action	X	X		Emergency Services
Action 6. Intergovernmental Agreement between the County of Sacramento and the City of Rancho Cordova	City of Rancho Cordova	2016 Action	X	X		Prevention Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 7. Land Use (Long Range)	City of Rancho Cordova	2016 Action	X	X		Prevention Natural Resource Protection
Action 8. Post disaster training for staff	City of Rancho Cordova	2016 Action	X	X		Emergency Services
Action 9. Update/Maintain Emergency Operation Plans (EOPs)	City of Rancho Cordova	2016 Action	X	X		Emergency Services
Action 10. Increase Everbridge Enrollment	City of Rancho Cordova	2016 Action	X	X		Emergency Services
Action 11. Developing and maintaining a database to track community vulnerability	City of Rancho Cordova	2016 Action	X	X		Prevention Emergency Services
Action 12. Landscape and Irrigation Requirements/Retro	City of Rancho Cordova	2016 Action	X	X		Prevention Public Information
Action 13. Landscape Ordinance and Model Water Efficient Landscape Ordinance Implementation	City of Rancho Cordova	2016 Action	X	X	X	Prevention Natural Resource Protection
Action 14. Restrict Impervious Surfaces in Front Yards	City of Rancho Cordova	2016 Action	X	X	X	Prevention Natural Resource Protection Public Information
Action 15. Porous pavement and vegetative buffers	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Natural Resource Protection
Action 16. Storm Water Pump Station Generator Purchase and Infrastructure Upgrades	City of Rancho Cordova	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 17. SB-5 Urban Level of Flood Protection	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 18. Channel Vegetation Management and Erosion Control Projects	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 19. Adoption of Hydromodification and Low Impact Development (LID) Standards	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Natural Resource Protection
Action 20. Implement Projects in the Stormwater Capital Improvement Program Master Plan	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 21. Sunrise Blvd. & Monier Circle Drainage Improvements	City of Rancho Cordova	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 22. Roundabouts	City of Rancho Cordova	2016 Action	X	X		Prevention Property Protection Structural Projects
Action 23. Dam Failure Mitigation and Preparedness for Evacuations	City of Rancho Cordova	New Action	X	X		Property Protection Natural Resource Protection
Action 24. Wildfire Weed Reduction and Resiliency	City of Rancho Cordova	New Action	X	X		Property Protection Natural Resource Protection
American River Flood Control District						
Action 1. Arcade Creek Erosion Repair Project	ARFCD and unincorporated Sacramento County	New Action	X	X	X	Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. American River Emergency Rock Revetment Preparedness Stockpile	ARFCD and unincorporated Sacramento County	New Action	X	X	X	Property Protection Natural Resource Protection
Action 3. Highway 160 Bridge Gap Levee Access	ARFCD and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Citrus Heights Water District						
Action 1. Implement ASR Technology	CHWD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 2. Construction of a New Storage Tank	CHWD and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects
Action 3. Construction of a New Operations Building	CHWD and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects
Cosumnes Community Services District						
Action 1. Drought Mitigation Planning	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 2. Enhance the District's Public Education, Awareness, and Outreach Program to Include all Hazards of Concern	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 3. Integrate the LHMP into Cosumnes CSD Strategic Plans	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 4. Wildfire Staffing	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 5. Mutual Aid Agreements	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 6. Continue Vegetation Management Program	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Los Rios Community College						
Action 1. Pandemic Response Plan	Los Rios Community College	New Action	X	X		Prevention Emergency Services
Action 2. Emergency Operations Plan Update	Los Rios Community College	New Action	X	X		Prevention Emergency Services
Action 3. COVID-19 Education/Information Program	Los Rios Community College	New Action	X	X		Prevention Public Information
Action 4. Installing a Microgrid Project, at the Folsom Lake College, El Dorado Center (EDC) in Placerville, CA	Los Rios Community College	New Action	X	X		Prevention Emergency Service
Action 5. Backup Power for Police Dispatch	Los Rios Community College	New Action	X	X		Emergency Services
Action 6. Tree Mitigation – Districtwide	Los Rios Community College	New Action	X	X		Property Protection Natural Resource Protection
RD 800						
Action 1. Reclamation District 800 Emergency Levee Repair Project	RD 800 and unincorporated Sacramento County	2016 Action	X	X		Property Protection Structural Projects Natural Resource Protection
RD 1000						
Action 1. Asset Management Plan Update	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Corporation Yard Improvements	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Waterside Levee Inspection Capability	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Property Protection
Action 4. Pleasant Grove Area Levee Improvements	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 5.Plant 1 Emergency Generator Natural Gas Conversion and Mobile Generators for Plants 2, ,3 and 5	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection Emergency Services
Action 6. Plant 8 Improvements	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 7. Expanded SCADA System	RD 1000 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Natural Resource Protection
Action 8. Update Emergency Operations Plan and Staffing	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Emergency Services
Sacramento County Water Agency						
Action 1. Flood Hazard Mitigation	SCWA and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Improve Water Supply Portfolio	SCWA and unincorporated Sacramento County	New Action	X	X		Prevention
Action 3. Seismic Upgrades	SCWA and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects Natural Resource Protection
Sac Metro Fire						
Action 1. Finalization and Implementation of Metro Fire's Community Risk Assessment and Associated Community Risk Reduction Plan	SMFD	New Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection Public Information Emergency Services
Action 2. Evaluation and Implementation of Measures Necessary to Mitigate Fire Stations that Would be Directly Affected by Dam Failure	SMFD	New Action	X	X		Property Protection Structural Projects Emergency Services
Action 3. Modernization/Upgrade all District Facilities to Comply with Essential Services Code Requirements	SMFD	New Action	X	X		Property Protection Structural Projects Emergency Services
Action 4. Community Wildfire Protection Plan (CWPP) – Revision and Implementation of Resulting Changes	SMFD	New Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information
Action 5. Relocate the Essential Facilities in the 200 year Floodplain	SMFD	New Action	X	X	X	Property Protection Structural Projects Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Sacramento Regional Sanitation District						
Action 1. Develop Climate Change Resiliency Plan	Regional San and unincorporated Sacramento County	New Action	X	X		Prevention
Action 2. Replace current equipment with touchless technologies	Regional San and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects
Action 3. Complete I&I Study and Develop I&I Policy	Regional San and unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection
Action 4. Regional San Biogeneration Facility	Regional San and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects Natural Resource Protection
Action 5. Reduction of Fire Hazard of Regional San Bufferlands	Regional San and unincorporated Sacramento County	2016 Action	X	X		Property Protection Natural Resource Protection
Action 6. Update GHG Emissions Inventory	Regional San and unincorporated Sacramento County	New Action	X	X		Prevention Property Protection
Action 7. Study Telecommute Options and Enhanced Information Technology Needs to Support Workforce	Regional San and unincorporated Sacramento County	New Action	X	X		Prevention
Sacramento Area Sewer District						
Action 1. Flood Control	SASD and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Pandemic Planning	SASD and unincorporated Sacramento County	New Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Southgate Recreation and Park District						
Action 1. Drought Mitigation Actions/Drought Contingency Plan	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Natural Resource Protection
Action 2. Flood Mitigation Actions/Land Acquisition	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Structural Projects
Action 3. Conservation Easements	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention
Action 4. Multi-jurisdictional Cooperation within Watersheds	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention
Action 5. Storm Water Management Practices – Implement Storm Water Management Practices as identified in Stormwater Quality Design Manual	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection
Action 6. Severe Weather: Heavy Rains and Storms Mitigation Actions/Tree Management	SRPD and unincorporated Sacramento County	2016 Action	X	X		Property Protection Natural Resource Protection
Action 7. Integrate Local Hazard Mitigation Plan into District Master Plan	SRPD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 8. Covid-19 Response Plan	SRPD and unincorporated Sacramento County	New Action	X	X		Emergency Services
Twin Rivers School District						
Action 1. Reduce Risks to Property and Life due to Earthquake	TRSD	New Action	X	X		Property Protection Structural Projects
Action 2. Reduce Risk to Flooding of Northern Area Schools	TRSD	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 3. Stormdrain Upgrades/Revise and Update Districtwide Stormwater Prevention Plan	TRSD	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 4. Prevent Loss of Life or Injury due to Extreme Heat	TRSD	New Action	X	X		Prevention Emergency Services
Action 5. Evacuation for Heavy Rains, Storms, Winds, and ALL Hazards	TRSD	New Action	X	X		Emergency Services
Action 6. Trees Trimmed/ Vegetation Removed to Minimize Impact During Fire Season	TRSD	New Action	X	X		Property Protection Natural Resource Protection
BALMD						
Action 1. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.	BALMD, RD 317, RD 407, RD 2067	New Action	X`	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information
Action 2. Regional Flood Management Plan Projects	BALMD, RD 317, RD 407, RD 2067	New Action	X`	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information
Action 3. Small Communities Plans – Flood Protection – Structural and Nonstructural Mitigation	BALMD, RD 317, RD 407, RD 2067	New Action	X`	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 4. 2021 Emergency Operations Plan (EOP) – Currently in development	BALMD, RD 317, RD 407, RD 2067	New Action	X`	X	X	Prevention Emergency Services
RD 3						
Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. FSRP Critical Erosion Repair	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Steamboat Slough Seepage Repairs	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Interior Drainage Improvements	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 5. Relief Cut Plan	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 6. Implement recommendations in West Walnut Grove Flood Risk Reduction Plan	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 7. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
RD 341						
Action 1. San Joaquin River Multi-Benefit Project	RD 341 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 349						
Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs	RD 349 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Interior Drainage Improvements	RD 349 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report	RD 349 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Relief Cut Plan	RD 349 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 369						
Action 1. Backup Power Project	RD 369 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services Property Protection
Action 2. Flood Safety Plan Updates, Training, and Exercises	RD 369 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services Public Outreach
Action 3. Small Communities Plans - flood protection - structural and nonstructural mitigation	RD 369 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
RD 551						
Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. FSRP Critical Seepage Repair	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Interior Drainage Improvements	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 5. Implement recommendations in Courtland Flood Risk Reduction Plan	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 554						
Action 1. Small Communities Plans – Flood Protection – Structural and Nonstructural Mitigation	RD 554	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Disadvantaged Community Projects and subsequent updating in 2021.	RD 554	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 3. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.	RD 554	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. 2021 Emergency Operations Plan (EOP) – Currently in development	RD 554	New Action	X	X	X	Prevention Emergency Services
Action 5. Regional Flood Management Plan Projects	RD 554	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 556						
Action 1. 2021 Emergency Operations Plan (EOP) – Currently in development	RD 556	New Action	X	X	X	Prevention Emergency Services
Action 2. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.	RD 556	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Regional Flood Management Plan Projects	RD 556	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 563						
Action 1. Rock Slope Protection Project	RD 563 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Levee Geometry Levee Improvement Project	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 3. Levee Failure Repair Project	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Levee Seepage Repair Project	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 5. Backup Power Generator Project	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
Action 6. Flood Exercise and Emergency Operations Plan Update	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
RD 1002						
Action 1.Regional Flood Management Plan Projects	RD 1002 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2.2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.	RD 1002 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3.2021 Emergency Operations Plan (EOP) – Currently in development	RD 1002 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
RD 1601						
Action 1. Levee Improvement Project	RD 1601 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Rock Slope Protection Project	RD 1601 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. San Joaquin River Setback Levee	RD 1601 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Backup Power Project	RD 1601 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
Action 5. Flood Safety Plan Updates, Training, and Exercises	RD 1601 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
RD 2111						
Action 1. Rock Slope Protection Project	RD 2111 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Levee Improvement Projects	RD 2111 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Overflow Weir Project	RD 2111 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Syphon Project	RD 2111 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 5. Backup Power Project	RD 2111 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
Action 6. Flood Safety Plan Updates, Training, and Exercises	RD 2111 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services

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Appendix I: Watershed Management Plan

Abbreviations and Acronyms

Acronym	Definition
AB	Assembly Bill
ACS	American Community Survey
ALERT	Automated Local Evaluation in Real Time
APG	Adaptation Planning Guide
APN	Assessor Parcel Numbers
AQI	Air Quality Index
BAM	Best Available Map
BCEGS	Building Code Effectiveness Grading Schedule
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BRACE	Building Resilience Against Climate Effects
BRIC	Building Resilient Infrastructure and Communities
BW	Biggert Waters
CAC	Community Assistance Contact
CAISO	California Independent System Operator
CBC	California Building Code
CA DWR	California Department of Water Resources
Cal OES	California Office of Emergency Services
CAP	Climate Action Plan
CAS	Climate Adaptation Strategy
CAV	Community Assistance Visit
CCHPR	Climate Change and Health Profile Report
CCSM3	Community Climate System Model Version 3
CCTCRR	Central California Traction Company Railroad
CDAA	California Disaster Assistance Act
CDC	Center for Disease Control
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Health
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CGS	California Geological Survey
CHP	California Highway Patrol
CIP	Capital Improvements Plan

Acronym	Definition
CNNDB	California Natural Diversity Database
CNPS	California Native Plant Society
CNRA	California Natural Resource Agency
CPUC	California Public Utilities Commission
CRS	Community Rating System
CRV	Contents Replacement Values
CVFPB	Central Valley Flood Protection Board
CVP	Central Valley Project
DAC	Disadvantaged Community Status
DFIRM	Digital Flood Insurance Rate Map
DHA	Department of Human Assistance
DMA	Disaster Mitigation Act
DSA	Division of the State Architect
DSOD	Division of Safety of Dams
EF	Enhanced Fujita
EOC	Emergency Operation Center
EOP	Emergency Operations Plan
ESF	Emergency Support Function
F	Fujita
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHSZ	Fire Hazard Severity Zones
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FMMP	Farmland Mapping and Monitoring Program
FRA	Federal Responsibility Area
FRAP	Fire and Resource Assessment Program
GFDL	Geophysical Fluid Dynamics Laboratory
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GRASP	Geospatial Research, Analysis & Services Program
HAB	Harmful Algal Bloom
HFTD	High Fire Threat District
HMGP	Hazard Mitigation Grant Program
HMPC	Hazard Mitigation Planning Committee
HOS	Hands on Sacramento

Acronym	Definition
IBC	International Building Code
ICC	Increased Cost of Compliance
IPCC	Intergovernmental Panel on Climate Change
IRC	International Residential Code
IRWM	Integrated Regional Water Management
LAFCO	Local Agency Formation Commission
LID	Low Impact Development
LFPZ	Levee Flood Protection Zone
LOMA	Letter of Map Amendment
LOMR	Letter of Map Revision
LHMP	Local Hazard Mitigation Plan
LRA	Local Responsibility Area
MERS	Middle East Respiratory Syndrome
MHDP	Multi-Hazards Demonstration Project
MHI	Median Household Income
MMI	Modified Mercalli Intensity
MPH	Miles Per Hour
MSL	Mean Sea Level
MW	Megawatts
NBHCP	Natomas Basin Habitat Conservation Plan
NCDC	National Climactic Data Center
NDMC	National Drought Mitigation Center
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGO	Non-Governmental Organization
NGS	National Geodetic Survey
NIDIS	National Integrated Drought Information System
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NWS	National Weather Service
OES	Sacramento County Office of Emergency Services
OHP	Office of Historic Preservation
PA	Public Assistance
PDM	Pre-Disaster Mitigation
PG&E	Pacific Gas and Electric
PM	Particulate Matter

Acronym	Definition
PNAS	Proceedings of the National Academy of Sciences
PPI	Plan for Public Involvement
PSPS	Public Safety Power Shutoff
RAWS	Remote Automated Weather Station
RCP	Representative Concentration Pathways
RD	Reclamation District
RL	Repetitive Loss
RLA	Repetitive Loss Analysis
SAC-SJ	Sacramento-San Joaquin
SAFCA	Sacramento Area Flood Control Agency
SARS	Severe Acute Respiratory Syndrome
SB	Senate Bill
SBA	Small Business Administration
SCADA	Supervisory Control and Acquisition Data
SDAC	Severely Disadvantaged Community
SEMS	Standardized Emergency Management System
SFHA	Special Flood Hazard Area
SGMA	Sustainable Groundwater Management Act
SH	State Highway
SMRC	Sacramento Medica Reserve Corp
SMSA	Sacramento Metropolitan Statistical Area
SMUD	Sacramento Metropolitan Utility District
SR	State Route
SRA	State Responsibility Area
SRFCS	Sacramento River Flood Control System
SRL	Severe Repetitive Loss
SSHCP	South Suburban Habitat Conservation Plan
SUALRP	Sacramento Urban Area Levee Reconstruction Project
SVI	Social Vulnerability Index
SWG	Severe Weather Guidance
SWP	State Water Project
SWRCB	State Water Resources Control Board
UBC	Uniform Building Code
UCERF	Uniform California Earthquake Rupture Forecast
ULOP	Urban Level of Flood Protection
UPRR	Union Pacific Railroad
URM	Unreinforced masonry

Acronym	Definition
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
WHO	World Health Organization
WSOC	Wildfire Safety Operations Center
WRCC	Western Regional Climate Center
WUI	Wildland Urban Interface

Chapter 1 Introduction

1.1 Purpose

Sacramento County, 7 incorporated communities, and 24 special districts prepared this Local Hazard Mitigation Plan (LHMP) Update to the Federal Emergency Management Agency (FEMA) approved 2016 Sacramento County LHMP. The purpose of this LHMP Update is to guide hazard mitigation planning to better protect the people and property of the County from the effects of hazard events. This LHMP Update demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This LHMP Update was also developed, among other things, to ensure Sacramento County and participating jurisdictions' continued eligibility for certain federal disaster assistance: specifically, the FEMA Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA).

1.2 Background and Scope

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses incurred by insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable, and much of the damage caused by these events can be reduced or even eliminated.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $6 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2019 Interim Report).

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. This plan documents Sacramento County's hazard mitigation planning process and identifies relevant hazards and vulnerabilities and strategies the County and participating jurisdictions will use to decrease vulnerability and increase resiliency and sustainability in the community.

This Sacramento County 2021 LHMP Update is a multi-jurisdictional plan that geographically covers the entire area within Sacramento County's jurisdictional boundaries (hereinafter referred to as the Planning Area). The following jurisdictions participated in the planning process and are seeking FEMA approval of the LHMP Update:

- Sacramento County*
- Brannan Andrus Levee Maintenance District (Reclamation Districts 317, 407, 2067)*
- City of Citrus Heights*

- City of Elk Grove*
- City of Folsom*
- City of Galt*
- City of Isleton*
- City of Rancho Cordova*
- City of Sacramento*
- American River Flood Control District
- Citrus Heights Water District
- Cosumnes Community Services District Fire*
- Los Rios Community College*
- Reclamation District 3*
- Reclamation District 341*
- Reclamation District 349
- Reclamation District 369*
- Reclamation District 551*
- Reclamation District 554*
- Reclamation District 556*
- Reclamation District 563*
- Reclamation District 800*
- Reclamation District 1000*
- Reclamation District 1002*
- Reclamation District 1601*
- Reclamation District 2111*
- Sacramento County Water Agency
- Sacramento Metro Fire District
- Sacramento Regional County Sanitation District*
- Sacramento Area Sewer District*
- Southgate Recreation and Park District*
- Twin Rivers School District*

* Participated in 2016 Sacramento County LHMP

All plan participants from the 2016 Sacramento County Plan are participating in this LHMP Update.

This LHMP Update was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA) or DMA 2000.) While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). This planning effort also follows FEMA's 2013 Plan Preparation Guidance. Because the Sacramento County Planning Area is subject to many kinds of hazards, access to FEMA grant programs is vital.

Information in this LHMP Update will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. The

Sacramento County Planning Area has been affected by hazards in the past and is thus committed to reducing future impacts from hazard events and maintaining eligibility for mitigation-related federal funding.

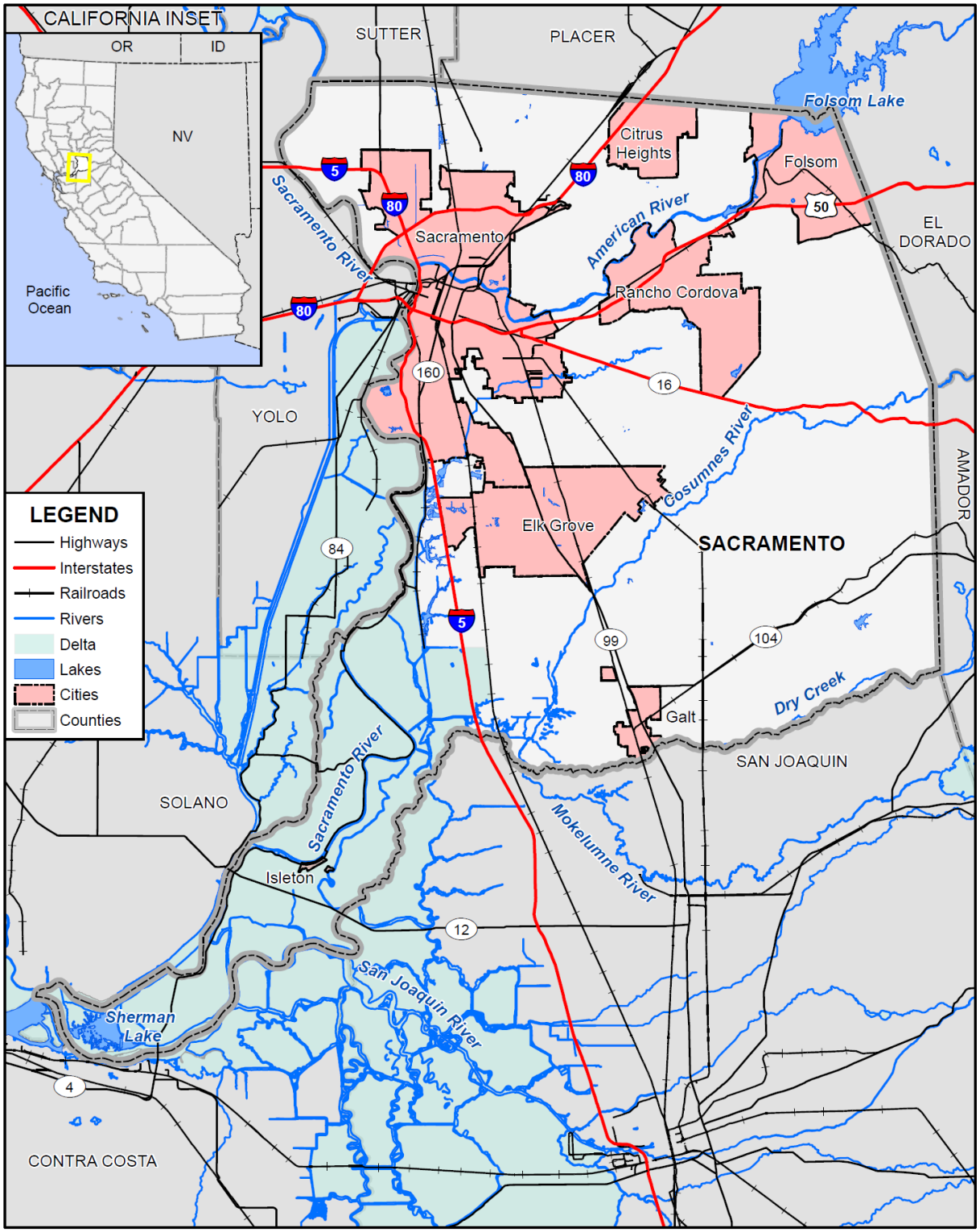
1.3 Community Profile

Sacramento County lies within the Central Valley of California, and is the County seat of the state capitol of Sacramento. The County has a history as a center of government, trade, transportation and agriculture, and as a consequence the City of Sacramento is a major transportation hub. Interstates 80 and 5; U.S. Highway 50; and State Highways 99, 16 and 160 all extend from the outer edges of the County and converge in downtown Sacramento. Similarly, all of the rail lines in the County converge in Sacramento at the site of the old Sacramento Rail Yard. Airports include Sacramento International, Sacramento Executive, Mather Air Force Base, McClellan Air Force Base and other smaller airports. Each of these major transportation corridors or locations impacts the land uses in the vicinity.

The County is divided into 25 community areas, seven of which are incorporated cities. Most of these communities are in the urbanized core in the western, northwestern or northern portion of the County. The southwestern, eastern and southern portions of the County are more agricultural and rural, residential. Many portions of the developed County are within the historic floodplains of the three major rivers (Sacramento, American, and Cosumnes Rivers) and are protected by a system of levees.

A map of the County is shown in Figure 1-1.

Figure 1-1 Sacramento County



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

1.3.1. History

Early Spanish explorers and the Franciscan and Jesuit missionaries who followed them were the first Europeans to reach northern California. The interior of the Sacramento Valley, away from the easily defended and more accessible chain of coastal missions and pueblos, was left largely untouched by the Spanish and "Californios." Established settlement of the Sacramento area did not begin until the late 1830s and early 1840s, when resourceful and independent individuals such as Sutter and Jared Sheldon obtained land grants from the Mexican government, usually in exchange for an agreement to protect Mexican interests in these remote interior regions.

With the initial Euro-American settlement of Sacramento County by John Sutter in 1839 at what would become Sutter's Fort, the established outpost brought with it an increase in Euro-American trappers, hunters and settlers to the area. After the arrival of Sutter, several individuals obtained large Mexican Land Grants in the area. As a result of the Mexican War (1847-1848), California became part of the territory of the United States. In 1848, gold was discovered at Sutter's Mill in Coloma. With the discovery of gold in 1848, a torrent of settlers from the east flooded into the Sacramento region. As the population increased and easily found gold decreased, newcomers who decided to stay turned to alternative vocations, particularly agriculture. Many found land comparatively plentiful and cheap. Raising grain, livestock, and produce to sell to the thousands of miners heading to the gold fields proved a profitable venture. These combined events hastened the settlement of the area and the development of Sacramento as an economic and transportation center. The designation of Sacramento as the state capital, in 1854, also resulted in the area's increase in socio-political importance.

The County is the major component of the Sacramento Metropolitan Statistical Area (SMSA) which includes Sacramento, El Dorado and Placer Counties. The County Charter was established in 1933 and is still used today. The official County Seal was adopted by the Board of Supervisors on January 18, 1961, following a contest for an appropriate design.

1.3.2. Geography and Climate

Sacramento County lies just north of the center of California's Central Valley. The confluence of two of the state's major rivers, the Sacramento and the American, occurs within the County. The southwestern panhandle of the County extends far into the Sacramento-San Joaquin Delta, to the point just north of Antioch, where nearly all waters of the Central Valley converge. To the south, San Joaquin County is primarily agricultural. The wooded foothills of the Sierra Nevada rise to the east in Amador and El Dorado Counties. On the north, Placer County has experienced dramatic growth over the past decade, and much of the grasslands adjacent to the northern Sacramento County boundary have been converted to residential uses. Yolo and Sutter Counties to the northwest and west have experienced growth as well, though agricultural uses remain.

The County is divided into 25 community areas, seven of which are incorporated cities. Most of these communities are in the urbanized core in the western, northwestern or northern portion of the County. The southwestern, eastern and southern portions of the County are more agricultural and rural residential. Many portions of the developed County are within the historic floodplains of the three major rivers (Sacramento,

American, and Cosumnes Rivers) and are protected by a system of levees. The California Department of Finance estimated the total population of the County to be 1,555,365 in 2020.

In general, topography in Sacramento County is characterized by a broad band of very flat valley floor land in the western sector, a transition zone of gently sloping alluvial plains in the central sector, and a low foothill region in the eastern sector. Elevations range from below sea level in the delta island area in the Southwest corner of the County to approximately 800 feet in the foothill region. Much of Sacramento County is low and flat. Some areas of the County are so flat that they have essentially no slope at all. Natural drainageways in these areas are usually poorly defined, and drainage of storm waters is slow. Most of these areas lie in the western and southern portions of the County. The general drainage pattern in Sacramento County is from northeast to southwest. As previously noted, all drainage is ultimately conveyed out of the county by the Sacramento and San Joaquin Rivers.

Sacramento County is characterized by a mild climate, with year-round sunshine. The summers are warm, with dry days and mild nights. During the winter "rainy season" (November through February), over half the total annual precipitation falls, yet rain in measurable amounts occurs only about ten days monthly during the winter. Mountains surround the Sacramento Valley to the west, north and east. Because of the shielding influence of the high mountains, winter storms reach the valley in a modified form. However, torrential rain and heavy snow frequently fall on the Western Sierra Slopes, the Southern Cascades, and to a lesser extent, the Coastal Range. As a result, flood conditions occasionally occur along the Sacramento River and its tributaries.

1.3.3. Population and Demographics

The California Department of Finance 2020 estimates for population of the County and its jurisdictions are shown in Table 1-1.

Table 1-1 Sacramento County Population by Jurisdiction, 2020

Jurisdiction	Total Population
Citrus Heights	87,811
Elk Grove	176,154
Folsom	81,610
Galt	25,849
Isleton	828
Rancho Cordova	78,381
Sacramento	510,931
Unincorporated County	593,801
Total	**1,555,365**

Source: California Department of Finance, 2020 E-1 Report

Select social and economic information for the County and participating jurisdictions are shown in Table 1-2.

Table 1-2 Sacramento County – Select Social and Economic Statistics

Statistic	Number
Populations	
Population under 5	6.4%
Population over 65	14.1%
Median Age	36.4
Racial Makeup	
White	56.7%
Black or African American	9.9%
American Indian or Alaska Native	0.7%
Asian	16.1%
Native Hawaiian or Pacific Islander	1.2%
Some Other Race	7.8%
Two or more races	7.5%
Income	
Median income	$69,767
Mean Income	$89,707
Poverty rate	
All families	14.3%

Source: 2010 US Census, 2017 US Census Bureau American Community Survey, California Employment Development Department

1.3.4. Economy and Tax Base

Sacramento County has a diverse economy. US Census estimate show economic characteristics for the County. These are shown in Table 1-3.

Table 1-3 Sacramento County Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	6,521	0.9%
Construction	49,006	6.8%
Manufacturing	37,399	5.2%
Wholesale trade	16,671	2.3%
Retail trade	81,132	11.2%
Transportation and warehousing, and utilities	41,582	5.8%
Information	10,153	1.4%
Finance and insurance, and real estate and rental and leasing	46,752	6.5%
Professional, scientific, and management, and administrative and waste management services	85,489	11.8%
Educational services, and health care and social assistance	161,306	22.3%

Industry	Estimated Employment	Percent
Arts, entertainment, and recreation, and accommodation and food services	72,190	10.0%
Other services, except public administration	39,145	5.4%
Public administration	75,730	10.5%

Source: US Census Bureau American Community Survey 2018 Estimates

Major employers in the County are shown in Table 1-4.

Table 1-4 Major Employers in Sacramento County

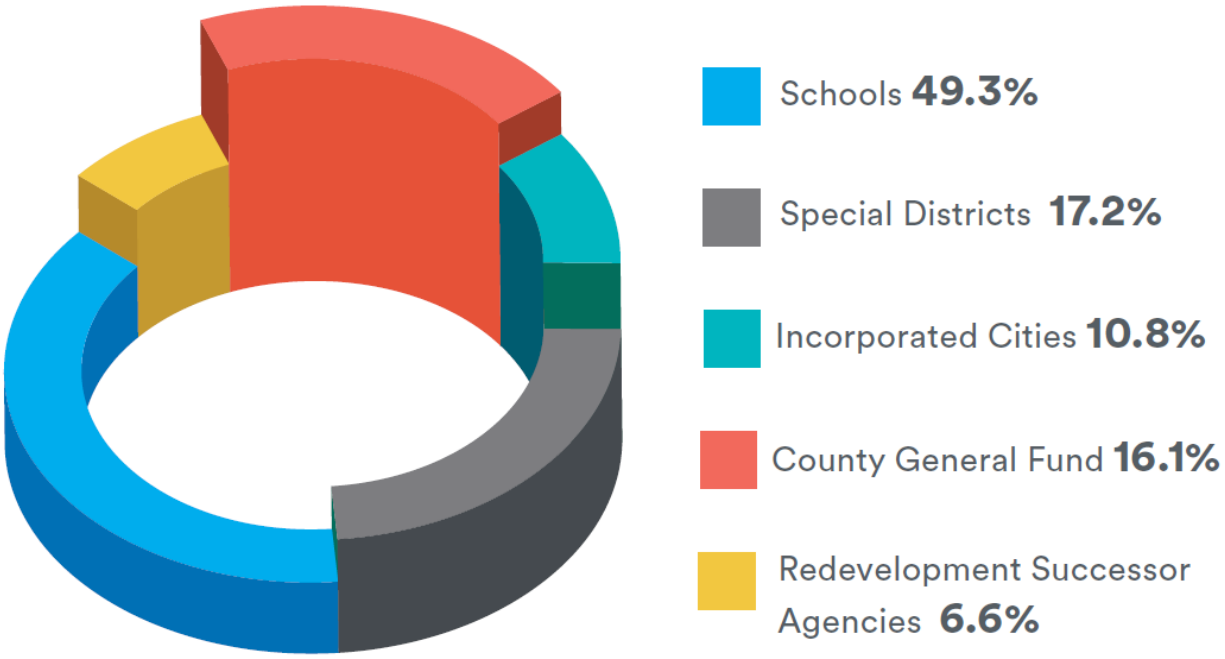
Employer Name	Location	Industry
Aerojet Rocketdyne Inc	Rancho Cordova	Aerospace Industries (mfrs)
Agreeya Solutions	Folsom	Information Technology Services
American River College	Sacramento	Junior-Community College-Tech Institutes
AMPAC FINE CHEMICALS LLC	Rancho Cordova	Electronic Equipment & Supplies-Mfrs
Apple Distribution Ctr	Elk Grove	Distribution Centers (whls)
California Department of Corrections	Sacramento	Insurance Agents Brokers & Service
California Prison Ind Auth	Folsom	Government Offices-State
California State Univ Sacramento	Sacramento	Schools-Universities & Colleges Academic
Corrections Department	Sacramento	State Govt-Correctional Institutions
Dept of Transportation In Ca	Sacramento	Government Offices-State
Disabled American Veterans	Sacramento	Veterans' & Military Organizations
Employment Development Dept	Sacramento	Government Offices-State
Environmental Protection Agency	Sacramento	State Government-Environmental Programs
Intel Corp	Folsom	Semiconductor Devices (mfrs)
Kaiser Permanente South	Sacramento	Hospitals
L A Care Health Plan	Sacramento	Health Plans
Mercy General Hospital	Sacramento	Hospitals
Mercy San Juan Medical Ctr	Carmichael	Hospitals
Sacramento Municipal Utility	Sacramento	Electric Contractors
Securitas Security Svc USA	Sacramento	Security Guard & Patrol Service
SMUD	Sacramento	Electric Companies
State Compensation Ins Fund	Sacramento	Insurance
Sutter Medical Ctr-Sacramento	Sacramento	Hospitals
United Loan Corp	Sacramento	Real Estate
Water Resource Dept	Sacramento	Government

Source: Economic Development Department, 2020

The County has a wide and varied tax base. Property taxes constitute the largest source of money for Sacramento County's General Fund. Property taxes are a one-percent tax on a property's assessed value

under California law. After the deduction of property tax exemptions for homeowners', disabled veterans', and charitable organizations, the County's total net assessed value for 2020-21 is over $180 billion. Property tax revenue collected at the County level is distributed to over 175 local government agencies; cities, schools, and special districts such as fire, park, community service and cemetery districts. A distribution of property taxes can be seen on Figure 1-2.

Figure 1-2 Sacramento County – Property Tax Distribution



Source: Sacramento County Assessor's Office

Tax base information is tracked and maintained by the Sacramento County Assessor's Office. The following tables show the tax base for the County as well as for the incorporated jurisdictions. Table 1-5 shows the secured real property value by property type for the entire County. Table 1-6 shows the secured real property value by jurisdiction.

Table 1-5 2019-2020 Sacramento County Planning Area Distribution of Value by Property Use*

	Parcel Count		2019-2020		Assessed Values		2019-2020	
Property Type	**2020**	**2019**	**# Change**	**% Change**	**2020**	**2019**	**$ Change**	**% Change**
Vacant Land - Residential	16,832	16,421	411	2.5%	2,150,977,648	2,003,590,342	147,387,306	7.4%
Single Family Residences	384,023	380,260	3,763	1.0%	115,292,649,366	108,723,604,319	6,569,045,047	6.0%
Condominiums	13,731	13,577	154	1.1%	2,502,757,313	2,295,187,758	207,569,555	9.0%
Manufactured Homes	7,150	8,177	-1,027	-12.6%	452,100,239	442,551,588	9,548,651	2.2%
Multi-Family 2 to 4 units	16,115	16,004	111	0.7%	4,731,914,231	4,426,256,841	305,657,390	6.9%
Agricultural	3,011	3,016	-5	-0.2%	1,618,524,538	1,565,358,366	53,166,172	3.4%
Multi-family 5 or more units	3,926	3,913	13	0.3%	13,167,916,674	11,923,037,719	1,244,878,955	10.4%
Commercial/Industrial	17,066	17,058	8	0.0%	38,706,173,716	37,022,190,692	1,683,983,024	4.5%
Vacant Commercial/Industrial Land	3,406	3,432	-26	-0.8%	1,247,859,646	1,246,889,702	969,944	0.1%
Oil, Gas, and Minerals	140	131	9	6.9%	51,426,197	47,126,283	4,299,914	9.1%
Church & Welfare Parcels	1,312	1,275	37	2.9%	1,867,120,463	1,821,338,015	45,782,448	2.5%
Common Area Parcels	3,052	2,873	179	6.2%	1,599,484	1,569,527	29,957	1.9%
Locally Assessed Utility Parcels (owned/leased)	599	604	-5	-0.8%	0	0	0	0.0%
Government Owned	7,721	7,558	163	2.2%	0	0	0	0.0%
Misc. Other	3,128	3,257	-129	-4.0%	186,294,809	190,180,750	-3,885,941	-2.0%
Totals	**481,212**	**477,556**	**3,656**	**0.8%**	**181,977,314,324**	**171,708,881,902**	**10,268,432,422**	**6.0%**

Source: Sacramento County Assessor's Office

*Values are gross totals (land, improvements, fixtures, and personal property) before exemptions

Table 1-6 Local Assessment Roll Totals by Jurisdiction

Jurisdiction	2020-21	2019-20	Net Increase	% Increase
Citrus Heights	7,736,564,948	7,386,280,380	350,284,568	5%
Elk Grove	22,571,199,959	21,279,713,049	1,291,486,910	6%
Folsom	15,621,129,725	14,672,408,347	948,721,378	6%
Galt	2,398,848,655	2,264,325,927	134,522,728	6%
Isleton	66,765,832	61,908,949	4,856,883	7%
Rancho Cordova	9,823,138,897	9,289,666,527	533,472,370	5%
Sacramento City	58,824,432,221	55,084,240,000	3,740,192,221	6%
Unincorporated Area	64,790,246,311	61,773,430,506	3,016,815,805	5%
Totals	**181,832,326,548**	**171,811,973,685**	**10,020,352,863**	**6%**

Source: Sacramento County Assessor's Office

1.4 Plan Organization

This Sacramento County LHMP Update is a multi-jurisdictional plan that geographically covers the entire area within Sacramento County's jurisdictional boundaries (i.e., the Planning Area). The Sacramento County Local Hazard Mitigation Plan update is organized as follows:

Base Plan

- Chapter 1: Introduction
- Chapter 2: What's New
- Chapter 3: Planning Process
- Chapter 4: Risk Assessment

- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance

Annexes

- Annex A: City of Citrus Heights
- Annex B: City of Elk Grove
- Annex C: City of Folsom
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  - ✓ Delta Annex Chapter 10: Reclamation District 563
  - ✓ Delta Annex Chapter 11: Reclamation District 1002
  - ✓ Delta Annex Chapter 12: Reclamation District 1601
  - ✓ Delta Annex Chapter 13: Reclamation District 2111

Appendices

- Appendix A: Planning Process
- Appendix B: References
- Appendix C: Mitigation Strategy
- Appendix D: Adoption Resolution
- Appendix E: Threatened and Endangered Species
- Appendix F: Critical Facilities

- Appendix G: Survey
- Appendix H: RLAA
- Appendix I: Watershed Management Plan

The **Base Plan** provides the overall framework for this multi-jurisdictional LHMP. It is the umbrella document that includes the planning process, methodologies, and procedural requirements for all participating jurisdictions (i.e., unincorporated County and all Jurisdictional Annexes). As such, Chapters 1-7 of the Base Plan apply to the unincorporated County, the seven incorporated communities, and the 24 special Districts as participants to this LHMP Update seeking FEMA approval of the Plan. Because this is a multi-jurisdictional plan, the Base Plan addresses the LHMP hazard mitigation planning elements specific to the Sacramento County Planning Area which includes data, information and analysis specific to all participating jurisdictions and also includes data, information, and analysis specific to unincorporated Sacramento County.

The **Jurisdictional Annexes** detail the hazard mitigation planning elements specific to each additional participating jurisdiction to this Sacramento County LHMP Update. Each annex is not intended to be a standalone document, but appends to, supplements, and incorporates by reference the information contained in the Base Plan document. As such, all Chapters 1-7 of the Base Plan, including the planning process and other procedural requirements and planning elements apply to and were met by each participating jurisdiction. The annexes provide additional information specific to each participating jurisdiction, with a focus on providing additional details on the risk assessment and mitigation strategy.

The **Appendices** provide additional information, data, and planning process documentation that applies to all participating jurisdictions (i.e., unincorporated County and all jurisdictional annexes) to this Sacramento County LHMP Update.

Chapter 2 What's New

Requirements §201.6(d)(3) and §201.7(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

The 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) contained descriptions of their planning processes, the risk assessments of identified hazards for the Sacramento County Planning Area and mitigation strategies for reducing the risk and vulnerability from these hazards. Since approval of this plan by FEMA, progress has been made by the County, the seven incorporated communities, and 20 special Districts on implementation of the 2016 mitigation strategies. As part of this LHMP Update, a thorough review and update of the 2016 County LHMP was conducted to ensure that this Update reflects current community conditions and priorities in order to realign the updated mitigation strategy for the next five-year planning period. This section of this LHMP Update includes the following:

- **What's New in the Plan Update**. Section 2.1 provides an overview of the approach to updating the Plan and identifies new analyses, data and information included in this LHMP Update to reflect current community conditions. This includes a summary of new hazard and risk assessment data as it relates to the Sacramento County Planning Area as well as information on current and future development trends affecting community vulnerability and related issues. The actual updated data, discussions, and associated analyses are contained in their respected sections within this LHMP Update.
- **Summary of Significant Changes to Current Conditions and Hazard Mitigation Program Priorities**. Section 2.2 provides a summary of significant changes in current conditions, changes in vulnerability, and any resulting modifications to the community's mitigation program priorities.
- **2016 Mitigation Strategy Status and Successes**. Section 2.3.2 provides a description of the status of mitigation actions from the 2016 LHMP and also indicates whether a project is no longer relevant or is recommended for inclusion in the updated 2021 mitigation strategy. This section also highlights key mitigation success stories of the County and other participating jurisdictions since the 2016 LHMP.

This What's New section provides documentation of Sacramento County Planning Area's progress or changes in their risk and vulnerability to hazards and their overall hazard mitigation program. Completion of this LHMP Update further provides documentation of the Sacramento County communities' continued commitment and engagement in the mitigation planning process.

2.1 What's New in the Plan Update

This LHMP Update involved a comprehensive review and update of each section of the 2016 Plan and includes an assessment of the success of the participating communities in evaluating, monitoring, and implementing the mitigation strategy outlined in the 2016 LHMP. Only the information and data still valid from the 2016 LHMP was carried forward as applicable into this 2021 LHMP Update.

Also to be noted, Chapter 7 Implementation and Maintenance of this LHMP Update identifies key requirements for updating future plans:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to inventories; and
- Incorporate new action recommendations or changes in action prioritization.

These requirements and others as detailed throughout this Plan were addressed during this LHMP Update process.

As part of its comprehensive review and update of each section of the Plan, Sacramento County and participating jurisdictions recognized that updated data, if available, would enhance the analysis presented in the risk assessment and utilized in the development of the updated mitigation strategy. Highlights of new data used for this LHMP Update is identified below in this section and is also sourced in context within Chapter 4, Risk Assessment. Specific data used is sourced throughout this LHMP Update. This new data and associated analysis provided valuable input for the development of the updated mitigation strategy presented in Chapter 5 of this LHMP Update.

Highlights of new information and analyses contained in this combined LHMP Update includes the following:

- Most hazards from the 2016 Plan were profiled in this LHMP Update. River/Stream/Creek Bank Erosion was moved into and dealt with in the flood, dam failure, and levee failure hazards. New hazards include pandemic. Hazards dropped from consideration include ag hazards (though the effects of hazards on the ag industry are discussed in each hazard vulnerability section) and fog.
- A refined critical facility definition was created. The County created a new list of critical facilities that were spatially quantified in GIS, and then overlayed on each mapped hazard.
- Future development data was updated and collected from the County and each City. This was spatially quantified in GIS, and then overlayed on each mapped hazard.
- Disaster declarations were updated, including federal, state, and USDA disaster declarations.
- The NCDC Storm Events and FEMA/Cal OES disaster declaration tables were updated.
- A new section on Power Shortage/Failure was added. Public Safety Power Shutoff events were also added.
- Cal-Adapt and updated Sacramento County Climate Action Plan data was added to the climate change section, as well as to other hazards that are exacerbated by climate change.
- New dam data provided by Cal OES was used for the dam inventory and analysis. This data included an updated hazard classification for identified dams and updated inundation mapping. Values at risk to dam inundation was analyzed. Critical facilities and populations at risk to dams were tabulated.
- An updated GIS analysis was performed for earthquake, including a Hazus earthquake run to show risk and provide potential loss estimates to the County from earthquake.
- An updated GIS analysis using the 2018 DFIRMs was performed for the flooding hazard for the 1%/0.2% annual chance floods, including values at risk, critical facilities at risk, population at risk, future development, and general community impacts.

- An updated GIS analysis was performed for landslides, including values at risk, critical facilities at risk, population at risk, future development, and general community impacts.
- More detailed GIS analysis was performed for the wildfire hazard, including values at risk, critical facilities at risk, population at risk, historic, cultural, and natural locations at risk, and general community impacts.
- An entire rework of the risk assessment for each identified hazard to reflect new information and to reflect the updated FEMA plan review tool. This included reworking the hazard profile and adding sections on location, extent, and new hazard event occurrences; redoing the entire vulnerability analysis to add additional items and updating the vulnerability assessment based on more recent hazard data as well as using the most current parcel and assessor data for the existing built environment to develop loss estimates.
- To better meet the revised FEMA plan review tool, a more extensive analysis of the extents to identified hazards was conducted and included in this LHMP Update.
- Utilizing updated critical facility GIS mapping for the Planning Area, an analysis was conducted to provide an updated inventory of critical facilities and those that fall within mapped hazard areas.
- An enhanced vulnerability assessment was conducted, which added a GIS analysis of updated future development areas in the Planning Area and specific to each of the mapped hazards.
- A greater study of County mitigation capabilities was added.
- Incorporation and analysis of the updated California Department of Finance population data was utilized for this LHMP Update.
- Environmental justice concerns were addressed in portions of this Plan Update.
- Also, as required by current FEMA planning guidance, an analysis of ongoing and continued compliance with the NFIP was included in this LHMP Update.

2.2 Summary of Significant Changes to Current Conditions, Planning Area Vulnerability, and Hazard Mitigation Priorities

This section provides a summary by hazard of significant changes in current conditions, planning area vulnerability, and any resulting modifications to the community's mitigation program priorities since the 2016 LHMP:

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Climate Change			X

- NWS data indicates temperatures are increasing resulting in more extreme heat days. 2020 and 2021 temperatures have been some of the hottest.
- Weather extremes, including precipitation have become much more variable – the Planning Area is seeing increased precipitation and intensity as well as abnormally dry, drought conditions.
- Atmospheric rivers that stream through the I-80 corridor give rise to highly concentrated flood events that overwhelm the stormwater system, especially when these occur during high tide conditions and high winds causing wave impacts and overwhelming system pumps and roads.

- Climate change conditions exacerbate and increase vulnerability in multiple hazard areas. Other impacts include impacts to food sources and food-related diseases, eco-system changes, public health issues, etc.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Dam Failure	X		

- Folsom Dam spillway improvement project, recently completed, allows releases at a lower flood stage for enhanced flood control. Additional dam improvements, that will raise the dam 3 feet, will continue to make the likelihood of a dam failure less likely. These projects decrease the overall vulnerability in the Folsom Dam inundation areas.
- Jurisdictional dams generally have no change in vulnerability as they are highly regulated. However, with more people moving into dam inundation areas, the vulnerability increases due to an increase in potentially affected population, but not generally due to an increased risk of dam failure.
- Non-jurisdictional dams can pose the biggest risk and, over time with little regular maintenance and often located in remote areas with little security, result in an increase in vulnerability to Sacramento County.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Drought and Water Shortage			X

- Since the 2016 planning process, current drought conditions, including water supply issues, continue to have a significant impact on the Sacramento County planning area and California. As a result, the drought hazard has become a significant priority for mitigation planning.
- State drought mandates, including conservation measures, to protect water supply throughout California have been implemented and continue within the Planning Area.
- Similar to more forested areas of California, drought has contributed to an increase in vulnerability of the County due to increase tree mortality issues and general increase in wildfire conditions.
- Water quality concerns are exacerbated in drought conditions with less flows in streams, combined with drawing down the water table. Saltwater intrusion is a concern. Economic impacts associated with new NPDES permits.
- Drought conditions have increased the occurrence of stream bank erosion, with soils drying out and becoming more friable, they tend to slough off the banks causing increased areas of erosion.
- Over the last few years, the drought has had a economic impact on recreation in the County, with rivers running substantially lower, less people have been vacationing and undertaking water dependent recreational activities, such as boating.
- Recent drought conditions stress crops making them more susceptible to insect infestation and other weather related impacts.
- Reduced water supply results in land being left out of production reducing overall crop yields.
- Noxious weeds are more drought tolerant – better able to compete for water over local crops

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Earthquake and Earthquake Liquefaction		X	

- The primary factor that might change the earthquake vulnerability, is additional development and significantly more people moving to the area.
- However, adherence to current California building codes should ensure sound development in new development areas.
- There remains the potential for effects from earthquakes in the adjacent and nearby counties. However, historically, direct impacts to Sacramento County have been limited.

- A primary vulnerability of earthquake is to the Delta area, levees, and potential impacts to water supply.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Floods: 1%/0.2% annual chance		X	

- Overall the net increase or decrease in vulnerability to flood depends on the location within the Planning Area.
- Ongoing implementation of regional flood control projects and effective land use planning and requirements for development in identified floodplains have minimized additional exposure to this hazard in the County.
- The SB5/200-year requirements for urbanizing areas are reducing vulnerability.
- More intense precipitation events, including periodic atmospheric river conditions, continue to lead to flooding within the County. This was evident in winter storm events occurring in 2017 and 2019.
- With the flood hazard remaining one of the biggest hazards of concern to Sacramento County, flood mitigation projects, including flood insurance promotion and continued participation in the NFIP's CRS program, remains a priority.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Floods: Localized Flooding			X

- Climate change issues may result in more localized flooding as the climate warms and the wetter storms create more runoff.
- 2017-2019 winter storms, including greater intensity rains, resulted in more localized flooding throughout the Planning Area.
- Outdated and aging drainage infrastructure also contributes to a greater vulnerability to localized stormwater flooding.
- Recent drought conditions in some areas have hardened soils and predisposed areas to worse flooding.

- Sacramento County and incorporated communities continue to track and map localized flooding areas. These efforts, c2ombined with the development of new hydrology standards will help reduce the vulnerability of this hazard in the future.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Landslide, Mudslide, and Debris Flows		X	

- With several years of drought conditions, much of the vegetation along slopes areas is failing to thrive, thus there is a lack of vegetation to hold soil contributing to the landslide/mudslide potential.
- However, Sacramento County has very little exposure to this hazard due to the relative flat topography and with most landslide potential areas located in areas with little development.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Levee Failure		X	

- Similar to other hazards, increased development in areas protected by levees could result in an increase in vulnerability.
- Levee improvement projects, completed and in process, that will certify levees to 100- and 200-year levels of protection provide enhanced protection for the Planning Area. Once complete, these projects should decrease the vulnerability of the Sacramento County planning area to levee failure

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Pandemic		X	

- Pandemic is a new hazard to the 2021 LHMP Update

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Severe Weather: Extreme Temperatures - Heat			X

- There has been an increase in severe heat days in recent years. 2020 and 2021 have been some of the hottest on record.
- Climate change issues will continue to increase heat related impacts.
- Vulnerable populations are at greatest risk to this hazard.
- The heat, combined with drought conditions, has increased the potential for wildfires.
- Depending on the crops, heat can adversely impact the agricultural industry.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Severe Weather: Extreme Temperatures- Cold and Freeze	X		

- With the Planning Area experiencing more mild winters in recent years, there has been a decrease in vulnerability of Sacramento County to freeze and severe winter storms.
- Although freeze events when they do occur continue to impact area crops and vulnerable populations
- Depending on the crops, cold and freeze events can adversely impact the agricultural industry.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Severe Weather: Heavy Rains and Storms			X

- Similar to other weather hazards, the overall vulnerability of the Planning Area changes from year to year depending on the season. The rains of 2017, 2019 were significant, causing flooding and other adverse impacts to the County.
- Climate change brings renewed concern moving forward for heavy and more intense rains, storms and associated issues to the County.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Severe Weather: High Winds and Tornadoes			X

- High winds continue to be an issue in Sacramento County with a slight increase in overall vulnerability based on several issues.
- Primary concerns include wave action in the Delta and along stream banks contributing to erosion and high winds contributing to an increase in the wildfire potential.
- Also now a concern is the high winds leading to power outages and the potential for PSPS events creating other impacts to the Planning Area.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Subsidence		X	

- Drought conditions have contributed to increased subsidence statewide due to the drawdown of the water table.
- In Sacramento County, subsidence had been mostly a concern in the Delta area where subsidence issues have actually decreased with the implementation of better farming practices over the years.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Volcano		X	

- This low priority hazard has not changed over the last five years.

2021 LHMP Update Hazards	Decrease in Vulnerability	No Change in Vulnerability	Increase in Vulnerability
Wildfire			X

- Compounded by current drought conditions, the wildfire hazard has substantially increased and is no longer just a seasonal issue. The wildfire season, including the potential for a catastrophic wildfire, is now a year around concern.
- The vulnerability of Sacramento County to increased occurrence of a devastating wildfire has increased as exacerbated by the recent drought, increases in tree mortality, and overall increase in wildfire conditions.
- The increased development in WUI areas within the County also contributes to an increase in vulnerability.
- Wind has been a major contributor to the potential for a catastrophic wildfire. And when combined with extreme heat, also can trigger a PSPS which leaves the community at risk in other ways.
- With large wildfires occurring throughout California, Sacramento County has seen a significant change in air quality from smoke resulting in more recorded bad air days.
- Catastrophic wildfires in northern California counties have created other issues in the County, as evacuees flee the fires and look to nearby communities for temporary housing.

2.3 2016 LHMP Mitigation Strategy Successes and Status

Sacramento County and participating jurisdictions have been successful in implementing actions identified in the 2016 Sacramento County LHMP Mitigation Strategies, thus, working diligently towards meeting their 2016 goals and objectives of:

GOAL 1: Minimize risk and vulnerability of the Sacramento County community to the impacts of natural hazards and protect lives and reduce damages and losses to property, public health, economy, and the environment.

Objectives:

- Protect, preserve, and promote public health and safety, livability, and the environment
- Assure long term protection and resiliency of existing and future development (including infill areas) from natural hazards
- Protect critical facilities from natural hazards and minimize interruption of essential infrastructure, utilities, and services
- Protect natural resources; Protect and enhance water quality and supply, critical aquatic resources and habitat for beneficial uses.

- Maintain/enhance the flood mitigation program to provide 100/200/500-year flood protection
- Minimize risk of levee breach, overtopping or other failures
- Mitigate Repetitive Loss Properties
- Continued enhancement of CRS programs
- Address localized drainage issues
- Reduce the potential of wildfire in Sacramento County and protect the community
- from adverse effects of wildfire, including secondary impacts such as air quality
- Protect vulnerable populations from the threat of natural hazards
- Address climate change influence in project design and development
- Promote hazard mitigation as an integrated public policy and as a standard business practice

GOAL 2: Improve public outreach, awareness, education, and preparedness for all hazards to minimize hazard related losses

Objectives:

- Increase outreach, communication and awareness of natural hazards and reduce exposure to all hazard related losses, including climate change
- Improve the communities' understanding of natural hazards and how to effectively be prepared and take action to mitigate the impacts of hazard events
- Develop and target outreach and education for each hazard type and risk area
- Increase access to natural hazard information via enhanced web and mobile applications before, during, and after a disaster
- Enhance public outreach programs to target all vulnerable populations, including multi-language communications and multi-mode delivery
- Continued promotion of flood insurance

GOAL 3: Improve the capabilities of the community to mitigate losses and to be prepared for, respond to, and recover from a disaster event

Objectives:

- Promote interagency coordination of mitigation planning and implementation efforts
- Minimize hazard-related damage in order to maintain current service levels
- Continued enhancements to emergency services capabilities, integrating new technologies to reduce losses and save lives
- Promote intergovernmental and interagency coordination, planning, training, exercising and communication to ensure effective community preparedness, response, and recover
- Increase the use of coordinated, shared resources between agencies
- Promote public/private partnerships in hazard mitigation and preparedness programs
- Identify, coordinate, and implement countywide evacuation and shelter in place planning for all populations and increase community awareness of these activities

GOAL 4: Assure conformance to Federal and State Hazard Mitigation Initiatives and Maximize Potential for Mitigation Implementation

Objectives:

- Maintain FEMA Eligibility/Position Jurisdictions for Grant Funding

- Maintain good standing with FEMA and State hazard mitigation programs, regulations and requirements
- Develop an overall mitigation funding strategy to prioritize and pursue mitigation projects in an equitable manner to benefit all populations
- Maximize funding opportunities through identification and tracking of all types of Federal and state grant programs to implement identified mitigation projects

Where possible, Sacramento County and participating jurisdictions used existing plans and programs to implement the 2016 mitigation strategies.

2.3.1. Success Stories

Sacramento County

Sacramento County's Floodplain Management Section provides homeowners with opportunity to mitigate flood risk with help from FEMA grant funding. In 1996, Sacramento County's Floodplain Management Section outreached to homeowners suggesting they consider mitigating their flood risk. While outreach is an annual project, and mitigation is included in the annual brochure sent to all properties in the flood hazard areas, it is only in recent years that numerous homeowners have shown interest. This is likely due to concerns about climate change, concerns about levee maintenance and accreditation, and the rising cost of National Flood Insurance Program annual premiums. Over the years, outreach has been ramped up and more homeowners have been added to grant applications. The County's most recent home elevation project grant application included 35 homes utilizing FEMA's Hazard Mitigation Grant Program (HMGP) funds. The following provides highlights of some of the more notable flood mitigation projects.

Raising Houses

When an existing house is raised so that the floor is safely above the flood hazard elevation on a firm foundation and flood resistant support, the damage associated with flooding is greatly reduced. The lower level may be used for parking vehicles and for incidental storage. The residents should understand the County's flood warning systems and be prepared to relocate the vehicles and incidentals.

This home in Wilton, CA flooded in 1997, it was elevated, by HMGP 1155, in 1999. The mitigation project protected the home from possible flood damage in 2017.

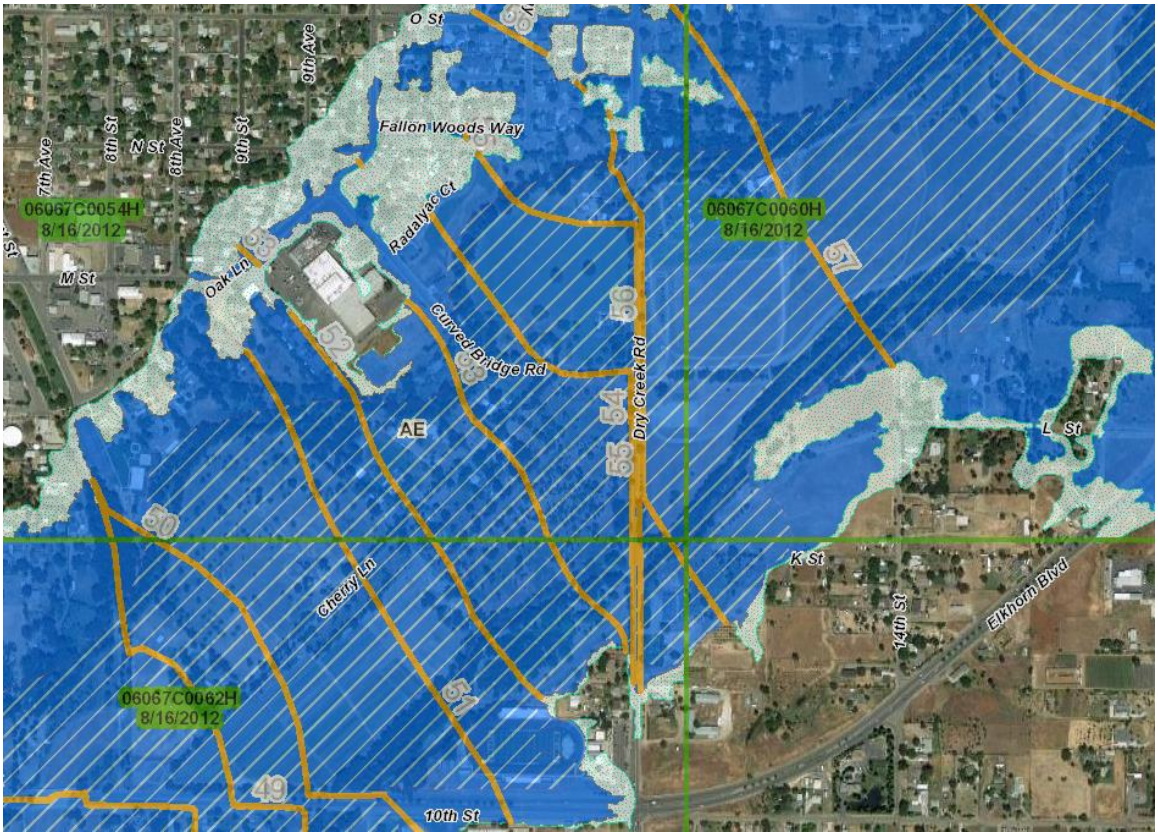
Figure 2-1 Sacramento County Home Elevation Project

Photo by: Sacramento County Floodplain Management Section

In the Dry Creek area of Rio Linda, the County has taken a two pronged approach. Where the flood hazard is deemed dangerous, properties have been acquired by a combination of FEMA, state and local funding. The land is owned by the County's Park Department and held as open space. Properties in shallow flood hazard areas may be elevated to reduce flood risk.

Dry Creek, in north Sacramento County is generally calm, but when it isn't it can be a monster flowing at 14,000 cubic feet per second.

Figure 2-2 Dry Creek during Flooding

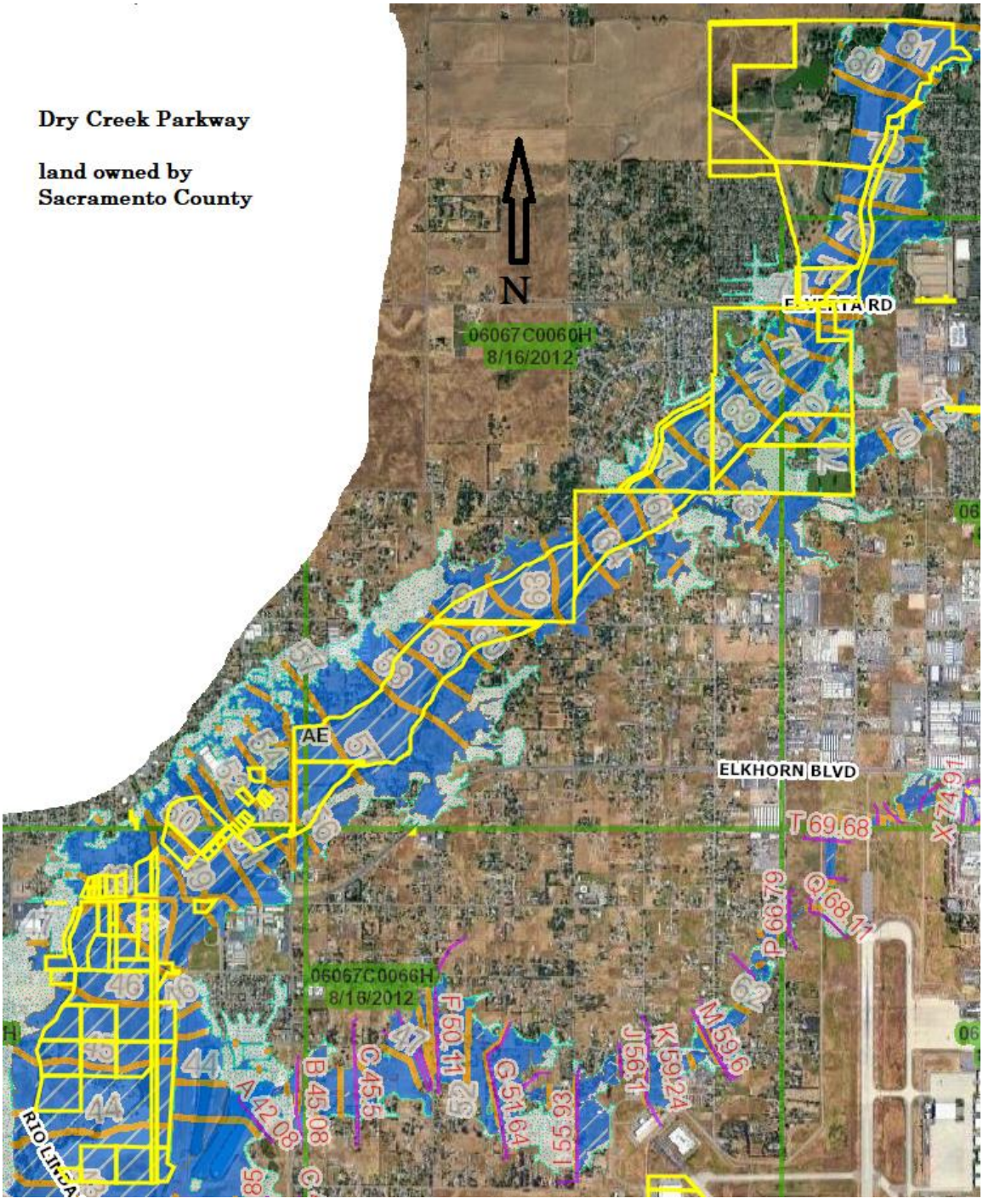


Clipped from County GIS, above, showing the width of the Dry Creek floodplain

Home acquisition and demolition program in the floodway.

Twelve pre-FIRM homes in the Dry Creek floodway suffered damage as many as five times : 1982, 1986, 1995, 1997, and 1998. Using HMGP 1155, in 1989-99, repetitive loss houses in the Dry Creek floodway were acquired and demolished. The land is owned by Sacramento County Parks Department.

Figure 2-3 Dry Creek Parkway



Map source: Sacramento County GIS with Google Map

Looking at the sum of the repetitive loss claims prior to mitigation, and inflating to 2018 dollars (using 5% inflator) the damage sum ranged from $68,000 to $239,000 per house. Significant storm events have occurred after these homes were acquired, including 12/31/2005, 12/2/2012 and January 2017; thus, significant losses were avoided. For houses outside of the proposed Dry Creek Parkway, the County of Sacramento encourages elevation to reduce the risk of flood damage.

Figure 2-4 House in Rio Linda, CA Elevated under HMGP FEMA-DR-1155-CA

Source: Sacramento County DWR

NFIP covered damage was $27,000, inflate to 2018 dollars it would be $83,000 (5% / yr). Damages were avoided in significant storm events on December 31, 2005 and December 2, 2012 and January 2017. Currently, the County of Sacramento with funding from FEMA Hazard Mitigation Grant Program and the County's Stormwater Utility has begun encouraging homeowners to raise houses in the fringe of the floodplain area (HMGP4240, approved in 2019), such as the pictures below.

Figure 2-5

Source: Sacramento County DWR

The **Beach Stone Lakes** area, east of the Sacramento River and west of the City of Elk Grove is a large floodplain area with agricultural properties. The flooding is caused by a combination of the Cosumnes River, Morrison Creek and backwater above the north Delta. To compound this concern, the Sacramento River east levee is not certified. The community flooded in 1986, 1997, and twice in 2017.

Figure 2-6 Beach Stone Lakes Flooding

Source: Sacramento County DWR

The County of Sacramento with local and FEMA grant funds is inviting homeowners to mitigate the flood hazard.

Figure 2-7 House Lifted in May 2021

Source: Sacramento County DWR

The **Sacramento River Delta** is a treasure rich in history, agriculture, and outdoor recreation. The future of the Delta is bright but for the flood hazard. The County of Sacramento encourages home elevation with help from FEMA grant programs. The one shown below was raised in 2020.

Figure 2-8 House being Raised

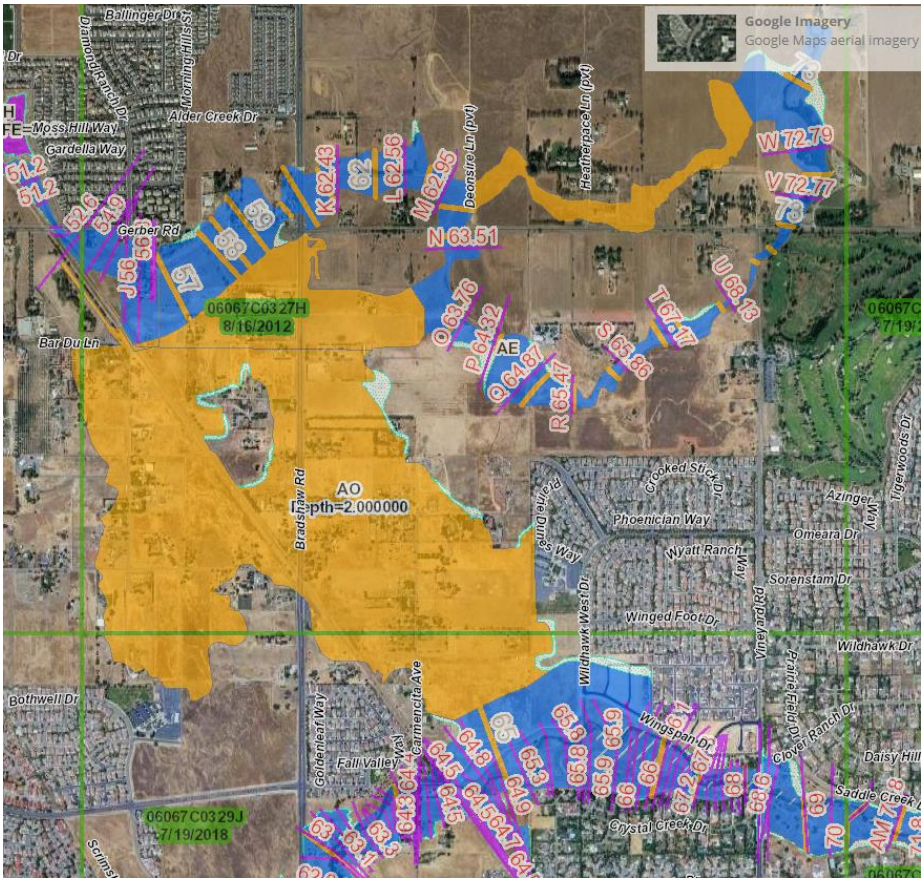
Source: Sacramento County DWR

The projects above are known as non-structural mitigation measures because they do not seek to control the floodwater but to live with it while protecting the house. An example of a structural flood control project is the Southgate Soccer Field Basin Project on Laguna Creek.

Constructing Detention Basins

In partnership with Southgate Recreation and Park District, the County of Sacramento entered into a contract for construction (summer 2021) of a side channel detention basin to control inter-basin flooding that occurs between Laguna Creek (at the bottom of the figure) to the north to Gerber Creek.

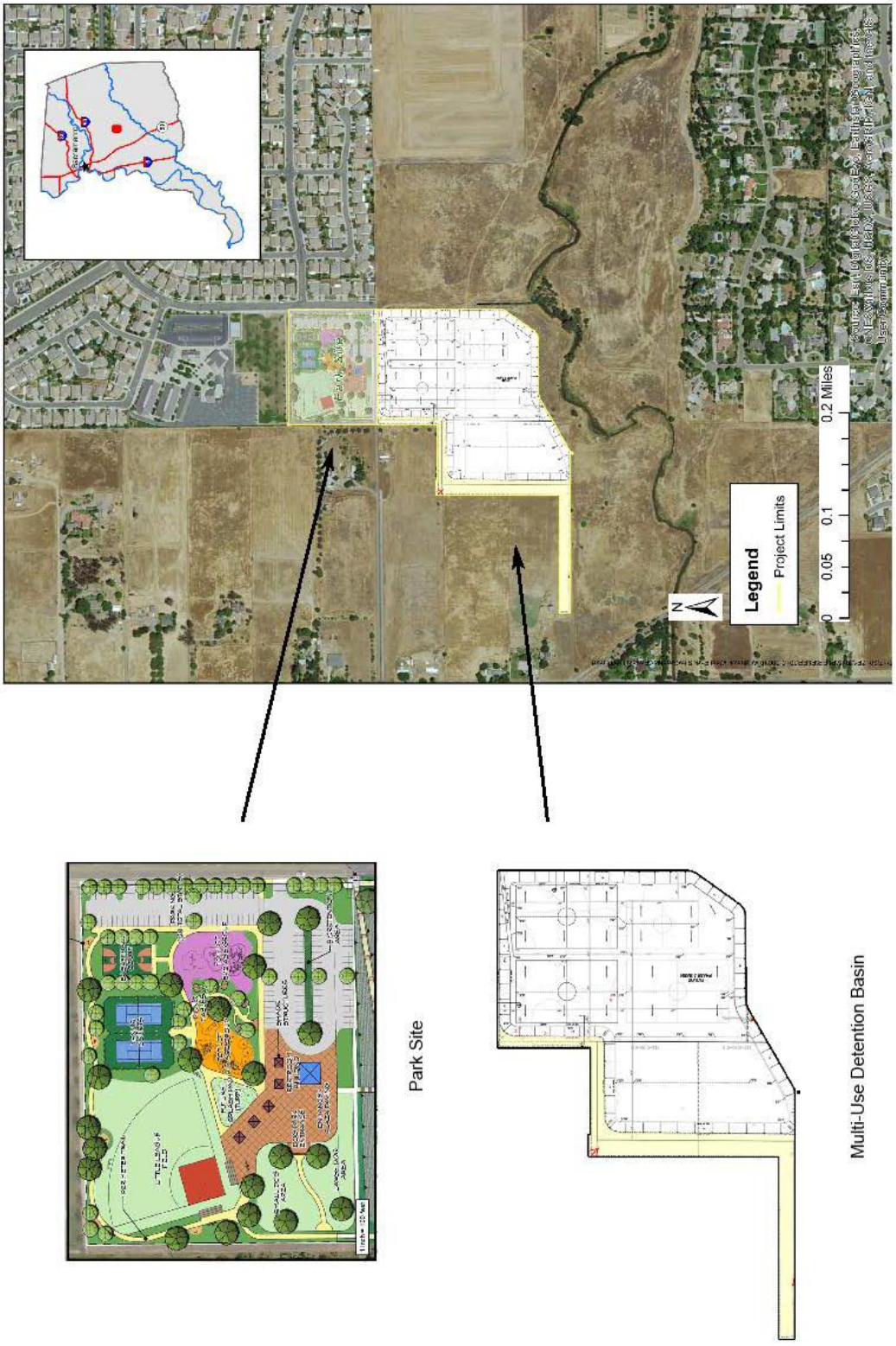
Figure 2-9 Detention Basins



Source: Sacramento County DWR

This project will be an active use park but will be subject to flooding approximately 3 times every 30 years. This will help control the inter-basin Zone AO sheet flow floodplain shown above in orange. The project plan is shown below. The parking and active use sports will be on high ground while the soccer will be played in the flood control basin area.

Figure 2-10 Active Use Park Plans



2.3.2. 2016 Mitigation Strategy Update

The 2016 Sacramento County LHMP mitigation strategy contained 241 separate mitigation actions for the County and participating jurisdictions. Of the 241 actions, 27 have been completed, 4 are complete and ongoing, 171 are ongoing, and 42 have not been started. 159 2016 Sacramento County actions have been identified for inclusion in this LHMP Update, and are carried forward in Chapter 5 in Table 5-4. Table 2-1 provides a status summary of the mitigation action projects from the 2016 Sacramento County LHMP. Following the table is a description of the status of each project.

Table 2-1 Sacramento County's 2016 LHMP Update: Mitigation Action Status Summary

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Sacramento County				
Multi-Hazard Actions				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	X	X		Y
Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness		X		Y
Increase pedestrian and bicycle evacuation routes by constructing regional bike/pedestrian trail infrastructure, and expanding connection to neighborhoods (particularly in vulnerable areas)		X		Y
Community Rating System (CRS) Program for Public Information (PPI)		X		Y
Flood Insurance Assessment, Awareness, and Promotion		X		Y
Public Outreach Mailers		X		N
Toxic Substance Release		X		N
Climate Change Actions				
Increase average fuel efficiency and reduce GHG emissions from the County Fleet and Fuels		X		Y
Reduce Sacramento County's vulnerability to Climate Change by reducing GHG emissions in the commercial and residential sectors by making energy efficiency a priority through building code improvements		X		Y
Mitigate Climate Change impacts by integrating climate change research and adaptation planning into County operations and services		X		Y
Reduce Sacramento County's vulnerability to extreme heat events and associated hazards by Increase tree planting/canopy preservation/enhancement		X		Y
Drought Actions				
Implement Water Supply CIP		X		N
Flood, Levee Failure, and Localized Flood Actions				
Keep the PPI current		X		Y
Alder Creek flood control		X		Y

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Alder Creek flood mitigation (dam)		X		Y
Alder Creek miners reservoir, property owned by the City of Folsom		X		Y
Delta Small Communities flood protection - structural and nonstructural mitigation		X		Y
Gum Ranch flood control - joint use basin		X		N
Implement Storm Drain CIP		X		N
Laguna Creek at Triangle Aggregate flood control -joint use basins		X		Y
Laguna Creek mitigate flood hazard south of Jackson Highway		X		N
Model Sacramento River levee breach (LAMP) south of Freeport		X		N
Morrison Creek Miners Reach Flood Insurance Study		X		N
Morrison Creek Miners Reach levee improvements		X		N
Outreach stormwatch guide (ALERT, Stormready, weather radio)		X		N
Peak flow floodplain mitigation Arcade Creek near Auburn Blvd		X		N
Risk Map (flood frequency, depth, velocity)			X	Y
Elevation & Acquisition Projects (to Mitigate Flood Risk)		X		Y
Repetitive Loss Properties (to Mitigate Flood Risk)		X		Y
Five-Year Capital Improvement Plan – Drainage Projects		X		N
Arcade Creek Corridor Plan		X		N
Elevate Homes on Long Island (Grand Island Road, Sacramento River)	X			Y
Repetitive Loss Church Building on Dry Creek		X		N
South Branch Arcade Creek – Gum Ranch Basin (with Fair Oaks Park District) and Kenneth Avenue Bridge Improvements (with Sacramento County Department of Transportation)		X		Y
Dry Creek Flood Hazard Mitigation Acquisitions with County Regional Park Department			X	N
Arcade Creek at Evergreen Estates Floodwall Improvements		X		N
Linda Creek Peak Flow Mitigation			X	N
Flood Preparation in the American River Parkway		X		Y
Improve County ALERT (Automated Local Evaluation in Real Time) System of Stream and Rain Gauges		X		N
Update County Hydrology Standards		X		Y
Woodside Condominiums Repetitive Flood Loss Property		X		Y
Bridge Replacement on Elk Grove Florin Road at Elder Creek		X		N
Michigan Bar Bridge Replacement at the Cosumnes River		X		N
El Camino Avenue Phase 2 Road Improvements		X		N

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Improve Flood Protection and/or Evacuation Planning for Mobile Home/RV Park at Manzanita/Auburn. Alternatively, the Park Should Establish Flood Warning and evacuation procedures.		X		Y
Hydromodification and Stormwater Quality Countywide		X		Y
Evacuation Mapping	X			Y
Regional Flood Management Plan Projects		X		N
River/Stream/Creek Bank Erosion				
Erosion Site Repairs		X		N
Wildfire Actions				
Wildfire Suppression		X		Y
Wildfire Fighting - Support		X		Y
Wildfire Suppression – Regional Parks and Open Space (urban interface)		X		Y
City of Citrus Heights				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts		X		Y
Rinconada Flood Wall	X			N
Drainage Project Implementation		X		Y
City of Elk Grove				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts		X		Y
Mutual Aid Agreements		X		Y
Elk Grove Green Street Project: Repurposing Urban Runoff with Green Instructure Technologies			X	Y
Hazard Education and Risk Awareness		X		N
City of Elk Grove's Storm Drainage Master Plan (SDMP)		X		Y
City of Folsom				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts	X			N
Stormwater Basin Maintenance and Operation Project		X		Y
Alder Creek Watershed Council			X	N
Drainage System Maintenance Tax Assessment			X	Y
Floodplain Mapping		X		N
Redevelopment Area Drainage Improvements		X		Y
Stormwater Basin Maintenance and Operation Project		X		N
Heating and Cooling Centers		X		Y
Public Education/Outreach Extreme Weather		X		Y
Weed Abatement Program		X		Y

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Arson Prevention and Control Outreach		X		N
Wildfire Hazard Identification		X		N
Ignition Resistant Building Construction Upgrades		X		N
Wildfire Prevention Outreach		X		N
City of Galt				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts			X	Y
Increase Redundancy/Functionality of Water Wells and Sewer Lift Stations		X		N
Drain Inlet Retrofit Capital Improvement Plan (CIP)		X		N
Creek/Streams Vegetation Management Plan			X	Y
Increase Data Capacity of Emergency Frequencies	X			N
City of Isleton*				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan			X	Y
Storm Water Runoff Rehabilitation Project			X	Y
Wastewater Treatment Plant Pond Levee Elevation Raise to 200-year Flood Standard			X	Y
City of Rancho Cordova				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	X	X		Y
Sunrise Boulevard Widening Kiefer to Jackson			X	Y
City of Rancho Cordova Disaster Debris Management Plan	X			Y
Transportation Interconnectivity		X		Y
Intergovernmental Agreement between the County of Sacramento and the City of Rancho Cordova	X			Y
Land Use (Long range)		X		Y
Post disaster training for staff		X		Y
Update/Maintain Emergency Operation Plans (EOPs)			X	Y
Increase Everbridge Enrollment		X		Y
Developing and maintaining a database to track community vulnerability.		X		Y
City Website HMP and City Website, Press Notification, and Social Media Emergency Information		X		N
Building & Safety Division Disaster Inspector Training		X		N
Landscape and Irrigation Requirements/Retro			X	Y
Landscape Ordinance			X	Y
Impervious surface			X	Y
Porous pavement and vegetative buffers			X	Y

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Storm Water Pump Station Infrastructure Upgrades		X		Y
SB-5 Urban Level of Flood Protection	X			Y
Channel Vegetation Management and Erosion Control		X		Y
Adoption of Hydromodification and Low Impact Development (LID) Standards	X			Y
Stormwater Capital Improvement Program Master Plan		X		Y
Sunrise Blvd. & Monier Circle Drainage Improvements		X		Y
Roundabouts		X		Y
City of Sacramento				
Multi-Hazard Actions				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan		X		Y
Coordination with Relevant Organizations and Agencies to Consider the Impacts of Urbanization and Climate Change on Long-Term Natural Hazard Safety		X		Y
Maintain and Identify Changes in Critical Facilities GIS Layer to Support Emergency Management Efforts		X		Y
Community Outreach on Multi-Hazard Preparation & Pre-mitigation	X	X		Y
Evaluation and Mitigation of Critical Facilities in Identified Hazard Areas		X		Y
Retrofit of Repetitive Loss Properties			X	Y
Safeguard Essential Communication Services		X		Y
Multi-lingual Disaster Education	X	X		Y
Cal OES Safety Assessment Program Evaluators		X		Y
National Flood Insurance Program & Community Rating System Continuation		X		Y
Coordinate with Sacramento Area Flood Control Agency on Completion of South Sacramento Streams Group Projects	X			N
Develop a Master Generation Plan for Pump Stations		X		Y
Develop a Disaster Housing Plan		X		Y
Disaster Resistant Business Program		X		Y
Develop Enhanced Emergency Planning for Special Needs Populations in the City of Sacramento Emergency Operations Plan and Other Planning Documents		X		Y
Establish a Post-Disaster Action Plan		X		Y
Flood Recovery Plan		X		Y
Public Information Flood Response Plan		X		Y
Construction of a new Emergency Operation Center (EOC)			X	Y

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Emergency Operation Center (EOC) Expansion and Information Technology Upgrade		X		Y
Protection of Transportation Infrastructure			X	Y
Public Education Campaign for Everbridge System	X			Y
Regional Emergency and Disaster Preparedness Exercises to Test Operational & Emergency Plans		X		Y
Special Needs and Critical Facilities Database and Advanced Warning System		X		Y
Assets Inventory		X		Y
Protection of City Assets from Cyber Terrorism	X			Y
Protection of City Information Technology Infrastructure		X		Y
Cell Booster	X			N
Travel Time Model for Lower American and Sacramento Rivers and their Major Tributaries		X		Y
Watershed Spill Contamination to Drinking Water Quality: Preparedness for Events and Recovery		X		Y
Purchase Drones for Use in Disaster Preparedness, Mitigation, and Response		X		Y
Climate Change Actions				
Map and Assess Vulnerability to Sea Level Rise			X	Y
Emission Study of City Sump and Pump Stations		X		Y
Climate Change Mitigation Actions/Climate Change Adaptation Plan for Drinking Water Quality		X		Y
Harmful Algal Bloom (HAB) Surveillance and Response Planning		X		Y
Drought and Water Shortage Actions				
Aquifer Storage	X			N
Perform a Groundwater Recharge Feasibility Study	X			Y
Earthquake Actions				
Map and Assess Community Vulnerability to Earthquakes	X			N
Seismic Vulnerability Assessment on Sacramento Levees, Infrastructure & Buildings	X			N
Retrofit Historical Buildings		X		Y
Extreme Cold and Heat Actions				
Heating Centers in High Priority Locations		X		Y
Cooling Centers in High Priority Locations		X		Y
Extreme Weather Outreach Strategy		X		Y
Severe Weather Action Plan		X		Y
Flood, Localized Flood, and Levee Failure Actions				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Coordinate with Stakeholder on Proposed Flood Control Project on Magpie Creek		X		Y
Adopt Additional Floodplain Development Standards		X		Y
Drainage Projects for Repetitive Loss Properties		X		Y
Emergency Notification and Evacuation Planning		X		Y
Historic Magpie Creek		X		Y
Natomas Internal Drainage Canals/Levees		X		Y
Drainage Projects from the City's Priority Drainage Project List			X	Y
Projects Identified in the Combined Sewer System Improvement Plan Update		X		Y
Easements for Open Land Along Levees		X		Y
Emergency Management Planning and Levee Security		X		Y
Flood Fighting Equipment	X			Y
Flood Management Land Use Planning and Development		X		Y
Florin Creek Pump at Pomegranate Avenue			X	Y
Internal Drainage System Improvements		X		Y
Levee and Structural Flood Management Improvements		X		Y
Master planning to identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding		X		Y
Retrofit Pumping Plants with Discharge Monitoring Devices		X		Y
Risk Communication and NFIP/CRS Projects		X		Y
Steamers and Rio City Café Floodwalls	X			N
Trash Racks and Debris Cages		X		Y
Multi-Jurisdictional Modeling for Drainage Watersheds Greater Than 10 Square Miles		X		Y
Post-Flood Water Treatment Facility Recovery		X		Y
Wind and Tornado Actions				
Tree Trimming & Debris Removal		X		Y
Upgrading Overhead Utility Lines & Burying Critical Power Lines		X		N
Install Redundancies and Loop Feeds for Power Lines & Infrastructure		X		Y
Erosion Actions				
Stabilization of Erosion Hazard Areas		X		Y
Wildfire Actions				
Implement a Fire Education and Information Program		X		Y
Fuels Reduction on the American River Parkway			X	Y
Outreach on the Effects of Smoke on Air Quality			X	Y

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Cosumnes Community Services District				
Flood Response Equipment		X		Y
Flood Response Training		X		N
Los Rios Community College				
District Wide Roofing Renovations	X			N
ARC Drainage at Arcade Creek	X			N
Protect District Property		X		N
Metro Fire District				
Relocate the essential facilities in the 200-year flood plain			X	Y
Perform seismic study of all district facilities and identify those facilities at greatest risk for earthquake damage.			X	N
Implement a Wildland Urban Interface (WUI) Building/Fire Code			X	N
Develop and Implement a comprehensive WUI fuels management program.		X		N
Deploy 2 remote automated weather stations (RAWS) in Metro Fire jurisdiction			X	N
Defensible space ordinance			X	N
Brannan Andrus Levee Maintenance District				
Implement Bioengineered Bank Stabilization techniques		X		N
Development of Dredge Stockpile Site	X			N
Georgiana Slough Waterside Erosion Repair		X		Y
Hydrographic surveys and data collection	X			N
Mokelumne River Crown Raising	X			N
San Joaquin River Waterside Erosion Repair	X			N
Sevenmile Slough French Drain and Seepage Berm			X	N
Reclamation District #3*				
Levee Improvements		X		N
Reclamation District #341*				
San Joaquin River Setback Levee/Habitat Bench Multi-Benefit Project, Phase 1		X		N
Complete Projects from Regional Flood Management Plan		X		N
Reclamation District #369				
Pump Station Upgrades and Backup Generators		X		Y
Levee Maintenance Program Improvements		X		N
RD 551*				
Levee Improvements		X		N

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Reclamation District #554*				
Apply for a Letter of Map Revision (LOMR) to bring the District back into Zone X. (outside of the 100-year flood zone)			X	N
Fill Abandoned Slough		X		N
Geotechnical Investigation		X		N
Snodgrass Slough Levee Improvements			X	N
Reclamation District #556*				
Flood Response Activities, Georgiana Slough Weir		X		N
Georgiana Slough Vegetation Management			X	N
Georgiana Slough Waterside Erosion Repair			X	N
Topographic and Hydrographic Surveys and Data Collection		X		N
Reclamation District #563*				
Rock Slope Protection Project		X		Y
HMP and PL-8499 Levee Improvement Projects		X		Y
Reclamation District #800				
Erosion Repair		X		Y
Emergency Supplies			X	N
Reclamation District #1000				
River Berm and Levee Erosion		X		Y
Erosion Protection Canal Banks		X		Y
Implement Security Measures at Key Facilities		X		Y
2014 Capital Improvement Plan		X		Y
Implement Supervisory Control and Acquisition Data system (SCADA) on District canals and pump stations		X		Y
Public Outreach and Education		X		Y
Stockpile and pre-stage flood emergency response materials			X	Y
Emergency response improvements including radios for communications	X			N
Emergency Back-up Generator for pump stations		X		Y
Reclamation District #1002*				
Geotechnical Investigation			X	N
Snodgrass Slough Levee Improvements		X		N
Snodgrass Slough Vegetation Management		X		N
Reclamation District #1601*				
Levee Improvement Project		X		Y
Reclamation District #2111*				
Rock Slope Protection Project		X		Y

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
HMP and PL-8499 Levee Improvement Projects		X		Y
Sacramento Regional County Sanitation District				
South River Pump Station Flood Protection Project	X			N
Reduction of Fire Hazard SRCSD Bufferlands		X		Y
Sacramento Area Sewer District				
MOU for Dedicated Cell Phone Tower and Cell Phone Pack		X		N
Southgate Recreation and Park District				
Drought Mitigation Actions/Drought Contingency Plan		X		Y
Flood Mitigation Actions/Land Acquisition		X		Y
Conservation Easements		X		Y
Multi-jurisdictional Cooperation within Watersheds	X		X	Y
Storm Water Management Practices – Implement Storm Water Management Practices as identified in Stormwater Quality Design Manual		X		Y
Severe Weather: Heavy Rains and Storms Mitigation Actions/Tree Management		X		Y
Twin Rivers School District				
New drainage plans to sites within the flood areas including, site drainage, storm drain upgrades and re-grading fields to shed water (on-site) away from buildings			X	N
Work with City/County/Water departments to create defensible spaces at sites where nearby creeks are prone to flooding. Build-up earthen berms (off-site) to shed water away from critically located schools.			X	N
Working with the Department of the State Architect (DSA) on Earthquake Retrofit Plan on all sites.			X	N
Revise and update district-wide Storm Water Prevention Plan		X		N
Create defensible perimeter space – for fire areas. Trees trimmed and vegetation removed to minimize impact during fire season.		X		N

Sacramento County Actions

Multi-Hazard Actions

Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Completed. However, recommend that when the new LHMP is approved at the Board it be scheduled concurrent with a General Plan amendment round (4 per year) so that the new LHMP can be re-incorporated by reference. Per the State this will be required to maintain our AB 2140 compliance which we currently have.

Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): OES continues to do outreach using Sacramento Ready (website), notification system, and social media.

Increase pedestrian and bicycle evacuation routes by constructing regional bike/pedestrian trail infrastructure, and expanding connection to neighborhoods (particularly in vulnerable areas)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The 47th project was re-scheduled for construction in 2021.

Community Rating System (CRS) Program for Public Information (PPI)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Annually reviewed for CRS.

Flood Insurance Assessment, Awareness, and Promotion

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The CRS outreach is an annual activity. Since 1979, the only flood insurance available has been the National Flood Insurance Program, now private flood insurance policies are available in California.

Public Outreach Mailers

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The CRS outreach is an annual activity.

Toxic Substance Release

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Continuous effort.

Climate Change Actions

Increase average fuel efficiency and reduce GHG emissions from the County Fleet and Fuels

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Continuous effort.

Reduce Sacramento County's vulnerability to Climate Change by reducing GHG emissions in the commercial and residential sectors by making energy efficiency a priority through building code improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The Office of Planning and Environmental Review (PER) continues to work on the County's Climate Action Plan and Adaptation Strategy. In response to Board direction, an ambitious 12-month workplan has been established to complete the CAP. Additionally, PER prepared the County's first Environmental Justice element of the General Plan which was unanimously adopted by the Board in 2020. The Environmental Justice Element contains policies and implementation measures that seek to improve resiliency in disadvantaged areas by targeting improvements to Environmental Justice communities and developing a County-wide outreach strategy that engages those who have been traditionally or systematically excluded from public participation

Mitigate Climate Change impacts by integrating climate change research and adaptation planning into County operations and services

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing.

Reduce Sacramento County's vulnerability to extreme heat events and associated hazards by Increase tree planting/canopy preservation/enhancement

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing.

Drought Actions

Implement Water Supply CIP

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Continuous progress is being made through construction of Capital Improvement Projects. The projects rehabilitate and upgrade conjunctive use, conservation, production, redundancy, and reliability of the water supply system.

Flood, Levee Failure, and Localized Flood Actions

Keep the PPI current

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Annually reviewed for CRS and is ongoing yearly.

Alder Creek flood control

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The proposed land development project at Aerojet will include flood control on Alder Creek. The 130 year old gold miner's dam and sediment filled reservoir remains a concern (owned by the City of Folsom).

Alder Creek flood mitigation (dam)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The land developers should be compelled to help the City deal stabilize this situation.

Alder Creek miners reservoir, property owned by the City of Folsom

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The fish tissue have been tested for Hg. (see note on action above).

Delta Small Communities flood protection - structural and nonstructural mitigation

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): First drafts of the plans for each town will be available for public review in September 2020.

Gum Ranch flood control - joint use basin

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Construction by the adjacent land developer.

Implement Storm Drain CIP

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Continuous progress is being made through construction of Capital Improvement Projects. The projects rehabilitate and upgrade the storm drain system to reduce flood risk.

Laguna Creek at Triangle Aggregate flood control -joint use basins

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Conditional Letter of Map Revision study was submitted to FEMA July 2020. Upon affirmation by FEMA reviewer, staff will reengage the miners in discussions leading to final configuration of the facility.

Laguna Creek mitigate flood hazard south of Jackson Highway

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City of Rancho Cordova is aware of the concern.

Model Sacramento River levee breach (LAMP) south of Freeport

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): There will be more about this reach of levee in the Hood Flood Risk Reduction Plan.

Morrison Creek Miners Reach Flood Insurance Study

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This is related to the proposed West Jackson Plan. The facility does provide flood control, as a condition of the original mining permit. Some residents downstream are hoping for new flood insurance rate maps, and reduced cost of flood insurance.

Morrison Creek Miners Reach levee improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This is related to the proposed West Jackson Plan.

Outreach stormwatch guide (ALERT, Stormready, weather radio)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The PPI group seeks ways to improve / vary its outreach each year. (See Action #4, above)

Peak flow floodplain mitigation Arcade Creek near Auburn Blvd

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Ongoing concern.

Risk Map (flood frequency, depth, velocity)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Not started. This might be a future interest for the

County. The concept of Risk Map is to provide the public with more information than simply being in the 100-year FEMA floodplain.

Elevation & Acquisition Projects (to Mitigate Flood Risk)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This is an active project.

Repetitive Loss Properties (to Mitigate Flood Risk)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This is an active project.

Five-Year Capital Improvement Plan – Drainage Projects

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Continuous progress is being made through construction of Capital Improvement Projects. The projects rehabilitate and upgrade the storm drain system to reduce flood risk.

Arcade Creek Corridor Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This is a reminder that the Arcade Creek Watershed Plan, 2003 includes some opportunities for jurisdictional partnership (www.saccreeks.org).

Elevate Homes on Long Island (Grand Island Road, Sacramento River)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Grant funding should be forthcoming, for a 2022 project.

Repetitive Loss Church Building on Dry Creek

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Grant funding should be forthcoming, for a 2021 project.

South Branch Arcade Creek – Gum Ranch Basin (with Fair Oaks Park District) and Kenneth Avenue Bridge Improvements (with Sacramento County Department of Transportation)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This action will be amended.

Dry Creek Flood Hazard Mitigation Acquisitions with County Regional Park Department

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Not yet started.

Arcade Creek at Evergreen Estates Floodwall Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Nothing to report.

Linda Creek Peak Flow Mitigation

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Nothing to report.

Flood Preparation in the American River Parkway

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing.

Improve County ALERT (Automated Local Evaluation in Real Time) System of Stream and Rain Gauges

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The system is being maintained, as is.

Update County Hydrology Standards

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The study to update the depth-duration-frequency table and the climate change analysis are being peer reviewed by a third-party consultant.

Woodside Condominiums Repetitive Flood Loss Property

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): FEMA approved two grants to raise up to 90 units at Woodside. The Homeowners Association will soon vote to decide if they want to proceed.

Bridge Replacement on Elk Grove Florin Road at Elder Creek

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The Elk Grove Florin Road Widening Project is scheduled for construction in 2020-21. The project includes replacement of the existing, functionally obsolete, bridge at Elder Creek. The bridge replacement is scheduled for completion in 2021.

Michigan Bar Bridge Replacement at the Cosumnes River

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The Michigan Bar Bridge Replacement project was re-scheduled for construction in 2022.

El Camino Avenue Phase 2 Road Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project was completed.

Improve Flood Protection and/or Evacuation Planning for Mobile Home/RV Park at Manzanita/Auburn. Alternatively, the Park Should Establish Flood Warning and evacuation procedures.

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This is still of interest to staff, subject to feedback from the property owners(s).

Hydromodification and Stormwater Quality Countywide

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing.

Evacuation Mapping

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): These are posted on the County GIS (Water Resources page)

Regional Flood Management Plan Projects

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing.

River/Stream/Creek Bank Erosion

Erosion Site Repairs

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): No changes or updates. We currently have no projects in progress or slated. These as noted on your attached are only entered into by WR when it has been determined that there is a flood, safety, or environmental aspect that deems the repair necessary. Most cases are just natural erosion that is inherent of most of our maintained creek.

Wildfire Actions

Wildfire Suppression

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Regional Parks did install signage and a numbering system for the access roads and trails in various fire-prone areas. Due to staff turnover, it is unknown what "new technology to report fires and share information" refers to, but there is no current improvement over the expectation that citizens call 911 to report fires. Fire departments have coordinated for training burns when conditions and staff allow, but the frequency of training activity seems to have decreased, though Parks is still willing to participate. Parks maintains access roads with brush clearance to allow fire department grass rigs to access most areas, though fire engines will have more limited access.

Regional Parks maintains a prohibition on the use of cooking devices (BBQs, pits, etc) outside of designated picnic areas where the wildfire danger is lower.

Wildfire Fighting - Support

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Regional Parks did install signage and a numbering system for the access roads and trails in various fire-prone areas. Due to staff turnover, it is unknown what "new technology to report fires and share information" refers to, but there is no current improvement over the expectation that citizens call 911 to report fires. Fire departments have coordinated for training burns when conditions and staff allow, but the frequency of training activity seems to have decreased, though Parks is still willing to participate. Parks maintains access roads with brush clearance to allow fire department grass rigs to access most areas, though fire engines will have more limited access.

Parks provided sensitive habitat and cultural resources info in digital format to staff and to outside agencies to help increase the speed and accuracy of decision making during wildfire response.

Wildfire Suppression – Regional Parks and Open Space (urban interface)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Regional Parks applied for a FEMA Hazard Mitigation grant to address the wildfire risk in the Wildland Urban Interface. County Board of Supervisors approved 9.0 FTE positions to create a unit dedicated to reducing wildfire risk and environmental crimes, along with committing $200,000 in the current FY (21-22) for grazing in the Regional Parks system. In prior years, Regional Parks has located ad-hoc funding to graze areas as funding allowed. The focus of the grazing and wildfire reduction is parks areas that are most hazardous to the neighboring residential and commercial structures, and Regional Parks is planning to issue contracts to several grazing vendors to continue the annual spring grazing.

City of Citrus Heights

Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):

Ongoing measures are being taken through CIPs, private development projects and maintenance activities, as well as implementation through policies and best practices.

Rinconada Flood Wall

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):

This project was completed in 2019 as part of the city's drainage master plan implementation efforts. The project proved successful based on post storm events. However, the ultimate measure of loss avoidance and effectiveness in mitigating local hazard and risk will be determined in the event of large a storm event when the increased capacity can be properly observed.

Drainage Project Implementation

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?):

This action is ongoing as the City continues to develop and deliver projects identified in its existing neighborhood areas drainage master plans. The City is on target to deliver drainage improvement projects annually as part of its stormwater management program.

City of Elk Grove

Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The 2016 LHMP was used and referenced in the development of the 2019 Comprehensive General Plan Update, which included an updated to the Safety Element. Results from this LHMP Update will be reviewed and considered for amendment into the General Plan later in 2021.

Mutual Aid Agreements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Between 2016 and 2020, the City took part in eight Mutual Aid Agreements to provide Police Department personnel for emergency events, primarily for wildfire incidents in the region. The City will continue to participate in Mutual Aid Agreements to support emergency response as needed.

Elk Grove Green Street Project: Repurposing Urban Runoff with Green Instructure Technologies

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project has not yet been implemented due to lack of funding. Grant funding has been applied for but not yet awarded.

Hazard Education and Risk Awareness

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): A number of outreach efforts have been undertaken in recent years to educate the public on natural hazards. This includes articles in the bi-monthly City newsletter related to risk awareness and flood preparedness, social media PSA campaigns on extreme heat, and additional outreach events on flood risk.

City of Elk Grove's Storm Drainage Master Plan (SDMP)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Several projects identified in the Storm Drainage Master Plan have been implemented. The completion of the following projects reduced the flood risk for locations around the City.

- Sleepy Hollow Detention Basin Retrofit: Increased stormwater infiltration
- North Camden Drive Storm Drain Improvements: Pipe upsizing
- Storm Drain Pump Station Improvements: Upgraded telemetry
- Blakemore Court and Hartwell Court Drainage Improvements: Pipe upsizing
- Bradshaw/Sheldon Intersection Improvements: New culvert
- Emerald Vista Drive Storm Drain Improvements: Pipe upsizing

City of Folsom

Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project was implemented. Elements of the LHMP were integrated into the Safety Element of the General Plan most recently updated in 2021, as well as the Emergency Operations Plan most recently updated in 2020. The project certainly reduced risk qualitatively if not quantitatively by highlighting mitigation actions and projects throughout the City.

Stormwater Basin Maintenance and Operation Project

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project was implemented. A Stormwater Basin Operation and Maintenance Manual was developed, and a Stormwater Basin Assessment Report was prepared that prioritized the rehabilitation efforts needed as existing basins in the City. A Capital Improvement Project was created and to date four basins have been rehabilitated as noted in the assessment report. Three additional basins are anticipated to be rehabilitated in 2021, with additional basins to follow in subsequent years. Each project reduces the risk of flooding in the City.

Alder Creek Watershed Council

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): No, this project has not been implemented to date.

Drainage System Maintenance Tax Assessment

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): No, this project has not been implemented to date. Initial compilation of documents and backup data has been conducted by City staff, but to date no Capital Improvement Project has been brought forward to do the necessary public outreach and coordination for a drainage system utility fee to be successful.

Floodplain Mapping

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project was implemented. The City, in coordination with FEMA Region IX, has recently completed updated floodplain modeling and mapping of portions of Alder Creek, Hinkle Creek, Humbug Creek, and Willow Creek. The updated modeling and mapping have been accepted by FEMA and are currently being prepared to be released for public review and comment before becoming effective. Updated effective maps are expected to be available by early 2022.

Redevelopment Area Drainage Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project has been implemented and is ongoing. Multiple drainage improvements have been constructed in the Redevelopment Area, including project on Natoma Street, Sutter Street, Bidwell Street, Reading, Street, and others. Each project has reduced risk by improving the capacity and efficient of the storm drainage infrastructure.

Stormwater Basin Maintenance and Operation Project

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Duplicate from Action 2 above.

Heating and Cooling Centers

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project has been implemented and is ongoing.

Public Education/Outreach Extreme Weather

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project has been implemented and is ongoing.

Weed Abatement Program

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project has been implemented and is ongoing.

Arson Prevention and Control Outreach

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project has been implemented and is ongoing.

Wildfire Hazard Identification

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project has been implemented and is ongoing.

Ignition Resistant Building Construction Upgrades

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project has been implemented and is ongoing.

Wildfire Prevention Outreach

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Yes, this project has been implemented and is ongoing.

City of Galt

Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Waiting for an opportunity where the City amends/modifies the General Plan adopted in April 2009. The only section modified is the Housing Element.

Increase Redundancy/Functionality of Water Wells and Sewer Lift Stations

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): several of the City's sewer lift stations were rehabilitated (e.g. wet wells lined, stainless steel pump rails, etc). The City awarded in August 2021 a design contract for Lift Station Upgrades. The City constructed two deep water wells for increased flow, better water quality and minimizing impacts to other water purveyors/users by going into a third deeper aquifer. The project was implemented. Main evidence of loss avoidance was a very small number of Sanitary Sewer Overflows (SSOs) between 2016 and 2020.

Drain Inlet Retrofit Capital Improvement Plan (CIP)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project was not implemented, as the City's stormwater utility does not generate sufficient capital to fund this CIP.

Creek/Streams Vegetation Management Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project was not implemented as the City's stormwater utility does not generate sufficient capital to fund this CIP.:

Increase Data Capacity of Emergency Frequencies

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Completed. Data bandwidth for emergency responders is no longer considered a problem by data system upgrades by data providers.

City of Isleton

Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City's General Plan has not been updated for years, thus the 2016 LHMP was not integrated. The City is currently developing an update to the General Plan scheduled to be completed spring 2022. The 2021 LHMP will be incorporated by reference into their updated General Plan Safety Element.

Storm Water Runoff Rehabilitation Project

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Due to lack of funding, this project was not implemented, but will be included in this updated LHMP.

Wastewater Treatment Plant Pond Levee Elevation Raise to 200-year Flood Standard

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Due to lack of funding, this project was not implemented, but will be included in this updated LHMP as part of overall rehabilitation efforts for the WWTP.

City of Rancho Cordova

Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project was completed in 2018.

Sunrise Boulevard Widening Kiefer to Jackson

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): A section of Sunrise Boulevard south of Kiefer and north of Jackson is subject to localized flooding. This project will raise the road in this area to be above the local flood plain. The design for this project is anticipated to start in 2022 because of funding constraints. This project will be included in the LHMP Update.

City of Rancho Cordova Disaster Debris Management Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Plan was completed and submit to CALOES for review. Status of approval is unknown. This project will not be carried forward in this LHMP Update.

Transportation Interconnectivity

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Work on this project is ongoing with the review of development projects. This project will be included in the LHMP Update.

Intergovernmental Agreement between the County of Sacramento and the City of Rancho Cordova

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): MOU complete. This project will not be carried forward in this LHMP Update.

Land Use (Long range)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This task is ongoing. During the development review process, City staff reviews new projects for environmental sensitive areas when submitted to the City. This task will be included in the LHMP Update.

Post disaster training for staff

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This task is ongoing. It includes OES training and post disaster planning classes/webinars for City staff. The task will be included in the LHMP Update.

Update/Maintain Emergency Operation Plans (EOPs)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Current Emergency Operations Plan was last updated in 2018 and is required to be updated every 5 years, so the next update will be in 2023. This project will be included in the LHMP Update.

Increase Everbridge Enrollment

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This task is ongoing. Outreach to citizens/groups via news outlets/City website/kiosk to encourage enrollment. This project will be included in the LHMP Update.

Developing and maintaining a database to track community vulnerability.

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This task is ongoing. City GIS staff continues to research, gather, and store GIS data relative to major gas transmission lines and facilities. This project will be included in the LHMP Update.

City Website HMP and City Website, Press Notification, and Social Media Emergency Information

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This task did not start because of funding and staffing challenges. The City will develop a 5-year plan to upgrade City owned and operated facilities to include drought tolerant plants in landscaped areas and more efficient irrigation systems. This project will be included in the LHMP Update.

Building & Safety Division Disaster Inspector Training

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing. This project will not be carried forward in this LHMP Update.

Landscape and Irrigation Requirements/Retro

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing. This project will not be carried forward in this LHMP Update.

Landscape Ordinance

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This task is ongoing. The City will continue to Update and maintain to incorporate proper selection, planting, and maintenance practices into landscape

ordinance. This project will be included in the LHMP Update. In addition, City reviews new development projects for compliance with the MWELO requirements. This project will be included in the LHMP Update.

Impervious surface

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This task is ongoing. The City will continue to limit impervious surfaces within front yard of residential lots. This project will be included in the LHMP Update.

Porous pavement and vegetative buffers

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This task is ongoing. The City will continue to encourage the use of porous pavement, vegetative buffers and islands in large parking areas. This project will be included in the LHMP Update.

Storm Water Pump Station Infrastructure Upgrades

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City started working on this project. The backup generator specifications have been developed. The City is working on design plans for pump stations' site improvements. The project will be completed in the next 2-3 years. This project will be included in the LHMP Update.

SB-5 Urban Level of Flood Protection

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was completed in 2017. The City remapped the 200-year floodplain within City limits. This project will not be carried forward in this LHMP Update.

Channel Vegetation Management and Erosion Control

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This task is ongoing. The City will continue to perform routine weed abatement activities, and complete erosion control and excavation projects as funding allows. This project will be included in the LHMP Update.

Adoption of Hydromodification and Low Impact Development (LID) Standards

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was completed in 2018. The City updated development standards to require new projects to comply with LID and Hydromodification Management requirements. This project will not be carried forward in this LHMP Update.

Stormwater Capital Improvement Program Master Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing. The Master Plan was completed in March 2021. There were a number of flood control and maintenance projects identified in the Master plan that amount to $60 Million. The City will be implementing the projects identified in the Master Plan for the next 20-30 years. This project will be included in the LHMP Update.

Sunrise Blvd. & Monier Circle Drainage Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing. The City submitted a grant application to CALOES to fund the design and construction of the basin. The project will be implemented over the next 3 years. This project will be included in the LHMP Update.

Roundabouts

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing. The City will continue to encourage round-abouts in place of traffic signals where appropriate. This project will be included in the LHMP Update.

City of Sacramento

Multi-Hazard Actions

Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): A 5-year update of the General Plan is currently underway. City staff will incorporate the City's LHMP annex into the safety element as part of the general plan update.

Coordination with Relevant Organizations and Agencies to Consider the Impacts of Urbanization and Climate Change on Long-Term Natural Hazard Safety

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): On-going effort due to limited resources.

Maintain and Identify Changes in Critical Facilities GIS Layer to Support Emergency Management Efforts

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): On-going effort. Construction data from various sources of varying detail. This is the first comprehensive effort of compiling an up-to-date database. No other documentation exists describing data sources. It's a slow process due to the scope, scale, and complexity of the task, as well as staff's busy workload. Once complete it will need to be QC'd for completeness and accuracy.

Community Outreach on Multi-Hazard Preparation & Pre-mitigation

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City continues to participate and host many community outreach events associated with Hazard awareness and preparation. These events include "Capitol Action Day", "Flood Preparedness Week", "Highwater Jamboree" Annual Flood Preparedness Event and visiting neighborhood meetings and community events to share preparedness information.

Evaluation and Mitigation of Critical Facilities in Identified Hazard Areas

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): GIS continues to work with various groups to identify and update the critical facilities that may be affected by a natural disaster.

Retrofit of Repetitive Loss Properties

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is on-going, still working on funding and identifying owners that wish to retrofit their properties. We continue to promote flood insurance as an alternative for now.

Safeguard Essential Communication Services

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Maintenance and continued testing of essential communication services includes the City phone system, electronic mail, network services and servers, and critical infrastructure. Resolution underway to protect critical infrastructure to include facilities that house data centers, network services and servers, and our 9-1-1 communications. Information Technology also provides support through ongoing updates, testing, and strengthening of our essential communication services.

Multi-lingual Disaster Education

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City of Sacramento Office of Emergency Management established citywide translation services contracts accessible to all City Departments:

Translation/Interpretation Services	Interlingva, Inc. Instructions	PRC000495
	International Effectiveness Centers Instructions	PRC000519
	NorCal Services for the Deaf and Hard of Hearing Instructions	PRC000428
Translation/Interpretation Services (Telephone Only)	CTS Language Link	PRC000888

Source: City of Sacramento

Cal OES Safety Assessment Program Evaluators

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This is an ongoing program that requires continuous recertification of the inspectors and other staff members. The building division is tracking the number of employees who are current SAP evaluators. If training is needed for certification/recertification the staff members are schedule for that training. The city's participation in this program allows for us to ask for mutual aid from other participating jurisdictions. The loss avoidance for this item would be the avoidance of loss of life. This will keep people out of unsafe structures.

National Flood Insurance Program & Community Rating System Continuation

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City of Sacramento continues participation in

this program, always working towards improving our classification status by implementing new programs and projects.

Coordinate with Sacramento Area Flood Control Agency on Completion of South Sacramento Streams Group Projects

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project has been completed, several properties were taken out of the floodplain and flood risk has been reduced to the area.

Develop a Master Generation Plan for Pump Stations

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City has a robust generator plan but a master plan is still in the process. Sumps that need generators have been identified but the program has been delayed due to funding.

Develop a Disaster Housing Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Office of Emergency Management to assist with development of a Disaster House Plan. Supplement with OEM Emergency Operations Plan and Pre-Disaster Recovery Plan. Include the City's Office of Innovation and Economic Development as a resource.

Disaster Resistant Business Program

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This program has not started due to funding. The goal of this program is to increase community resiliency and avoid financial losses. The economic development department is interested in keeping this action in the next plan update.

Develop Enhanced Emergency Planning for Special Needs Populations in the City of Sacramento Emergency Operations Plan and Other Planning Documents

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): City OEM includes Access and Functional Needs (AFN) throughout the Emergency Operations Plan (EOP) and Pre-Disaster Recovery Plan. OEM continues to meet with AFN leaders to ensure accessibility and inclusion are maintained in compliance with the Americans with Disabilities Act. OEM plans are updated on a continuous basis and ensure that AFN is included throughout the entirety of the plan. Efforts to strengthen inclusivity continues as OEM networks and attends trainings, seminars, and events pertaining to AFN and diversity.

Establish a Post-Disaster Action Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): City OEM established a Post-Disaster Recovery

Plan that is updated on a continuous basis. City OEM provides direction on Post-Disaster Plans established by the City.

Flood Recovery Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): On-going, discussions need to be had to determine responsible parties.

Public Information Flood Response Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Use Alert & Warning Guidelines, and keep the same lists as the last LHMP

Construction of a new Emergency Operation Center (EOC)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project has not started, delayed due to COVID-19. Still seeking facility and infrastructure to build out full EOC Capabilities (Keep same information as last LHMP).

Emergency Operation Center (EOC) Expansion and Information Technology Upgrade

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Incorporate Citywide inventory management system, upgrade technology equipment for fully functional EOC facility and virtual coordination capacity.

Protection of Transportation Infrastructure

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is not started, but is being carried forward in this Plan Update.

Public Education Campaign for Everbridge System

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The program has been implemented and is ongoing, using media, and regular testing of the Everbridge system.

Regional Emergency and Disaster Preparedness Exercises to Test Operational & Emergency Plans

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This is an on going task. Issues with social distancing requirements to hold in person trainings and exercises due to covid.

Special Needs and Critical Facilities Database and Advanced Warning System

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): On-going. Resolution passed and GIS created an app identifying critical infrastructure, title 8 health and safety chapter 8.140 protection of critical infrastructure and wild fire risk areas.

Assets Inventory

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The Asset Inventory for the Department of Utilities has been implemented and is an ongoing process. For horizontal assets (typically at grade or below ground such as pipes, valves, etc.), the Operations and Maintenance staff has been collecting and validating asset data as resources allow. Asset inventory completeness depends upon the system, with the inventory for the water system being the most complete and the inventory for the storm drain system being the least complete. DOU utilizes Geographic Information Systems (GIS) and CityWorks, a computerized maintenance management system to track and record horizontal assets, including locations. For vertical assets (facilities, some of which may have below ground components), the Operations and Maintenance staff has been actively collecting and validating asset data for all vertical assets, including Treatment Plants, Wells, Reservoirs, and Sump Stations. DOU utilizes Maintenance Connection, a computerized maintenance management system, to track and record above ground asset data, including locations. The above ground asset inventory is nearly complete and includes information technology equipment, communication equipment, electrical equipment, permanent generators, and machinery. DOU also uses Maintenance Connection to track mobile assets like vehicles, temporary generators, and other heavy equipment and machinery. Hazard identification, which includes information on overhead powerlines, levee crossings, river crossings, etc. for each asset are typically listed in the computer system where the asset resides. The administrative buildings and treatment plants are the only facilities that have office assets such as furniture. Both of the administrative buildings at 35th Avenue, along with the Combined Wastewater Treatment plant were inventoried in 2016. Office assets for these facilities are tracked in a spreadsheet. Office asset inventories for the two Water Treatment Plants and the Meadowview facility still need to occur. By continuing to improve our asset inventories, we are reducing risk by being able to track asset location and condition and repair or replace assets in a timely manner. The completed asset inventories will allow us to identify what has been damaged or lost during a disaster.

Protection of City Assets from Cyber Terrorism

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This action item is in place. The City has an information security program in place that follows the NIST cybersecurity framework to protect us from cyber-attacks

Protection of City Information Technology Infrastructure

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): IT has an on-going process to protect the city's IT

infrastructure from natural disasters. For example, the city's main data center has been moved out of downtown to avoid flood hazards. In addition, under the draft citywide Pre-Disaster Recovery Plan, the city's Office of Emergency Services is currently working on defining citywide critical infrastructure, including critical IT infrastructure. Additional protection gap analyses and implementation steps will follow.

Cell Booster

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): After thorough research, it was decided that the intermittent issue could be fixed by hardwiring the dispatch consoles rather than using the air cards. That work was conducted and completed in June of 2019. There are no complaints of signal drop since June of 2019.

Travel Time Model for Lower American and Sacramento Rivers and their Major Tributaries

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The River Travel Time Tool and the GIS Spill Mapping Tool are available here http://douapp01/home/spillnotification, on the DOU River Spill Notification Page. This item is marked "ongoing" in the matrix as these tools are reviewed biannually and updated as needed. However, these are fully functional tools which reduce risk by providing accurate and timely travel time estimates for river spills in the vicinity of the City's drinking water intakes on the American and Sacramento rivers. There are no documented examples of loss avoidance.

Watershed Spill Contamination to Drinking Water Quality: Preparedness for Events and Recovery

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): In addition to the River Travel Time Tool and the GIS Spill Mapping Tool noted above, the DOU River Spill Notification Page http://douapp01/home/spillnotification, includes links to additional tools, information, procedures, and guidelines to for watershed spill response and recovery. In addition, 11/2019 Watershed Spills and WQ Incidents Guidance Binders are a handy, concise reference tool for responding to spills and water quality incidents. This item is marked "ongoing" in the matrix as the information is reviewed biannually and updated as needed. However, these resources reduce risk by providing accurate and effective information on response and recovery to spills in the American and Sacramento River Watersheds. There are no documented examples of loss avoidance.

Purchase Drones for Use in Disaster Preparedness, Mitigation, and Response

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): DOU / LMA and has an approved Citywide Policy and is developing our procedure, procurement is in the purchase process of the UAV's for the inspections and emergency response to critical infrastructure (levee's) The LMA is in joint coordination and training efforts with Sacramento City Fire and Police.

Climate Change Actions

Map and Assess Vulnerability to Sea Level Rise

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project has not started due to lack of funding sources.

Emission Study of City Sump and Pump Stations

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): DOU has started doing Department wide GHG inventorying. This action can be addressed in the upcoming Sustainability Action Plan, meaning high level recommendations. From there, projects and funding can be identified. The focus will be on replacement and new projects to upgrade to cleaner and newer emissions.

Climate Change Mitigation Actions/Climate Change Adaptation Plan for Drinking Water Quality

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The effects of climate change on water quality is discussed in the City's most recent Watershed Sanitary Survey Updates for the American River Watershed (2018) and the Sacramento River Watershed (2020). The Water Quality Laboratory and R&D section of DOU is researching the impact of wildfire related runoff on water quality in the vicinity of the City's drinking water intakes on the American and Sacramento Rivers. The City's membership in the Water Research Foundation supports cutting-edge academic research on climate change adaptation and climate change mitigation for water utilities. Current planning for the eventual expansion of the Sacramento River Water Treatment Plant includes elements for climate changes adaptation, such as the consideration of ozone disinfection.

Harmful Algal Bloom (HAB) Surveillance and Response Planning

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City, in coordination with agency partners, monitors for algal cyanotoxins in raw water at the intakes to our water treatment plants on the American and Sacramento Rivers and in the treated water produced by the treatment plants. This item is marked as "ongoing" in the matrix as the monitoring is on an annual schedule. The program reduces risk by screening for the presence of algal cyanotoxins in the City's source waters and by demonstrating the removal efficiency of the water treatment process on alga cyanotoxins, should any be detected. There are no documented examples of loss avoidance.

Drought and Water Shortage Actions

Aquifer Storage

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This was included in the groundwater master plan. Also. DOU funded a regional ASR study that was just completed by the Regional Water Authority.

Perform a Groundwater Recharge Feasibility Study

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): We evaluated conjunctive use (flexible operation between surface water and groundwater in our groundwater master plan. This would be "inlieu" recharge where you rely on surface water while the aquifer naturally recharged. We also considered a few direct recharge possibilities. The region is in the middle of creating the groundwater sustainability plan. That is a much more ambitious undertaking. Our internal work is complete. The collective work is ongoing.

Earthquake Actions

Map and Assess Community Vulnerability to Earthquakes

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): As part of DWR's levee evaluations program, the following GIS layer was created http://ferix.water.ca.gov/lep/ . The GIS layer identifies subsurface exploration locations and points of existing vulnerabilities. GERs for each study area can also be download from the website. Screening-level static analyses and screening-level seismic analyses were done on levees surrounding the Sacramento River, American River, NEMDC, and Natomas.

Seismic Vulnerability Assessment on Sacramento Levees, Infrastructure & Buildings

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The California Department of Water Resources (DWR) Division of Flood Management conducted a levee evaluations program to assess the existing conditions of levees in California's Central Valley from 2008 to 2015. Levees in each reach/sub-reach were analyzed for six static ULE criteria at the 200-year WSE: erosion risk (i.e., risk of levee breach due to erosion), freeboard, through seepage, under-seepage, landside slope stability, and waterside slope stability. In ULE, analyses were not performed for local discontinuities or penetrations. In addition, a seismic vulnerability evaluation was performed using a 200-year return period seismic event. The results of the assessment were used to classify intermittently loaded levees as having high, medium, or low vulnerability with respect to post-seismic flood protection ability. The reaches/sub-reaches that did not meet static ULE criteria were further evaluated to identify conceptual remedial alternatives. Typical conceptual static remedial alternatives consisted of installing cutoff walls along the centerline of the levees to address seepage and stability deficiencies, placing waterside rock slope protection for erosion and waterside slope stability deficiencies, and localized freeboard repair.

Retrofit Historical Buildings

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City continues to encourage seismic retrofitting of buildings. From the 2035 General Plan:

- the maintenance/repair of historic structures (HCR 2.1.7)
- the adaptive reuse of idled historic buildings (HCR 2.1.14) (something that generally triggers structural retrofit through Building division permitting processes)
- discourages needless demolitions (HCR 2.1.15)
- promotes the education of the public about the value of historic preservation and the protection and reuse of historic buildings (actions of which can lead to seismic retrofit in some instances) (HCR 3.1.4)

Extreme Cold and Heat Actions

Heating Centers in High Priority Locations

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Currently, the City uses the County's Severe Weather Guidance as the trigger to activate warming or cooling or clean air centers. Centers are activated in impacted areas throughout the City, using Community Centers (YPCE) or the Library, or other facilities operated by non-government organizations.

Cooling Centers in High Priority Locations

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City uses the County's Severe Weather Guidance as the trigger to activate warming or cooling or clean air centers; however the City also tends to follow National Weather Service and Public Health recommendations and will activate during Excessive Heat Warnings. Centers are activated in impacted areas throughout the City, using Community Centers (YPCE) or the Library, or other facilities operated by non-government organizations. If cooling centers are open at faith-based and other community facilities, the list is posted at 211sacramento.org or is available by calling 2-1-1.

Extreme Weather Outreach Strategy

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The City uses the media, Everbridge, and other Alert & Warming Capabilities to provide outreach.

Severe Weather Action Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Currently, the City uses the County's Severe Weather Guidance as the trigger to activate warming or cooling or clean air centers. The City is currently

analyzing the need to enhance and adapt the guidance to tailor to the needs of the City areas impacted by large, unhoused communities.

Flood, Localized Flood, and Levee Failure Actions

Coordinate with Stakeholder on Proposed Flood Control Project on Magpie Creek

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is on-going. Lead agency is USACE with SAFCA and City of Sacramento as the non-federal sponsors. The America Common Features Reach I (Magpie Creek) diversion Channel Levee improvements project is at 35 % design stage with an estimated construction time in 2022.

Adopt Additional Floodplain Development Standards

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is still on-going. We continue to develop and adopt new standards as needed due to changing regulations.

Drainage Projects for Repetitive Loss Properties

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is on-going, since the City currently has 18 repetitive loss properties. More projects are needed to mitigate for these losses. In 2017 a property located in Drainage Basin 31 was removed from the repetitive loss area list due to two projects that were implemented by the Department of Utilities. These projects eliminated property damage by removing the excess peak flow from 65th Street to Sump 31. The two projects are Sump 31 Discharge Pipeline (completed 2001) and Basin 31 Detention Basin at 65th Street and Broadway (completed 2010).

Emergency Notification and Evacuation Planning

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): In the event of an evacuation, and depending on the event, emergency notifications will be released using the Everbridge System and our Public Information Office. The Office of Emergency Management acts as the liaison and assists the City's Police Department operations to orchestrate the evacuation, Sacramento Fire provides the medical response and assists with community alerts, and YPCE provides sheltering should there be a need. In the event it is a flood related evacuation, the DOC activates and serves as the incident command center.

Historic Magpie Creek

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is on-going. The Magpie Creek Diversion Channel is part of the Corps levee improvement project under the WRDA 16 authorization. This reach of the project should be completed in 2024. The work consists of cutting off all (or the majority) of the spill into historic Magpie and keeping it contained in the diversion channel as it heads north then west

Natomas Internal Drainage Canals/Levees

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is on-going. DOU currently has a contract with KSN to provide the evaluation and certification of the interior levees in the Natomas Basin. The recertification will need to be submitted to FEMA prior to 2025.

Drainage Projects from the City's Priority Drainage Project List

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): These projects have not started. Due to funding issues related to the drainage fund, DOU/Drainage CIP has not updated the list of drainage improvement projects since 2016.

Projects Identified in the Combined Sewer System Improvement Plan Update

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The long term control plan (LTCP) works towards the 5yr/10yr/100yr goals in the CSS. The CSS improvement plan identified 28 projects and 3 programs. The LTCP is implementing the 20% of the projects and all of the programs. So far one project has been completed and that is 9th Street. The rest on the list below are in progress. The report has a schedule of when the rest of the projects will be completed.

Project No.	Project Name	Current Status (As of March 2021)
X14010097	Existing CS Optimization	Design 60%
X14010098	Freeport Sewer Improvement - Bidwell and Freeport	Out to Bid
X14010042	9th Street Sewer Replacement G to L Street	Complete
X14010104	McKinley Park CS Storage Facility	Construction
X14170107	W and 25th Street Storage	Pre-Design
X14170106	24th Street Storage	Pre-Design
I14610304	RDII Pilot Program	Planning
I14610303	GI Pilot Program	Planning
Program	Water Conservation Program	Implementation

Source: City of Sacramento

Easements for Open Land Along Levees

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is on-going. An analysis of current levee easements and setback to determine where additional and future easements will be needed is still on-going as well as developing a method and funding source to acquire the needed easements and open space to meet the ULDC standards.

Emergency Management Planning and Levee Security

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is on-going. A Flood Exercise Seminar was conducted in October of 2020 to train on the newly developed department's Emergency Operations Plan and to test the DOC Guidelines document. From the exercise, we are currently conducting training for all of the DOC participants on the key points of both documents. The data collected will be determined how the September 2021 exercise will be presented. In addition, we are working on the update to our Business Continuity Plan which could serve beneficial during a flood disaster.

The City currently has an OM Manual, with security portion from the South Sac Streams Interim, an original Sacramento River OM Manual and info on Levee Security from DHS. Also, we use a Security Awareness Guide for Levees from DHS. A more detailed Levee Security plan is needed.

Flood Fighting Equipment

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This mitigation Action was completed:

- Landing Craft is in the build process
- Excavator and trailer have been purchased
- 20,000 sand bags
- Misc. stakes, twine, visqueen
- Approx. 2,000 tons of Rip Rap
- Flood Warehouse Forklift
- UAS Survey Drone for Levee Inspections
- DOU has two DWR Conex Boxes staged at NACY full of Flood Fight Supplies

Flood Management Land Use Planning and Development

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is on-going. As part of the 2040 General Plan Update, staff will be evaluating potential new floodplain management policies.

Florin Creek Pump at Pomegranate Avenue

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project was not completed. A grant application was submitted to the state but were denied, no funding was available for this project.

Internal Drainage System Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Due to lack of drainage rate adjustment, there has been no funding to implement improvement projects. Some work has been done on drainage basin master

plans - Basin 33/34, Basin 129, and Basin 147. The models for Basin 54 and North Natomas Basins 5, 6, and 8a. have also been updated.

Levee and Structural Flood Management Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is on-going. There are currently six federally authorized projects that are being implemented to reduce flood risk to the Sacramento area:

- Natomas Levee Improvement Project-current On-going with active construction
- American River Common Features-current On-going with active construction
- Folsom Dam Modifications/Joint Federal Project- Complete (just some O&M issues to address – fully functional)
- Folsom Dam Raise Project- On-going with active construction
- South Sacramento Streams Group Project (Federal Project)-Complete – Fully functional some minor grading activities remain
- Sacramento River Bank Protection Program-Currently being done under WRDA 2016 ARCF authorization

Other efforts are ongoing:

- SAFCA levee accreditation for FEMA level of protection
- Regional planning as part of the Central Valley Flood Protection Plan
- USACE-CVFPB-SAFCA General Reevaluation Report (GRR) planning for 200-year flood protection for Sacramento area
- SAFCA and City plan development for 200-year flood protection to meet state requirements for Urban Level of Protection and Urban Levee Design Criteria

Master planning to identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is on-going due to funding issues. Two new master plans were developed, Basin 147 and Basin 129. Will continue to develop master plans to identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding in areas of the City that do not currently have master planning. Projects will be prioritized and will formulate timeline for the identified projects

Retrofit Pumping Plants with Discharge Monitoring Devices

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Since 2016, Dou has installed flow meters at one drainage pump station, Sump 141. Currently DOU is funding a study this year to evaluate alternative flow meter technologies to meter our Drainage stations. This study will recommend a pilot installation of one or more-meter technologies at our drainage pump stations. Based on the results from the pilot installations, a drainage metering program will be proposed. A project/study report will be reviewed by the end of April.

Risk Communication and NFIP/CRS Projects

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): On going – City continues to participate in NFIP/CRS programs as well as PPI which provides risk communication to the public

Steamers and Rio City Café Floodwalls

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project has been completed. This project resulted in increased flood protection thereby decreasing the likelihood of loss of life and property. The repair included removal of the existing wood fascia boards on both sides and top of the existing flood wall, and replacement with new wood on the easterly (land) side, and new wood on the top of the floodwall to match the existing height. The westerly (river) side of the wall will remained exposed concrete.

Trash Racks and Debris Cages

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): On-going due to funding issues. A study has begun to evaluate the effectiveness of antiquated trash racks at two pump stations and one ditch location. Once these studies are completed, estimated June 2021, the City will make recommendations to more effectively remove trash and debris at these locations. A larger effort is dependent on resources and funding availability

Multi-Jurisdictional Modeling for Drainage Watersheds Greater Than 10 Square Miles

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): On-going project. Currently, a Natomas Basin drainage study is underway via joint efforts from RD 1000, County of Sacramento, and City of Sacramento. The Parties wish to prepare a Letter of Map Revision (LOMR) for the Natomas Basin internal floodplain as part of an exterior levee certification project; and have determined that the existing model of the Natomas Basin internal floodplain requires an update in order to meet their current needs.

Post-Flood Water Treatment Facility Recovery

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The 11/2019 Watershed Spills and WQ Incidents Guidance Binders are a handy, concise reference tool intended for responding to spills and water quality incidents. However, the information, and guidance contained in the binders is also applicable to floodwater contamination at the treatment plants. This item is marked “ongoing” in the matrix as the information in the binders is reviewed biannually and updated as needed.

Wind and Tornado Actions

Tree Trimming & Debris Removal

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The Urban Forestry Section of Public Works provides continuous maintenance to trees located within the public right of way and responds to all reports of tree related impacts to the right of way. Emergency service is available 24 hours a day 7 days a week. Additional staff and equipment can be mobilized during extreme weather events to meet the needs of the situation.

Upgrading Overhead Utility Lines & Burying Critical Power Lines

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Over the next several months and through the first quarter of 2021 SMUD will be performing a series of maintenance and reliability enhancements. There are a total of 13 reliability enhancements. Project will reduce the number and duration of power outages and provide reliable electrical service

Install Redundancies and Loop Feeds for Power Lines & Infrastructure

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): SMUD is in the process of constructing two new Substation to serve midtown and downtown areas. Substation E is scheduled for construction through 2021. Substation H is in the proposal stage. The projects will improve energy reliability and capacity

Erosion Actions

Stabilization of Erosion Hazard Areas

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is on-going. The US Army Corp of Engineers has headed the Sacramento River Bank protection Project and this mitigation action will be channeled through them as an expansion to their ongoing efforts

Wildfire Actions

Implement a Fire Education and Information Program

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing and will be included in this Plan Update.

Fuels Reduction on the American River Parkway

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Funding and resources are not available at this time.

Outreach on the Effects of Smoke on Air Quality

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): See the County's new Hazardous Air Quality Annex, under the Severe Weather Guidance Plan

Cosumnes Community Services District

Flood Response Equipment

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing, but is not included in this Plan Update.

Flood Response Training

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing and is being carried forward in this Plan Update.

Los Rios Community College

District Wide Roofing Renovations

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was completed. An integrated foam system was utilized to make the existing roof system structures more weather resistant, reducing the permeability of the roof material and adding protection from rainwater penetrating the existing equipment located on buildings' rooftops.

ARC Drainage at Arcade Creek

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was completed including regrading the land next to Arcade Creek to have overflow from the creek flow back into creek area as well as land improvements made during development of adjacent athletic fields. This has minimized the likelihood of localized flooding from Arcade Creek during the rainy season to reach critical facilities and damage campus buildings.

Protect District Property

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This action is ongoing in nature. Addressing potential localized flooding issues are assessed in conjunction with infrastructure improvements and construction projects as they occur. This work is incorporated into the planning process through capital improvement projects. LRCCD examines avenues to discover ways to improve localized flooding risk to property, buildings, parking lots, and road closures that would impact student access, displace instruction, and cause costly cleanup or repairs.

Metro Fire District

Relocate the essential facilities in the 200-year flood plain

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was not implemented due to funding priorities. This is included in this 2021 LHMP Update.

Perform seismic study of all district facilities and identify those facilities at greatest risk for earthquake damage.

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was not implemented due to funding priorities. The viability of this and other projects will be determined based on recommendations included in the Sac Metro's Community Risk Reduction Plan which is scheduled to be completed in late 2021.

Implement a Wildland Urban Interface (WUI) Building/Fire Code

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was not implemented due to funding priorities. The viability of this and other projects will be determined based on recommendations included in the Sac Metro's Community Risk Reduction Plan which is scheduled to be completed in late 2021.

Develop and Implement a comprehensive WUI fuels management program.

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was not implemented due to funding priorities. The viability of this and other projects will be determined based on recommendations included in the Sac Metro's Community Risk Reduction Plan which is scheduled to be completed in late 2021.

Deploy 2 remote automated weather stations (RAWS) in Metro Fire jurisdiction

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was not implemented due to funding priorities. The viability of this and other projects will be determined based on recommendations included in the Sac Metro's Community Risk Reduction Plan which is scheduled to be completed in late 2021.

Defensible space ordinance

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was not implemented due to funding priorities. The viability of this and other projects will be determined based on recommendations included in the Sac Metro's Community Risk Reduction Plan which is scheduled to be completed in late 2021.

Brannan Andrus Levee Maintenance District

Implement Bioengineered Bank Stabilization techniques

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing and estimated to be completed in 2022-2023. Native grasses and plants selected to stabilize the levees. This risk reduction and loss avoidance results from tying the levee soils together making is more difficult for the levee sections to erode. The protection is from the grasses and plants themselves against wave and current actions.

Development of Dredge Stockpile Site

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project was implemented and completed. This project accomplished channel maintenance and is for navigational loss avoidance for ship traffic to have navigational abilities up the river. BALMD will reuse the dredge for an upcoming large Sacramento River Erosion and Habitat Enhancement project.

Georgiana Slough Waterside Erosion Repair

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Selected locations on the Georgianna Slough annual rip-rap repair provides risk reduction and protection from loss avoidance.

This project is funded and underway in planning and most recently in the permit process. The toe of the levee has become too steep resulting from erosion at the bottom of the river. This project is underway to keep the levee from failure. This is a loss avoidance project and will reduce risk.

Hydrographic surveys and data collection

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is performed as pre-dredge and post-dredge for verification of depth. Preformed on levee sections under the water to determine levee section viability and stability longevity. This method provides data for maintenance locations resulting in future reduce risk and loss avoidance.

Mokelumne River Crown Raising

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This crown was raised to insure minimum elevation standards as determined by DWR. These elevations have been raised above MHW. This project stops overtopping of a levee which would cause a catastrophic failure. This crown raising insures no water overtopping and avoids a catastrophic loss.

San Joaquin River Waterside Erosion Repair

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This erosion repair has been completed and has stabilized the loss of riparian habitat and insured levee stabilization.

Sevenmile Slough French Drain and Seepage Berm

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project has not been started. Funding has been delayed and the project remains in line for funds from the State of California.

Reclamation District #3

Levee Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing, but is not included in this Plan Update.

Reclamation District #341

San Joaquin River Setback Levee/Habitat Bench Multi-Benefit Project, Phase 1

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing, but is not included in this Plan Update.

Complete Projects from Regional Flood Management Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing, but is not included in this Plan Update.

Reclamation District #369

Pump Station Upgrades and Backup Generators

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is not yet complete. It is being carried forward in this Plan Update.

Levee Maintenance Program Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is not yet complete. It is not being carried forward in this Plan Update.

Reclamation District #551

Levee Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing, but is not included in this Plan Update.

Reclamation District #554

As a financially strapped RD, #554 has the fortune of being established as a Legacy Community and is high on the DWR list to invest funds for reducing risk and loss avoidance at Snodgrass Slough. The first round of evaluations will assist in providing different options available to the RD to continue risk reduction and loss avoidance. #554 has invested into the Geotechnical Investigations to establish the geometry requirements for risk reduction and loss avoidance for the cross channel.

Apply for a Letter of Map Revision (LOMR) to bring the District back into Zone X. (outside of the 100-year flood zone)

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project has not started because of the financially strapped RD where the ratio of levee mile to land acreage makes it difficult to fund projects.

Fill Abandoned Slough

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing. It continues ongoing as materials for fill are available.

Geotechnical Investigation

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The geotechnical investigation is ongoing. The information is vital and assists 554 in providing different options available to the RD to continue risk reduction and loss avoidance. This project is to establish the geometry requirements at the cross channel.

Snodgrass Slough Levee Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project has not been started because funding that is available had better value in other areas of the RD.

Reclamation District #556

Flood Response Activities, Georgiana Slough Weir

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing.

Georgiana Slough Vegetation Management

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is not started. 556 has a ratio of levee mile to land acreage that makes it very difficult to gain financially and cover the expenses required to start projects and keep them ongoing. Their funds are limited and distributed to most dire area of levee maintenance and flood control. With that said, 556 has improved flood response activities which improves the visual inspection of the levees and rip-rap maintenance to protect said levees from erosion. These activities are reducing risk and loss avoidance and will only improve with time.

Georgiana Slough Waterside Erosion Repair

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is not started. 556 has a ratio of levee mile to land acreage that makes it very difficult to gain financially and cover the expenses required to start projects and keep them ongoing. Their funds are limited and distributed to most dire area of levee maintenance and flood control. With that said, 556 has improved flood response activities which improves the visual inspection of the levees and rip-rap maintenance to protect said levees from erosion. These activities are reducing risk and loss avoidance and will only improve with time.

Topographic and Hydrographic Surveys and Data Collection

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Topographic is ongoing and Hydrographic has not started

Reclamation District #563

Rock Slope Protection Project

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing and will be carried forward in this Plan Update.

HMP and PL-8499 Levee Improvement Projects

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing and will be carried forward in this Plan Update.

Reclamation District #800

Erosion Repair

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The District lacked the funds required to implement the erosion repairs immediately after the 2017 floods. Since then, the District has raised assessments and worked in coordination with the National Resources Conservation Service (NRCS) to obtain funding to make the repairs. The NRCS has agreed to help the District repair three of the most critical erosion sites at a 75/25 NRCS/District cost share. The NRCS funded sites located on Freeman Road, Cosumnes Road and Fig Road are scheduled for construction during the summer of 2021. The District plans to continue repairing the other sites as funding becomes available.

Emergency Supplies

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The District has been unable to stockpile emergency supplies due to lack of storage space because the District does not own property, shops, or storage buildings. The District is currently searching for office space near or within the District and plans on purchasing a Conex container to keep onsite to store District tools and flood fight supplies.

Reclamation District #1000

River Berm and Levee Erosion

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Waterside river berm and levee erosion mitigation is an ongoing project typically sponsored by the US Army Corps of Engineers (USACE) under the Sacramento River Bank Protection authorization to address active erosion sites that could impact levee safety. Since 2016, there have been no projects implemented in RD 1000 jurisdiction. However, USACE with the State of California and RD 1000 conduct site surveys to identify potential bank protection sites.

In 2017, the Sacramento region had several disaster declarations due to flood damages. The damages included a significant erosion site on the Sacramento River north of Elverta Road. RD 1000 requested USACE assistance under PL84-99 but was determined the site was not eligible since the erosion was outside the theoretical levee prism. The site contains an existing single family residential structure which is within 15 feet of the erosion. The site will be included in the 2021 LHMP Update.

Erosion Protection Canal Banks

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Erosion protection along the interior canal and ditch banks continues to be implemented on an annual basis. RD 1000 identifies the most critical sites and places the rock slope protection (RSP) to prevent further erosion. Because of the RSP placed, erosion has been prevented which if not mitigated would have resulted in loss of adjacent private property and potential flood damages.

Implement Security Measures at Key Facilities

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): RD 1000 implemented security measures at key facilities including security fencing at Pumping Plant Number 8 and Pumping Plant No. 1 which are RD 1000's most critical pumping plants to reduce flood risk. Since implementation of these fences RD 1000 has not experienced any security breaches of these facilities and loss of power due to the security breaches. Prior to their implementation, RD 1000 experienced vandalism, wire theft and other damages which caused losses of power at these facilities thereby increasing flood risk within Natomas. RD 1000 will continue to implement security measures at key facilities.

2014 Capital Improvement Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): RD 1000 implemented several projects identified in its 2014 Capital Improvement Plan (CIP) including the security fencing at Pumping Plant Nos 1 and 8; Supervisory Control and Data Acquisition (SCADA) improvements to Pumping Plant Nos. 1, 2, 3, and 8; installation of an emergency generator at Pumping Plant No. 1; improvements to the RD 1000 Corporation Yard including an emergency operations center; purchase of new flood fight equipment. In addition, RD 1000 has been working with the USACE, SAFCA and State of California on the design and construction

of the federally authorized Natomas Levee Project to include projects identified in the 2014 CIP including SCADA at the proposed reconstructed Plant Nos 4 and 5; improved levee access for flood patrols and emergency flood fight response; separate levee patrol and safe parking locations along the levee crown during flood events; improvements to Pumping Plant No. 1 outfall structure including the discharge tunnels through the levee foundation. Implementation of these CIP projects will significantly reduce the flood risk in Natomas by bolstering levee safety, improving pumping plant operations and providing for levee patrols and a robust flood emergency response capability.

Recognizing the changing needs, RD 1000 adopted an update to the CIP in 2020. Some of the projects identified in the RD 1000 2020 CIP Update will be included in the LHMP Update for 2021.

Implement Supervisory Control and Acquisition Data system (SCADA) on District canals and pump stations

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): RD 1000 adopted a SCADA Master Plan in 2018 identifying current and future SCADA needs to allow for monitoring canal levels, pump station operations and security at the key facilities. Following adoption of the SCADA Master Plan, RD 1000 implemented SCADA improvements at Pumping Plant Nos 1, 2, 3 and 8 in 2019 using funds from a Bureau of Reclamation grant in coordination with the Natomas Mutual Water Company to improve water use efficiency in Natomas. The District used these improvements during the most recent flood season to monitor water levels at the pump plants as well as the pump operations all which reduce flood risk. RD 1000 has worked with the USACE, SAFCA and State of California to include SCADA improvements on the proposed reconstruction of Pumping Plant No. 4 (currently under construction) and Plant 5 (future construction) as part of the Natomas Levee Project.

Funding constraints prevented additional SCADA improvements identified in the Master Plan.

Public Outreach and Education

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): RD 1000 conducted public outreach and education by implementing a social media campaign including Twitter and Facebook; it also has a website which provides information about RD 1000 activities, current flood risks and contact information. The website provides links to other sites such as the National Weather Service for weather; reservoir levels, river stages and links to the City and County for evacuation notices. RD 1000 staff met with neighborhood and community groups to provide information about flood risk, levee status and levee construction information. While not directly reducing the flood risk, public information provides a tool for residents to use during a flood emergency to assess their personal risk and make appropriate decisions.

Stockpile and pre-stage flood emergency response materials

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): RD 1000 did not develop any new flood emergency stockpile or pre-staging flood response materials because of the ongoing levee construction activities by SAFCA and now USACE. It is more reasonable to wait until the construction is complete to identify sites

for the future stockpiles. However, RD 1000 did expand its stockpile of materials at the Corporation Yard including large rock, aggregate base, visquine and sand bags.

Emergency response improvements including radios for communications

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): RD 1000 coordinated with Sacramento County Office of Emergency Services (OES) to secure two way radios for communication during an emergency if cell phone service is not available. To date RD 1000 has not had to use the radios during storms or flood events. However their use during flood events if cell service is lost will reduce flood risk by allowing communication within RD 1000 as well as outside emergency responders including law enforcement, fire and other first responders.

Emergency Back-up Generator for pump stations

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): RD 1000 installed a diesel generator at Pumping Plant No. 1 capable of powering all of Plant 1B (6-400HP pumps) and most of Plant 1A. RD 1000 is looking to acquire additional generators, both permanent and portable for the other pumping plants but was not able to purchase due to funding constraints. Generators were included in the 2020 CIP Update and will be identified in the LHMP Update for 2021.

Reclamation District #1002

Geotechnical Investigation

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is not started. Geotechnical investigations remain as a potentially viable resource of information for the future.

Snodgrass Slough Levee Improvements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The Snodgrass Slough Levee Improvements project has drawings and plans ready to go to bid and continues to focus on risk management and loss avoidance. The 2017 addition of krails and work to address through seepage issues provided a high value of reduced risk and loss avoidance.

Snodgrass Slough Vegetation Management

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing. The development of a project is to improve risk management and loss avoidance on the levees.

Reclamation District #1601

Levee Improvement Project

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing and will be carried forward in this Plan Update.

Reclamation District #2111

Rock Slope Protection Project

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing and will be carried forward in this Plan Update.

HMP and PL-8499 Levee Improvement Projects

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Project is ongoing and will be carried forward in this Plan Update.

Sacramento Regional County Sanitation District

South River Pump Station Flood Protection Project

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The South River Pump Station (SRPS) Flood Protection Project was completed in 2018. The Project consisted of constructing a new flood protection levee and a raised all-weather access road around the existing SRPS. The ring levee and raised access road consist of a 22-foot high, 160-foot wide bottom width, earthen embankment that surrounds the SRPS and provides access from South River Road in the event that flooding occurs. The newly constructed flood protection system is designed to provide a minimum of 200-year level of protection.

Reduction of Fire Hazard SRCSD Bufferlands

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The Reduction of Fire Hazard to the Regional San Bufferlands is an ongoing annual project that consistently helps to reduce wildfire risk to the property.

Sacramento Area Sewer District

MOU for Dedicated Cell Phone Tower and Cell Phone Pack

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): This project is ongoing, but will not be carried forward in this Plan Update.

Southgate Recreation and Park District

Drought Mitigation Actions/Drought Contingency Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The Southgate RPD continues to implement state mandated water conservation regulations. The Southgate RPD stopped watering by ET (evapo-transportation, i.e irrigating based on weather data). Any new parks and landscape development is required to specify drought tolerant vegetation, less turf areas, less water using sprinkler systems (i.e. netafim, subterranean drip system, internet based controllers, and MP rotators.) All of which promote water conservation. Southgate RPD has identified areas in parks and landscape corridors where water usage would be significantly reduced to conserve our community's precious water resources. Watering area on the perimeter of some parks was significantly reduced or eliminated. Southgate RPD will continue to find was of reducing water consumption especially if we continue to have drought conditions in the following months.

Flood Mitigation Actions/Land Acquisition

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): As new development comes along Southgate RPD continues to pursue the acquisition of open space, and parkland, and seek joint-use opportunities with partner agencies. This is an ongoing mitigation action that is usually based on decisions that are made in conjunction with other agencies as area are identified that can serve as flood control areas.

Conservation Easements

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Southgate RPD continues to make an effort to acquire those lands that are considered to contain rare wildlife habitat in order to limit certain types of uses or prevent development from taking place by protecting the land for future generations. As new development comes along Southgate RPD will continues to pursue the acquisition of open space, and parkland, and seek joint-use opportunities with partner agencies.

Multi-jurisdictional Cooperation within Watersheds

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The Florin Creek multi-use basin was completed in 2017. The basin is designed to provide a minimum 100-year level of flood protection for the surrounding neighborhood. Due to the continuing drought conditions the basin has had sufficient water to test its functionality. Southgate RPD continues to work with outside agency in order to provide better flood control and improved recreational benefits at other locations.

Storm Water Management Practices – Implement Storm Water Management Practices as identified in Stormwater Quality Design Manual

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Southgate RPD continues to work in collaboration with the Sacramento County Department of Water Resources (DWR) to plan and design joint-use facilities that will provide both storm water management and recreation use to Southgate RPD residents. These types of projects keep creek drainage corridors in their natural state and provide storm water detention basins with compatible recreational uses such as trails and sports fields. These types of projects help improve the storm water quality and drainage capacity in our neighborhoods while at the same time providing additional recreation opportunities in the community.

Severe Weather: Heavy Rains and Storms Mitigation Actions/Tree Management

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): Southgate RPD adopted an Urban Forest Management Plan in 2021 that aims to identify actions that will support a healthy and regenerative urban forest. An inventory of trees has been compiled and if there are any high risk trees identified they have been removed and new trees have been planted.

Twin Rivers School District

New drainage plans to sites within the flood areas including, site drainage, storm drain upgrades and re-grading fields to shed water (on-site) away from buildings

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): District does not have any sites in flood areas that require new drainage plans.

Work with City/County/Water departments to create defensible spaces at sites where nearby creeks are prone to flooding. Build-up earthen berms (off-site) to shed water away from critically located schools.

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): District will identify sites where nearby creeks are prone to flooding and assess if modifications need to be made to create defensible spaces.

Working with the Department of the State Architect (DSA) on Earthquake Retrofit Plan on all sites.

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): District previously reached out to DSA regarding Earthquake Retrofit Plans on all sites and this is pending further direction from DSA.

Revise and update district-wide Storm Water Prevention Plan

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): The District revises and updates the Storm Water Prevention Plans as needed per project (for projects over 1 acre).

Create defensible perimeter space – for fire areas. Trees trimmed and vegetation removed to minimize impact during fire season.

Progress to Date (Consider: Was the project implemented – why or why not? Did the project reduce risks? Can you provide evidence of loss avoidance?): : District's Maintenance/Grounds Department trims trees and removes vegetation at sites on an ongoing basis.

Chapter 3 Planning Process

Requirements §201.6(b) and §201.6(c)(1): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and

3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Sacramento County recognized the need and importance of the update process for their 2016 Local Hazard Mitigation Plan (LHMP) and initiated its development. After receiving a grant from the Federal Emergency Management Agency (FEMA), which served as the primary funding source for this LHMP Update, the County contracted with Foster Morrison Consulting, Ltd. (Foster Morrison) to facilitate and develop the Plan. Jeanine Foster, a professional planner with Foster Morrison, was the project manager and Community Rating System (CRS) lead in charge of overseeing the planning process and the development of this LHMP update. Chris Morrison, also a professional planner with Foster Morrison, was the lead planner for the development of this LHMP Update. The Foster Morrison's team's role was to:

- Assist in establishing the Hazard Mitigation Planning Committee (HMPC) as defined by the Disaster Mitigation Act (DMA);
- Meet the DMA requirements as established by federal regulations and following FEMA's planning guidance;
- Support objectives under the National Flood Insurance Program's (NFIP) CRS and the Flood Mitigation Assistance (FMA) program;
- Facilitate the entire planning process;
- Identify the data requirements that HMPC participants could provide and conduct the research and documentation necessary to augment that data;
- Assist in facilitating the public input process;
- Produce the draft and final plan documents; and
- Coordinate with the California Office of Emergency Services (Cal OES) and FEMA Region IX plan reviews.

3.1 Local Government Participation

Sacramento County and the City of Sacramento, as the two participating NFIP CRS communities, the other six incorporated communities, and 24 special districts, made a commitment to this 2021 multi-jurisdictional LHMP Update as participating jurisdictions. The DMA planning regulations and guidance stress that each

local government (participating jurisdiction) seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the HMPC;
- Detail where within the Planning Area the risk differs from that facing the entire area;
- Identify potential mitigation actions; and
- Formally adopt the plan.

For Sacramento County and all participating jurisdictions, "participation" meant the following:

- Attending and participating in the HMPC meetings;
- Completing and returning the Data Collection Worksheets;
- Collecting and providing other requested data (as available);
- Coordinating information sharing between internal and external agencies;
- Managing administrative details;
- Making decisions on Plan process and content;
- Identifying mitigation actions for the Plan;
- Reviewing and providing comments on Plan drafts;
- Providing Draft documents of LHMP for public review;
- Informing the public, local officials, and other interested stakeholders about the planning process and providing opportunity for them to comment on the Plan;
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the Plan by the governing boards for each jurisdiction.

The County and all jurisdictions seeking FEMA approval of this LHMP Update met all of these participation requirements. Multiple representatives from the County and all jurisdictions attended the HMPC meetings described in Table 3-5 and also brought together an internal planning team to help collect data, identify mitigation actions and implementation strategies, and review and provide data on Plan drafts. Appendix A provides additional information and documentation of the planning process.

In order to promote the integration of CRS into this planning process, the HMPC representatives from the County and City of Sacramento, as the two CRS communities, were selected based on their areas of expertise relative to the CRS mitigation categories as detailed in Table 3-1. In addition, the Sacramento County and City of Sacramento staff responsible for community land use and comprehensive planning for their jurisdictions were active participants on the HMPC and provided data and information to support development of the Plan. Specifically, the Sacramento County Office of Planning and Environmental Review (John Lundgren, Senior Planner and Todd Taylor, Associate Planner) and City of Sacramento Community Development Department, Planning Division (Remi Mendoza, Associated Planner), in association with Foster Morrison Planners were involved in the development of this LHMP Update through attendance at meetings, providing data, future land use planning support, and help with all LHMP planning elements. In addition to attending meetings, providing draft text for inclusion in the plan, and reviewing Plan documents, Sacramento County and City of Sacramento planners, in addition to planners from other participating jurisdictions, also provided information on development since the 2016 LHMP, mapping, text, and details on future development areas, input on current mitigation capabilities, and a variety of documents and information specific to their jurisdictions.

Table 3-1 Sacramento County Planning Area LHMP Staff Capability with Six Mitigation Categories

Jurisdiction/Departments	Prevention	Property Protection	Natural Resource Protection	Emergency Services	Structural Flood Control Projects	Public Information	Other
Sacramento County							
Department of Water Resources/Flood Management and Engineering, George Booth	X	X	X		X	X	X
Emergency Services, Mary Jo Flynn-Nevins, Interim Chief of Emergency Services	X	X	X	X	X	X	X
Office of Planning and Environmental Review, John Lundgren, Senior Planner	X	X	X	X		X	X
City of Sacramento							
Department of Utilities, Rosa Millino, Senior Engineer	X	X	X		X	X	X
City, Office of Emergency Management, Daniel Bowers	X	X	X	X	X	X	X
Community Development Department Planning Division, Remi Mendoza, Associate Planner	X	X	X		X	X	X

Specific individuals representing Sacramento County and City of Sacramento departments, and representatives from other participating jurisdictions, participating in this LHMP Update were actively involved throughout the Plan Update process as identified in Appendix A in the sign-in sheets for the meetings and as evident through the data, information and input provided by HMPC representatives to the development of this LHMP Update. This Chapter 3 and Appendix A provides additional information and documentation of the planning process and participants to this Plan Update, including members of the steering and working committees, comprising the HMPC.

3.2 The 10-Step Planning Process

Foster Morrison established the planning process for updating the Sacramento County LHMP using the DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

1. Organize Resources;
2. Assess Risks;
3. Develop the Mitigation Plan; and
4. Implement the Plan and Monitor Progress.

Into this process, Foster Morrison integrated a more detailed 10-step planning process used for FEMA's CRS and FMA programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA's Hazard Mitigation Grant Program (HMGP); Building Resilient Infrastructure and Communities (BRIC), previously the Pre-Disaster Mitigation (PDM) program; CRS program; FMA Program; Severe Repetitive Loss (SRL) program; and new flood control projects authorized by the U.S. Army Corps of Engineers (USACE).

Table 3-2 shows how the modified 10-step process fits into FEMA's four-phase process. The sections that follow describe each planning step in more detail.

Table 3-2 Mitigation Planning Processes Used to Develop the Sacramento County Local Hazard Mitigation Plan

DMA Process	Modified CRS Process
1) Organize Resources	
201.6(c)(1)	1) Organize the Planning Effort
201.6(b)(1)	2) Involve the Public
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies
2) Assess Risks	
201.6(c)(2)(i)	4) Identify the Hazards
201.6(c)(2)(ii)	5) Assess the Risks
3) Develop the Mitigation Plan	
201.6(c)(3)(i)	6) Set Goals
201.6(c)(3)(ii)	7) Review Possible Activities
201.6(c)(3)(iii)	8) Draft an Action Plan
4) Implement the Plan and Monitor Progress	
201.6(c)(5)	9) Adopt the Plan
201.6(c)(4)	10) Implement, Evaluate, and Revise the Plan

This LHMP Update involved a comprehensive review and update of each section of the 2016 Plan and includes an assessment of the success of the County in evaluating, monitoring and implementing the mitigation strategy outlined in the initial Plan, as previously described in more detail in Chapter 2 and throughout Chapter 4 and Chapter 5.

The process followed to update the LHMP is detailed in the above table and the sections that follow and is in conformance with the latest DMA planning guidance and the CRS 2017 Coordinator's Manual. As part of this LHMP Update, all sections of the Plan were reviewed and updated to reflect new data, processes, and resulting mitigation strategies. Only the information and data still valid from the 2016 LHMP was carried forward as applicable into this LHMP Update.

3.2.1. Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

With Sacramento County's commitment to participate in the DMA planning process and the CRS program, Foster Morrison worked with Sacramento County's Department of Water Resources (County DWR), as overall project lead, to establish the framework and organization for development of the Plan. An initial meeting was held with key community representatives to discuss the organizational and process aspects of this LHMP Update process.

The initial kick-off meeting was held on September 15, 2020. Invitations to these kickoff meetings were extended to key County departments, the seven incorporated communities, special districts located within the County, as well as to other federal, state, and local stakeholders, including representatives from the public, that might have an interest in participating in the planning process. Representatives from the 2016 HMPC, key County departments, and other identified stakeholders were used as a starting point for the invite list, with additional invitations extended as appropriate throughout the planning process. The list of invitees is included in Appendix A.

Hazard Mitigation Planning Committee (HMPC)

The HMPC was established as a result of these initial meetings, as well as through interest generated through the early public meeting and outreach conducted for this project as detailed later in this section. The HMPC, comprising key County, City, special district, and other government and stakeholder representatives and the public, developed the LHMP with leadership from the County DWR and facilitation by Foster Morrison. This list includes all HMPC members that attended one or more HMPC meeting, as well as those who provided key input into the Plan development process. The following participated on the HMPC:

Table 3-3 Sacramento County – Hazard Mitigation Planning Committee

Name/Title	Title	Department/Agency/ Affiliation
Alan Haynes		NOAA/NWS/California Nevada River Forecast Center
Alan Vail	Managing Partner	Resident/VCS Consulting
Alexander Barba		Sacramento County DWR
Amittoj Thandi	Engineering Services Support Manager	City of Elk Grove
Angelina Wu		City of Sacramento
Anitra Pawley	Program Manager	In-Delta Investments, Division of Multibenefits, CA DWR;
Ann Kohl		AA Sierra Branch Committee
Anne Del Core		Resident of Sierra Oaks Vista; annedelcore@gmial.com

Name/Title	Title	Department/Agency/ Affiliation
Barb McGowan	DCC Engineering	BALMD (RDs 317, 407, 2607) BMcGowan@dcceng.net
Ben Ashby		CHP East Sacramento Area
Bill Darsie		KSN Engineers, RD 2111,1601, 563
Bill Forrest		City of Galt Public Works
Bill Sessa		Woodside Homeowners Association
Brandon Mitchell		Sacramento County Water Resources mitchellbr@saccounty.net
Brenda Bongiorno		Sacramento County Public Works
Brenna Howell		Howell Consulting
Brian Hensley		Citrus Heights Water District
Brian McCord	Director Operational Risk Management	California American Water
Brian Walker	Sr Engineer/Floodplain Manager	City of Roseville
Charles Bergstrom		City of Isleton; cbergson@cityofisleton.com
Chris Morrison	Lead Planner	Foster Morrison Consulting
Chris Neudeck		KSN Engineering/ cneudeck@ksninc.com
Christen Bennett		Sacramento County Water Agency; bennettchr@saccounty.net
Clair Davis	Floodplain and CRS Administrator	City of Fort Worth TX
Connie Perkins	Senior Engineer	Central Valley Flood Protection Board and City of Sacramento Resident
Connie Perkins	Senior Engineer	City of Sacramento Resident/ State CRS Coordinator
Dalia Fadl	Sr. Civil Engineer	City of Rancho Cordova
Dana Booth	Stormwater Quality Program Manager	Sacramento County
Daniel Bowers	Director of Emergency Management	City of Sacramento OEM
David Bolen		Sacramento County DWR
David Bolland		Bolland and Associates
Dawn Pimentel		Sacramento County DWR
Debbie Turner		Los Rios Community College District
Derek DeWaal		FBI; dfdewaal@fbi.gov
Derek Larson	Principal	Larsen Wurzel & Associates
Dirk Medema		City of Citrus Heights
Emily Pappalardo		MBK Engineers
Eric Singer	Assistant Planner	City of Citrus Heights
Forrest Williams		SCWA

Name/Title	Title	Department/Agency/ Affiliation
George Booth		Sacramento County DWR/Sacramento Water Agency
Gilbert Cosio	Principal Engineer	MBK Engineers for RD 3 (North Delta RDs)
Gilbert Mendes		Home Owner Franklin Pond Area - Elk Grove
Glen Rickelton		Sacramento County Department of Airports
Greta Soos	Assistant Planner	City of Sacramento Planning Department
Heidi Hampton		Sacramento Sheriff's Office RMAC
Heidi Huber		Sacramento County DWR
Holly Brown		Resident/SacRegion VOAD HandsOn Sacramento
Hunter Merritt	Public Involvement Specialist	USACE SPK Sacramento District
Israel Tamiru	Jr. Engineer	City of Sacramento DOU
Jamie Arno		Sac Metro Air District jarno@airquality.org
Jamie Hudson		City of Elk Grove Emergency Management
Jamie McKinley		City of Sacramento; jmckinley@cityofsacramento.org
Jason D'Alessio		Sacramento County OES
Jeanelle Gottlob	Emergency Manager	Jenelle Gottlob
Jeanine Foster	Project Manager	Foster Morrison Consulting
Jeff Werner		City of Elk Grove
Jillian Powell		Resident
Jim Gillum		Public/Gillum Consulting, Inc.
John Lundgren	Sr. Planner	Sacramento County Planning Department
Juanita Cano		Southgate Recreation and Park District
Julia Coleman	Risk Management Specialist	Risk Management Los Rios College
Julie Lim	Sr. Staff Assistant	City of Sacramento Department of Utilities
June Cowles		City of Rancho Cordova Planning Department
Kamal Atwal	Principal Civil Engineer	Sacramento County DOT O&M
Keith Leech		Sacramento County DGS Fleet Service
Ken Cusano	Fire Chief	Folsom Fire Department
Kerry Schmitz		Sacramento County Water Agency
Lauren Groves		City of Sac OEM (for Jeanelle Gottlob) lgroves@cityofsacramento.org
Levi Warr		CA DWR; levi.warr@water.ca.gov
Linda Ford		Resident/Metro Fire CERT
Lisa Barsdale		Sac Metro Fire
Lisa Deklinski		City of Sacramento Department of Utilities
Liz Ramos		Kjeldsen, Sinnock & Neudeck, Inc
Lu Li	Principal Civil Engineer	Sacramento County DOT; lil@saccounty.net

Name/Title	Title	Department/Agency/ Affiliation
Lupe Rodriguez		Sacramento County Department of Transportation
M. T Lorenzo-Lee		Resident Pocket Area
Mark Barcellos		Sacramento County Environmental Management Department
Mark Cherry		Sacramento Sheriff's Office
Mary Jo Flynn-Nevins		Sacramento County OES
Matt Demarco	Administrative Battalion Chief	Consumnes CSD Fire Department
Matt Hawkins	Emergency Manager	Sacramento County OES;
Matt Hertel	Action Long Range Planning Manager	City of Sacramento
Matthew Renfro	CivicSpark Fellow	Sacramento Metropolitan Air Quality Management District
Megan Floyd	Environmental Specialist	Sacramento County EMD
Megan LeRoy		KSN Engineers
Megan Walton		Cal OES Recovery
Melanie Saucier		SAFCA
Melissa Wright	Senior Civil Engineer	Sacramento County Department of Transportation
Michael Doane		Sacramento Regional Parks
Michael Moncrief	Principal	MBK Engineers
Michael Redfern		Sacramento Area Sewer District
Mika Guevarra	Emergency Volunteer	Sacramento Region BOAD HandsOn Sacramento
Mike Johnson		Sacramento County DWR
Mike Snelling	Director of Public Works	City of Galt
Neal Joyce	DOU Supervising Engineer	City of Sacramento Department of Utilities
Nestor Michelena		California Highway Patrol
Orlando Olivas		Sacramento County Dept. of Airports (for Glen Rickelton
Patrick Erwin		RDs 341 & 800/ Wagner & Bonsignore, Consulting Civil Engineers
Patrick Ji	Water Quality Engineer	City of Sacramento
Paul Kent	Emergency Manager	City of Elk Grove
Paul Siebensohn	Director of Field Operations	Rancho Murieta CSD
Piper Crawford		Regional Sanitation District
Raymond Kong		City of Sacramento DOU
Rebecca Scott		Citrus Heights Water District;
Regina Cave		City of Citrus Heights
Remi Mendoza		City of Sacramento Community Development Department

Name/Title	Title	Department/Agency/ Affiliation
Rod Rodriguez	Emergency Services Coordinator	Placer County OES
Rosa Millino	Senior Engineer	City of Sacramento
Ryan Neves	Senior Engineer	City of Folsom
Saira Nisha		Public
Scott Fujikawa	Senior Civil Engineer	Sacramento County Department of Airports
Shayan Rehmans		Sacramento County DWR
Shelly Jiang	Climate Change Coordinator	Sacramento Metropolitans Air Quality Management District
Shelly Jiang	Climate Change Coordinator	Sacramento Metropolitans Air Quality Management District
Silvia Reynoso	Water Resources Engineer	Cal DWR
Spencer Eberle		Resident Old North Sacramento/ ARFC District Board of Directors
Steve Nebozuk		Sacramento Regional County Sanitation District/ Sacramento Area Sewer District
Steve White		Sacramento County Department of Transportation
Sylvia Reynoso	DOU Supervising Engineer	City of Sacramento
Tim Kerr		American River Flood Control District
Tina Anderson	Project Manager	MBK Engineers
Todd Taylor	Associate Planner	Sacramento County Planning
Tom Monahan		Public
Tom Pasterski		SCWA
Tom Trexler		MBK Engineers
Toni Hoang		SMUD
Travis Franklin		Elk Grove Water District
Troy Bair	Deputy Fire Chief - Operations	Consumnes CSD Fire Department
Ty Bailey	Battalion Chief	Sacramento Metro Fire District
Valeri Mihanovich	Director	Public/The Regional Center for Volunteerism-Hanson Sacramento AND Sacramento Region Voluntary Organizations Active in Disaster
Victoria LaMar-Haas		Cal OES, Program Manager, Local Hazard Mitigation Planning
Vyoini Upadhyay	Associate Civil Engineer	Regional Sanitation District/ SASD Part of Sanitation Districts Agency
Wendi Wilkinson	Senior Ag Env. Scientist	Home Owner Franklin Pond Area Elk Grove/ California Department of Agriculture

Steering Committee

In addition to the HMPC, a Steering Committee to the HMPC was established to help guide LHMP development, including the CRS components of floodplain management planning and the overall development of the LHMP. The Steering Committee is comprised of key representatives from the County and the City of Sacramento as the two CRS communities and includes non-local government and public representatives. The non-local government members of the Steering Committee (citizens and other outside stakeholders) represent more than 50% representation of the committee for the Steering Committee. See Table 3-4 and Appendix A for details on the makeup of the Steering Committee.

Table 3-4 Sacramento County LHMP Steering Committee to the Hazard Mitigation Planning Committee

Community/ Representative	Department/Organization	County/ City	Public/ Resident	Stakeholder	# Meetings
Sacramento County					
George Booth	Sacramento County Department of Water Resources	X			5
John Lundgren	Sacramento County Office of Planning and Environmental Review	X			5
City of Sacramento					
Rosa Millino	Community Development Department Planning Division,	X			5
Remi Mendoza	Development Services Department/ Regulatory Compliance	X			5
Public Representatives					
Wendy Wilkinson	Home Owner Franklin Pond Area, Elk Grove		X	X	5
Gilbert Mendes	Home Owner Franklin Pond Area, Elk Grove		X		4
Spencer Eberle	Resident – Old North Sacramento		X		5
Holly Brown	Resident/Hands On Sacramento		X	X	3
Jim Gillum	Resident/Gillum Consulting		X		4
Connie Perkins	City of Sacramento Resident		X	X	3
Maria Lorenzo-Lee	Resident Pocket Area		X	X	3
Mike Guevarra	Resident/Hands On Sacramento		X	X	3
Tom Monahan	Public		X		3
Derek Lawson	Public		X		3
Valerie Mihanovich	Public/Hands On Sacramento		X	X	3
Linda Ford	Resident/ Metro Fire Cert				3

Meetings

The planning process officially began with a kick-off meeting held on September 15, 2020, followed by public kick-off meeting held the same day at 6:00 pm. The meetings covered the scope of work and an introduction to the DMA, CRS, and FMA requirements. During the HMPC meetings, participants were provided with data collection worksheets to facilitate the collection of information necessary to support development of the Plan. Using FEMA guidance, these worksheets were designed to capture information on past hazard events, identify hazards of concern to each of the participating jurisdictions, quantify values at risk to identified hazards, inventory existing capabilities, record possible mitigation actions, and to capture information on the status of mitigation action items from the 2016 Plan. A copy of the worksheets for this project are included in Appendix A. Each participating jurisdiction seeking FEMA approval of this LHMP Update completed and returned the worksheets to Foster Morrison for incorporation into this LHMP Update.

During the planning process, the HMPC communicated through virtual Zoom meetings, email, telephone conversations, Dropbox websites, and through a County developed webpage dedicated to the Plan development process. This later website was developed to provide information to the HMPC, the public and all other stakeholders on the LHMP process. Draft documents were also posted on these websites so that the HMPC members and the public could easily access and review them.

The Sacramento County LHMP website (as shown on Figure 3-1) can be accessed online at: https://waterresources.saccounty.net/stormready/Pages/Local-Hazard-Mitigation-Plan-2017-Update.aspx

Figure 3-1 Sacramento County Hazard Mitigation Plan Update Website

Source: Sacramento County

The HMPC met formally five times during the planning period (September 2020 – September 2021) which adequately covers the four phases of DMA and the 10-Step CRS planning process. The formal meetings held and topics discussed are described in Table 3-5. Agendas and sign-in sheets for each of the meetings are included in Appendix A.

Table 3-5 HMPC Meetings

Meeting Type	Meeting Topic	Meeting Date(s)	Meeting Location(s)
HMPC #1 Kick-off Meeting	1) Introduction to DMA and the planning process 2) Overview of current LHMP; 3) Organize Resources (CRS Steps 1,2&3): the role of the HMPC, planning for public involvement, coordinating with other agencies/stakeholders 4) Introduction to Hazard Identification	September 15, 2020	Zoom Meeting

Meeting Type	Meeting Topic	Meeting Date(s)	Meeting Location(s)
HMPC #2	1) Risk assessment overview and work session -CRS Step 4: Assess the Hazard -CRS Step 5: Assess the Problem	February 5, 2021	Zoom Meeting
HMPC #3	1) Review of risk assessment summary 2) Review and update of mitigation goals 3) Intro to Mitigation Action Strategy -CRS Step 6: Set Goals -CRS Step 7: Review possible activities	March 24, 2021	Zoom Meeting
HMPC #4	1) Review of mitigation alternatives 2) Review and update of mitigation actions from the 2012 plan 3) Identify updated list of mitigation actions by hazard 4) Review of mitigation selection criteria 5) Update and prioritize mitigation actions 6) Mitigation Action Strategy Implementation and Draft Action Development -CRS Step 7: Review possible activities -CRS Step 8: Draft an Action Plan	March 30, 2021	Zoom Meeting
HMPC #5	1) Review of final HMPC, jurisdictional and public comments and input to plan 2) Review and documentation of changed conditions, vulnerabilities and mitigation priorities 3) CRS Step 8: Draft an Action Plan 4) CRS Step 9 & 10: Plan Maintenance and Implementation Procedures	August 4, 2021	Zoom Meeting

Zoom Meetings

As a result of the Covid-19 Pandemic, all of the HMPC and public meetings were conducted virtually via the online Zoom format. While these Zoom meetings presented a few challenges from a collaboration standpoint, holding these meetings online also had its advantages. First, it was observed that more people were available to attend an online meeting, including those out of area agencies where travel to Sacramento for a meeting was difficult due to the time involved. Another benefit was the use of the Chat function in the Zoom format. This allowed those individuals not likely to speak up in a face-to-face meeting to provide input via Chat. Further, these Chat transcripts were recorded in a written retrievable format that allowed Foster Morrison to develop comprehensive notes detailing HMPC and public input. While all efforts were made to track meeting attendance, this virtual format did not always allow us to collect a full and accurate sign-in record from the meeting participants. While it was encouraged for everyone to use the chat function to sign in. Not everyone was online to be able to use the chat function (e.g., those people calling in via their phones) and even those that had access did not always use it. Thus, the sign-in sheets cannot be considered definitive on those who attended and those who did not.

Planning Step 2: Involve the Public

Public stakeholders are defined as any stakeholders not attached to local government in the Sacramento County Planning Area. Up-front coordination discussions with Sacramento County DWR, the County and

City of Sacramento floodplain managers established the initial plan for public involvement. Public involvement activities for this LHMP Update included press releases, social media communications, stakeholder and public meetings, development of an LHMP webpage and associated website postings, the collection of public and stakeholder comments on the draft plan through a variety of mechanisms, and other public outreach activities as further described below, as well as specific targeted outreach to different groups of people and other agencies throughout the plan development process. Information provided to the public included an overview of the mitigation status and successes resulting from implementation of the 2016 Plan as well as information on the processes, new risk assessment data, and proposed mitigation strategies for this 2021 LHMP Update. As part of the Plan development process, a Public Involvement Strategy was developed to ensure a meaningful public process and to focus efforts on maximizing CRS credits for public outreach. This strategy focused on using established public information mechanisms and resources with the community.

Early Public Meeting

Public outreach for this Plan Update began at the beginning of the plan development process with an advertisement placed in the local newspaper, social media, and other local outreach methods (like the flyer shown in Figure 3-2 and social media messages) announcing the public meeting and informing the public of the purpose of DMA, CRS, and the hazard mitigation planning process for the Sacramento County Planning Area. Members of the public were also invited to join the HMPC meetings.

Figure 3-2 Public Invitation Flyer

SACRAMENTO COUNTY

Help Reduce Disaster Losses in Your Community by Participating in the Sacramento County Local Hazard Mitigation Plan Update

Sacramento County is developing a Local Hazard Mitigation Plan (LHMP) Update to their 2016 plan. The purpose of this LHMP Update is to assess risk to natural hazards, implement actions to reduce future losses, and maintain eligibility for federal mitigation funds in accordance with the Disaster Mitigation Act of 2000. Partners in this planning effort include the incorporated communities of the City of Sacramento, Citrus Heights, Elk Grove, Folsom, Galt, Isleton, and Rancho Cordova and many special districts throughout the County.

What is Hazard Mitigation?

Hazard mitigation means any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards.

Why is Natural Hazard Mitigation Important?

Most people who live or work in Sacramento County have been affected by natural hazards in one way or another. Sacramento County and its residents are vulnerable to a variety of hazards including **floods, levee failure, drought, wildfire, and other severe weather events.**

The rising costs associated with disaster response and recovery have focused the attention of federal, state, and local governments on addressing natural hazards before they occur. Obviously, torrential rains and floods cannot always be prevented from occurring. Planning for natural hazards and implementing mitigation measures, however, can reduce the impact of such events when they do occur. Emergency response and recovery costs; property damage; personal injury and loss of life; and the overall economic and social impact on the community can all be reduced, and in some instances eliminated through natural hazard mitigation.

Hazard Mitigation Plan and Plan Update Process

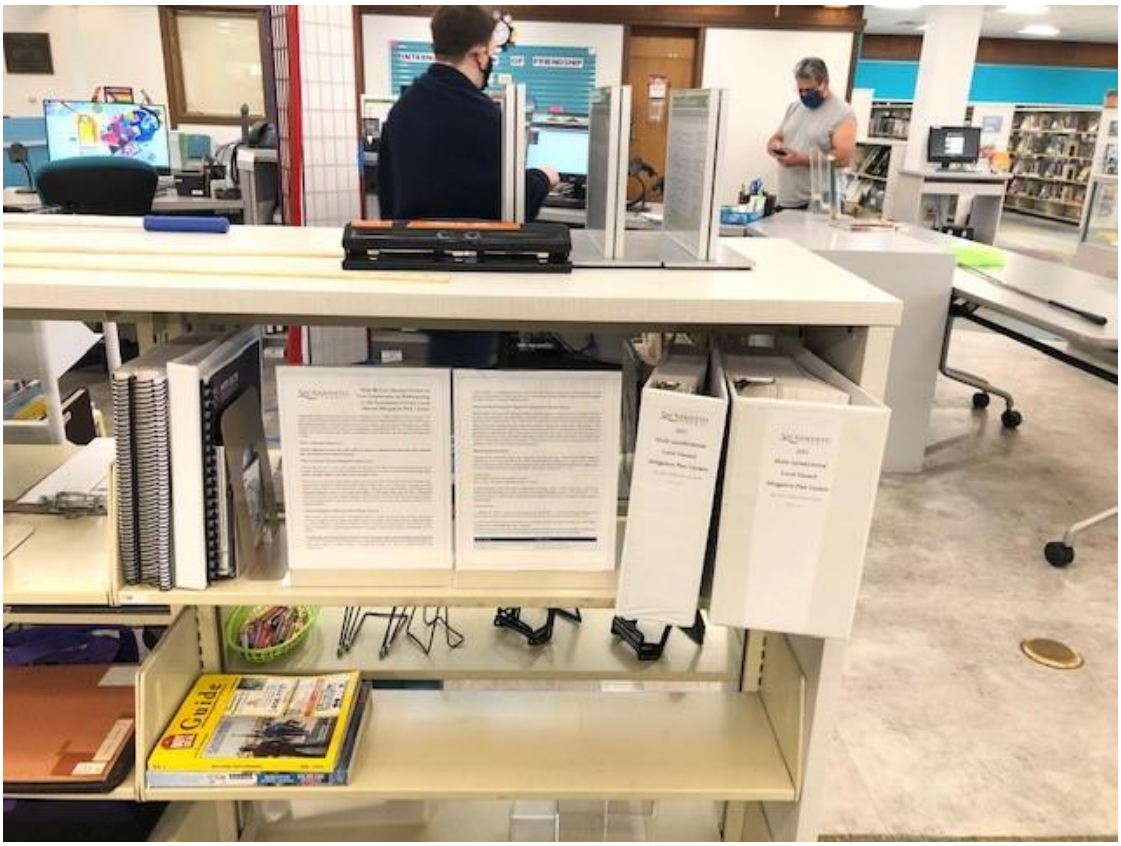
After securing Federal Emergency Management Agency (FEMA) mitigation grant funding, Sacramento County is using the funds to support an update of the 2016 LHMP. This LHMP Update is being developed by a Hazard Mitigation Planning Committee (HMPC) comprised of representatives from various County and City departments; neighboring jurisdictions; key federal, state, and local agency stakeholders; and the public.

The plan will address an updated list of hazards, will assess the likely impacts of these hazards to the people and assets of the Sacramento County planning area, and will also establish updated goals and prioritize projects to reduce the impacts of future disasters on people and property as well as to critical facilities and infrastructure.

Final Public Meeting

The first draft of the Plan was provided to the HMPC in May of 2021, with a public review draft provided in July 2021. A public meeting was held on August 3, 2021 to present the draft LHMP and to collect public comments on the Plan prior to finalization and submittal to Cal OES/FEMA. The public meeting was advertised in a variety of ways to maximize outreach efforts to both targeted groups and to the public at large and included an advertisement in a local newspaper and social media messages inviting the public to attend either the formal public meeting or the planning team meeting at their convenience. The advertisement in the local newspaper included information on the date, location and time of the meeting, where the draft Plan could be accessed in the community, and how to provide comments on the draft LHMP Update. In addition to a copy of the draft Plan being placed on the County website in advance of these meetings, a hard copy of the draft of the Plan was made available to interested parties at the Arcade location of the Sacramento County Public Library:

Figure 3-3 Public Outreach at Main Sacramento County Library – Arcade Location



Source: Sacramento County

Documentation to support the final public meeting can be found in Appendix A. In addition to advertisement for public participation, notices of meetings were sent directly to all persons on the HMPC contact list and also to other agency and key stakeholders with an interest in the Sacramento County Planning Area. The majority of these people reside in Sacramento County or in surrounding communities. Because this is a multi-jurisdictional planning effort, all public outreach activities for this LHMP Update

were conducted in cooperation with and on behalf of Sacramento County and City of Sacramento, as the two CRS communities, as well as for all participating jurisdictions.

The formal public meetings for this project are summarized in Table 3-6.

Table 3-6 Schedule of Public and Stakeholder Meetings

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Early Public Meeting	1) Intro to DMA, CRS and mitigation planning 2) 2021 LHMP Update Process	September 15, 2020	Zoom Meeting
Final Public Meeting	1)Presentation of Draft LHMP and solicitation of public and stakeholder comments	August 3, 2021	Zoom Meeting

Where appropriate, stakeholder and public comments and recommendations were incorporated into the final Plan throughout the Plan development process, including the sections that address mitigation goals and strategies. Various public comments were obtained throughout the planning process and prior to Plan submittal to Cal OES and FEMA. A table summarizing the formal public comments received and how they were addressed is included in Appendix A. All press releases, newspaper advertisements and articles, website postings, and public outreach efforts are on file with Sacramento County DWR and are included in Appendix A.

The draft LHMP Update is currently available online on the Sacramento County website at: https://waterresources.saccounty.net/stormready/Pages/Local-Hazard-Mitigation-Plan-2017-Update.aspx

Other Public Outreach Efforts

Beyond these more formal public involvement activities, the update process also included the following public outreach activities included in Table 3-7 which are further documented and described in Appendix A. The public outreach activities described here were conducted with participation from and on behalf of all jurisdictions participating in this Plan, including the CRS communities of Sacramento County and the City of Sacramento.

Table 3-7 Other Public Outreach Efforts

Effort	Description
Sacramento County LHMP Update Website	Information on the Plan update process and location of documents, and final HMPC and public meeting locations were posted on the County website. This website also included a link to the Survey. See StormReady.com
Public Outreach Flyer for Kickoff Meeting	An initial public outreach flyer was developed for the initial public and planning team kick off meetings and to use throughout the project as outreach materials.
September 1, 2020 Sacramento County Social Media Posts	Social media message on Twitter and Facebook advertising the LHMP Project Kickoff. They all link back to the StormReady webpage where more information on the LHMP Update project can be found.

Effort	Description
September 4, 2020 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project Kickoff. They all link back to the StormReady webpage where more information on the LHMP Update project can be found.
September 8, 2020 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project Kickoff. They all link back to the StormReady webpage where more information on the LHMP Update project can be found.
September 13, 2020 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project Kickoff. They all link back to the StormReady webpage where more information on the LHMP Update project can be found.
September 15, 2020 Sacramento County online Ad	Online (Sacramento County website) Ad posted the day of the LHMP Kickoff Meetings advertising the LHMP Project and the Public and HMPC Kickoff Meetings.
October 2020 – September 2021 LHMP Hazard Survey	A public survey was posted on the County's website inviting the public to comment on how prepared both the County and individuals are for a possible natural disaster, including flood events.
December 1, 2020 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Hazard Survey. They all link back to the Survey as posted on the StormReady County webpage
February 16, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Hazard Survey. They all link back to the Survey as posted on the StormReady County webpage
February 17, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Hazard Survey. They all link back to the Survey as posted on the StormReady County webpage
November 2020 – August 2021 Digital Ads for Survey promotion	Digital ads were developed that ran through the County's Entercom radio contract. The messages appear once a week as it's mixed in with County Storm Ready ads. The link goes to the survey. These digital ads are geo-located and target various areas of the County at different times. The ads ran once a week.
December 20-27, 2020 Comcast Commercial for Survey promotion	A commercial was developed in both English and Spanish that ran on numerous channels throughout Sacramento County advertising the LHMP Update Survey and directing them to the StormReady.com website. The commercial appeared on 30 different channels, in 8 different areas/zones in the County and ran 840 times.
Public Outreach Flyer for the Final Public and HMPC meetings and how to submit comments on the Draft Plan	A Public Outreach Flyer was developed to advertise the final Public and HMPC Meetings and to solicit input on the Draft LHMP prior to finalization and submittal to Cal OES and FEMA.
July 28, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project final Public and HMPC meetings and how to review and provide comment on the Draft LHMP. They all link back to the StormReady webpage where the Public Review Draft Plan and more information on the LHMP Update project can be found.
August 2, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project final Public and HMPC meetings and how to review and provide comment on the Draft LHMP. They all link back to the StormReady webpage where the Public Review Draft Plan and more information on the LHMP Update project can be found.

Effort	Description
August 3, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project final Public and HMPC meetings and how to review and provide comment on the Draft LHMP. They all link back to the StormReady webpage where the Public Review Draft Plan and more information on the LHMP Update project can be found.
Public Outreach at Sacramento County Public Library, Downtown (Arcade) Location	The County placed the draft plan in the reference section at the Sacramento County Public Library, Downtown (Arcade) location. Invitations were placed on social media, the County website, and as part of the advertisements for public meetings to let the public know that the documents were there for review and input as well as in electronic format on the LHMP website.

Public Outreach Survey

An integral element in hazard mitigation planning is broad public participation. Information provided by residents fosters a better understanding of local hazard concerns and can spawn innovative ideas to reduce impacts of future hazard events. A public opinion survey was accomplished to gather information from Sacramento County Planning Area residents concerning local hazards. The survey was located on the County's LHMP website and survey participation was promoted through public meetings, program websites, press releases, social media, and other public outreach events as previously described. Following is a summary of survey results.

- 190 individuals took the survey.
- 51 out of the 190 people who responded were extremely concerned about the possibility of the community being affected by a disaster.
- Wildfire, drought, flood, and levee failure were hazards of greatest concern.
- 52 out of 183 respondents noted that their house was in a floodplain, 50 out of 183 didn't know if their home was in a floodplain.
- 85 out of 182 respondents noted that their house was protected by a levee, 31 out of 183 didn't know if their home was protected by a levee.
- 87 out of 181 respondents had experienced a natural disaster.
- TV, email, direct mailings, and social media were the best choices to reach the public regarding disaster information and making homes more disaster resistant.

The full survey and survey results are included in Appendix H.

Program for Public Information (PPI) Strategy

As part of their overall flood outreach programs, Sacramento County and the City of Sacramento have in place a Program for Public Information (PPI) strategy designed to maximize credits under CRS Activity 330, Outreach Projects. The objective of CRS credit for a PPI is to provide additional credit for information programs that are designed to meet local needs and that are monitored, evaluated, and revised to improve their effectiveness. The PPI is an ongoing public information effort to design and transmit the messages that the community determines are most important to its flood safety and the protection of its floodplains' natural functions. Program elements include instructing residents on actions they should take before, during and after storm events to mitigate their flood risk. These actions can include being aware of your own flood

risk, implementing mitigation options available such as elevating or retrofitting a home, or understanding the benefits of purchasing flood insurance, even if a resident is outside of a federal flood hazard area.

These County and City PPI programs are important to consider in the development and implementation of this LHMP Update to ensure coordination and effectiveness of all public outreach and education efforts in the Sacramento County Planning Area.

Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, the HMPC determined that data collection, mitigation strategy development, and Plan approval would be greatly enhanced by inviting other local, state and federal agencies and organizations to participate in the process. Based on their involvement in hazard mitigation planning, their landowner status in the County, and/or their interest as a neighboring jurisdiction, representatives from the following agencies were invited to participate on the HMPC:

- American Red Cross
- Bureau of Reclamation
- Cal FIRE
- Cal Trans
- California Department of Fish and Game
- California Department of Water Resources
- California Highway Patrol
- California Office of Emergency Services
- California State Fire Marshall
- California State Parks
- Community Services Districts in the County
- FEMA Region IX
- Fire Protection Districts in the County
- Local FireWise communities
- Local Reclamation Districts
- National Weather Service/NOAA
- Pacific Gas & Electric
- Surrounding County OES leads
- United States Bureau of Reclamation
- United Stated Department of Agriculture
- United States Corps of Engineers
- United States Forest Service
- University of California Cooperative Extension

Coordination with key agencies, organizations, and advisory groups throughout the planning process allowed the HMPC to review common problems, development policies, and mitigation strategies as well as identifying any conflicts or inconsistencies with regional mitigation policies, plans, programs and regulations. Coordination involved contacting these agencies through a variety of mechanisms and informing them on how to participate in the LHMP Update process and if they had any expertise or assistance they could lend to the planning process or specific mitigation strategies. Coordination with these groups included, holding face-to-face meetings, sending outreach e-mails, some with follow up phone calls; and making phone calls alone to out of area agencies. All of these groups and agencies were solicited asking for their assistance and input, telling them how to become involved in the LHMP Update process, and

inviting them to HMPC meetings. This coordination with other agencies is documented in Appendix A and includes a summary table of who was contacted, the method of contact, and the purpose. Supporting documentation such as emails and meeting logs are also included.

In addition, as part of the overall stakeholder and agency coordination effort, the HMPC coordinated with and utilized input to the LHMP update from the following agencies:

- al-Adapt
- Cal Atlas
- Cal OES
- CAL FIRE
- Cal Trans
- California Department of Conservation
- California Department of Finance
- California Department of Fish and Wildlife
- California Department of Food and Agriculture
- California Department of Parks and Recreation
- California Department of Water Resources
- California Division of Mines and Geology
- California Employment Development Department
- California Geological Survey
- California Invasive Plant Council
- California Natural Resources Agency
- FEMA Region IX
- Library of Congress
- National Drought Mitigation Center
- National Levee Database
- National Oceanic and Atmospheric Association
- National Performance of Dams Program
- National Register of Historic Places
- National Resource Conservation Service
- National Response Center
- National Weather Service
- Pacific Gas and Electric
- Public Policy Institute of California
- United States Army Corps of Engineers
- United States Bureau of Land Management
- United States Bureau of Reclamation
- United States Department of Agriculture
- US Department of Transportation
- United States Farm Service Agency
- United States Forest Service
- United States Geological Survey
- United States Occupational Health and Safety Agency
- Western Regional Climate Center

Several opportunities were provided for the groups listed above to participate in the planning process. At the beginning of the planning process, invitations were extended to many of these groups to actively participate on the HMPC. Specific participants from these groups are detailed in Appendix A. Others

assisted in the process by providing data directly as requested in the Data Worksheets or through data contained on their websites or as maintained by their offices. Further as part of the public outreach process, all groups were invited to attend the public and HMPC meetings and to review and comment on the Plan prior to submittal to CAL OES and FEMA. In addition, as part of the review of the draft plan, key agency stakeholders were contacted and their comments specifically solicited as described further in this Section and included in Appendix A.

Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is also paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Sacramento County uses a variety of comprehensive planning mechanisms, such as general plans and ordinances, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this LHMP Update establishes a credible and comprehensive Plan that ties into and supports other community programs. The development of this LHMP Update incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

- CAL OES plans and data
- California Department of Finance demographic documents
- California Department of Water Resources plans and information
- California Geological Survey Plans
- CAL FIRE Fire Plans and data
- Climate Adaptation Plans
- CWPPs
- Emergency Operations Plans
- Evacuation Plans
- FEMA mitigation planning documents
- Flood Insurance Studies
- General Plans – County and Cities
- National Weather Service documents
- Stormwater Master Plans
- US Department of Agriculture Reports
- US Department of Interior Plans
- US Fish and Wildlife reports
- USGS Reports

Specific source documents are referenced at the beginning of each section of Chapter 4 and in Appendix B. These and other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. Data from these plans and documents were incorporated into the risk assessment and hazard vulnerability sections of the Plan. Where the data from the existing studies and reports is used in this LHMP Update, the source document is referenced throughout this Plan. The data was also used in determining the capability of the community in being able to implement certain mitigation strategies. Appendix B, References, provides a detailed list of references used in the preparation of this LHMP Update.

3.2.2. Phase 2: Assess Risks

Planning Steps 4 and 5: Identify the Hazards and Assess the Risks

Foster Morrison led the HMPC in a research effort to identify, document, and profile all the hazards that have, or could have, an impact the Sacramento County Planning Area. Starting with the 2016 Plan, natural hazards of concern were added, deleted, and modified for this LHMP Update. Data collection worksheets were developed and used in this effort to aid in determining hazards and vulnerabilities and where the risk varies across the Planning Area. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities.

The HMPC also conducted a capability assessment to review and document the Planning Area's current capabilities to mitigate risk from and vulnerability to hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified.

Also addressed in the risk assessment of this 2021 LHMP is an assessment of the County's floodplain management program and participation in the National Flood Insurance Program (NFIP), including a discussion of their continued compliance with NFIP requirements and their CRS program. However, it should be noted that this applies only to eligible NFIP communities. Participating special districts to this LHMP Update do not address their compliance with the NFIP as they are not eligible to participate in this program.

A more detailed description of the risk assessment process, methodologies, and results are included in Chapter 4 Risk Assessment.

3.2.3. Phase 3: Develop the Mitigation Plan

Planning Steps 6 and 7: Set Goals and Review Possible Activities

Foster Morrison facilitated brainstorming and discussion sessions with the HMPC that described the purpose and process of developing planning goals and objectives, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Chapter 5 Mitigation Strategy. Additional documentation on the process the HMPC used to develop the goals and mitigation strategy is in Appendix C.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, a complete first draft of the LHMP Update was developed. This complete draft was provided for HMPC review and comment via a Dropbox web link. Other agencies and the Public HMPC and Steering Committee members were invited to comment on this draft as well. HMPC and agency comments were integrated into the second public review draft, which was advertised and distributed to collect public input and comments. The HMPC integrated comments and issues from the public, as

appropriate, along with additional internal review comments and produced a final draft for CAL OES and FEMA Region IX to review and approve, contingent upon final adoption by governing boards of all participating jurisdictions.

3.2.4. Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the LHMP Update, the Plan was adopted by the governing boards of each participating jurisdiction using the sample resolution contained in Appendix D.

Planning Step 10: Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. Up to this point in the planning process, all of the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as a lead manager and possible funding sources, to help initiate implementation. An overall implementation strategy is described in Chapter 7 Plan Implementation and Maintenance.

Finally, there are numerous organizations within the Sacramento County Planning Area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the implementation and ongoing success of this plan and mitigation in Sutter County and is addressed further in Chapter 7.

Implementation and Maintenance Process: 2013

The 2016 Sacramento County, California Local Hazard Mitigation Plan Update included a process for Plan maintenance and implementation of the mitigation strategy as well as formal updates to the Plan document. The 2016 process called for quarterly and annual reviews with the status of mitigation strategy implementation documented in an annual report. In addition, the 2016 process called for a formal plan update as required by DMA regulations every 5 years. This 2021 LHMP Update, once approved and adopted, will meet the DMA formal 5-year update requirement.

In addition, the 2016 LHMP was relied on and integrated into other planning mechanisms in the County. Table 3-8 lists the planning mechanism the 2016 LHMP Update was integrated into by Sacramento County.

Table 3-8 Incorporation of 2016 Sacramento County LHMP Update into Other Planning Mechanisms

Planning Mechanism 2016 LHMP Was Incorporated or Implemented Through	Details
EOP updates	The EOP used the risk assessment from the 2016 LHMP to inform the hazard descriptions in the EOP update and other LHMP areas were incorporated to the extent they aligned with the EOP.
General Plan Safety Element	The 2016 LHMP was incorporated by reference into the Safety Element of the General Plan
Flood Safety Plans	The 2016 LHMP was considered in the development/update of recent flood plans in Sacramento County.
Delta Small Communities Plans for Sacramento County communities	The 2016 LHMP was considered in the development of recent flood plans in Sacramento County. Specifically, it was considered in the development of the Flood Risk Reduction plans for each small community as well as for a funding mechanisms for the implementation of resulting small community projects

The LHMP implementation and maintenance process as set forth in the 2016 Plan has been updated for this LHMP Update. The revised update implementation and maintenance process for the Sacramento County 2021 LHMP Update is set forth in Section 7 of this Plan document. A strategy for continued public involvement for this update process is also included in Chapter 7.

Chapter 4 Risk Assessment

Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. "It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage."

The risk assessment process identifies and profiles relevant natural hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a community's potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses (FEMA 386-2, 2002), which breaks the assessment down to a four-step process:

1. Identify Hazards;
2. Profile Hazard Events;
3. Inventory Assets; and
4. Estimate Losses.

Data collected through this process has been incorporated into the following sections of this chapter:

- **Section 4.1: Hazard Identification** identifies the natural hazards that threaten the Sacramento County Planning Area and describes why some hazards have been omitted from further consideration.
- **Section 4.2:. Sacramento County Assets at Risk** identifies the property values; populations; critical facilities; and cultural, historical, and natural resources at risk. This information is not hazard specific and covers the entire Sacramento County Planning Area.
- **Section 4.3: Hazard Profiles and Vulnerability Assessment** provides an overview of each hazard, its location and extent, and discusses the risk, vulnerability, and impacts of each natural hazard to the Planning Area. The hazard profile also describes previous occurrences of hazard events and the likelihood of future occurrences. The vulnerability assessment evaluates the Planning Area's and the unincorporated County's exposure to natural hazards; considering assets at risk, populations at risk, critical facilities, future development trends, and, where possible, estimates potential hazard losses.
- **Section 4.4: Capability Assessment** inventories existing local mitigation activities and policies, regulations, plans, and projects that pertain to mitigation and can affect net vulnerability.

This risk assessment covers the entire geographical extent of the Sacramento County Planning Area, including the incorporated communities and other participating jurisdictions. In accordance with FEMA requirements, this risk assessment describes how the hazards and risks vary across the Planning Area and

from jurisdiction to jurisdiction. While these differences are noted in this chapter, they are expanded upon in the annexes of the participating jurisdictions. If no additional data is provided in an annex, it should be assumed that the risk and potential impacts to the affected jurisdiction are similar to those described here for the entire Sacramento County Planning Area.

This LHMP Update involved a comprehensive review and update of each section of the 2016 risk assessment. Information from the 2016 LHMP was used in this Plan Update where valid and applicable. As part of the risk assessment update, new data was used, where available, and new analyses were conducted. Where data from existing studies and reports was used, the source is referenced throughout this risk assessment. Refinements, changes, and new methodologies used in the development of this risk assessment update are summarized in Chapter 2 What's New and are also detailed in this risk assessment portion of this Plan.

4.1 Hazard Identification

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

The Sacramento County Hazard Mitigation Planning Committee (HMPC) conducted a hazard identification assessment to determine the natural hazards that threaten the Planning Area. This section details the methodology and results of this effort.

Data Sources

The following data sources were used for this Hazard Identification portion of this Plan:

- California Office of Emergency Services (CAL OES)
- HMPC input
- National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) Storm Events Database
- 2016 Sacramento County LHMP
- 2018 State of California Hazard Mitigation Plan
- FEMA Disaster Declaration Database

4.1.1. Results and Methodology

Using existing hazards data and input gained through planning meetings, the HMPC agreed upon a list of natural hazards that could affect the Sacramento County Planning Area. Hazards data from Cal OES, FEMA, the NOAA NCDC database, and many other sources were examined to assess the significance of these hazards to the Planning Area.

The following hazards in Table 4-1, listed alphabetically, were identified and investigated for this LHMP Update. As a starting point, the 2018 California State Hazard Mitigation Plan was consulted to evaluate the applicability of hazards of concern to the State, to the Sacramento County Planning Area. Building upon this effort, hazards from the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) were also identified, and comments explain how hazards were updated from the 2016 Plan. Most hazards from

the 2016 plan were profiled in this LHMP Update. Fog was dropped for this 2021 Plan Update. The agricultural hazard and streambank erosion hazard were incorporated into other hazards. Pandemic was added to the Plan Update.

Table 4-1 Sacramento County Hazard Identification and Comparison from 2016 LHMP

2021 Hazards	2016 Hazards	Comment
–	Agricultural Hazards	This hazard was not a standalone hazard for this Plan Update. It is dealt with in multiple relevant hazard sections.
Climate Change	Climate Change	Additional data was added from the finalized Climate Action Plan. Data was added from the Climate Action Plan to this section as well as to other hazard sections.
Dam Failure	Dam Failure	Additional dams were added to the analysis using Cal OES and CA DWR Division of Safety of Dams inundation analysis.
Drought & Water Shortage	Drought & Water Shortage	Additional data was added from the droughts that occurred since the 2016 LHMP.
Earthquake	Earthquake	Additional data was added. New Hazus runs were completed and added to the vulnerability assessment.
Earthquake Liquefaction	Earthquake Liquefaction	Similar analysis was performed.
Floods: 1%/0.2% annual chance	Floods: 1%/0.2% annual chance	New DFIRM data was used to determine values at risk, populations at risk, and critical facilities at risk.
Floods: Localized Stormwater	Floods: Localized Stormwater	Similar analysis was performed.
Landslides, Mudslides, and Debris Flow	Landslides, Mudslides, and Debris Flow	Similar analysis was performed.
Levee Failure	Levee Failure	New DFIRM data was used to determine values at risk, populations at risk, and critical facilities at risk.
Pandemic	–	New Hazard
–	River/Stream/Creek Bank Erosion	This hazard was not a standalone hazard for this Plan Update. It is dealt with in the flood, dam failure, and levee failure hazards.
Severe Weather: Extreme Cold and Freeze	Severe Weather: Extreme Cold and Freeze	Similar analysis was performed.
Severe Weather: Extreme Heat	Severe Weather: Extreme Heat	Similar analysis was performed. PSPS discussion wase added.
–	Severe Weather: Fog	This hazard was dropped due to the limited mitigation efforts available to the County.
Severe Weather: Heavy Rains and Storms	Severe Weather: Heavy Rains and Storms	Similar analysis was performed.
Severe Weather: Wind and Tornado	Severe Weather: Wind and Tornado	Similar analysis was performed. PSPS discussion wase added.
Subsidence	Subsidence	Similar analysis was performed.

2021 Hazards	2016 Hazards	Comment
Volcano	Volcano	Similar analysis and research were performed.
Wildfire	Wildfire	Similar analysis was performed.

Certain hazards were excluded from consideration for this LHMP Update. They are shown in Table 4-2.

Table 4-2 Sacramento County – Excluded Hazards

Hazard Excluded	Why Excluded
Fog	This hazard was dropped due to the limited mitigation efforts available to the County
Tsunami	The County is not on the coast.
Air Pollution	The County did consider this a hazard for this Plan, it is dealt with in other planning mechanisms in the County. Smoke is discussed in the wildfire hazard.
Coastal Flooding, Erosion, and Sea Level Rise	The County is not on the coast.
Energy Shortage and Energy Resilience	The County did consider this a hazard, it is dealt with in other planning mechanisms in the County.
Natural Gas Pipeline Hazards	The County did not consider this a hazard due to the low number of gas pipelines traversing the County.
Oil Spills	The County did not consider this a hazard, as there are few pipelines or oil wells in the County.
Radiological Accidents	There are no areas in the County at risk to this hazard.
Subsidence	There are few areas of the County where subsidence is a risk. In addition, most subsidence is related to drought and water shortage, and will be discussed in that hazard profile and vulnerability assessment.
Cyber Threats	The County did consider this a hazard, but it is dealt with in other planning mechanisms in the County.
Airline Crashes	There have been few past occurrences in the County of airplane crashes. This is not a hazard to be included in the LHMP
Civil Disturbance	The County did consider this a hazard, but it is dealt with in other planning mechanisms in the County.
Well Stimulation and Hydraulic Fracking	This is not occurring in the County.

Table 4-3 was completed by the County and HMPC to identify, profile, and rate the significance of identified hazards. Those hazards identified as a high or medium significance are considered priority hazards for mitigation planning. Those hazards that occur infrequently or have little or no impact on the Planning Area were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency, extent, and resulting damage, including deaths/injuries and property, crop, and economic damage. The ability of a community to reduce losses through implementation of existing and new mitigation measures was also considered as to the significance of a hazard. This assessment was used by the HMPC to prioritize those hazards of

greatest significance to the Sacramento County Planning Area, enabling the County to focus resources where they are most needed.

Table 4-3 Sacramento County Hazard Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Significant	Occasional	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Medium	High
Earthquake	Extensive	Occasional	Catastrophic	Medium	Low
Earthquake Liquefaction	Limited	Occasional	Critical	Medium	Low
Floods: 1%/0.2% annual chance	Significant	Likely	Catastrophic	High	Medium
Floods: Localized Stormwater	Extensive	Highly Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Occasional	Limited	Low	Medium
Levee Failure	Extensive	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Medium	Low
Subsidence	Significant	Highly Likely	Limited	Medium	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Critical	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

4.1.2. Disaster Declaration History

One method the HMPC used to identify hazards was the researching of past events that triggered federal and/or state emergency or disaster declarations in the Sacramento County Planning Area. Federal and/or state disaster declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), and/or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and without the long-term federal recovery programs of major disaster declarations. The quantity and types of damage are the determining factors.

Based on the disaster declaration history provided in Table 4-4, Sacramento County is among the many counties in California susceptible to disaster. Details on federal and state disaster declarations were obtained by FEMA and Cal OES and compiled in chronological order in Table 4-4. A review of state declared disasters indicates that Sacramento County received 28 state declarations between 1950 and 2020. Of the 28 state declarations: 19 were associated with severe winter storms, heavy rains, or flooding; 3 were for drought; 2 were from levee failure; 1 was from economic disasters, 1 was from earthquake, and 1 was from pandemic; and 1 was from fire. A review of federal disasters shows 21 federal disaster declarations. Of these 21 federal declarations: 14 were associated with severe winter storms, heavy rains, or flooding, 2 were from earthquake, 2 from levee break, 1 was from drought, 1 was from pandemic, and 1 was for hurricane (a nationwide declaration for Katrina evacuations). A summary of these events by disaster type is shown in Table 4-5.

Table 4-4 Sacramento County State and Federal Disaster Declarations, 1950-2020

Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
2021	Drought	Drought	Drought	–	4/10/2021	–
2020	Covid-19	Pandemic	Pandemic	DR-4482	3/4/2020	1/20/2020
2017	California Severe Winter Storms, Flooding, Mudslides	Flood	Storms	DR-4308	3/7/2017	4/1/2017
2017	California Severe Winter Storms, Flooding, And Mudslides	Flood	Storms	DR-4305	2/10/2017	3/16/2017

Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
2017	California Severe Winter Storms, Flooding, Mudslides	Flood	Storms	DR-4301	–	2/14/2017
2014	Napa Earthquake	Natural	Earthquake	EM-4193	–	9/17/2014
2014	California Drought	Drought	Drought	GP 2014-13	1/17/2014	–
2008	Central Valley Drought	Drought	Drought	GP 2008-03	6/12/2008	–
2008	2008 January Storms	Flood	Storms	GP 2008-01	1/5/2008	–
2005/2006	2005/06 Winter Storms	Flood	Storms	DR-1628	–	2/3/2006
2005	Hurricane Katrina Evacuations	Economic	Hurricane	EM-3248 2005	–	9/13/2005
2001	Energy Emergency	Economic	Greed	GP 2001	1/1/2001	–
1998	1998 El Nino Floods	Flood	Storms	DR-1203	Proclaimed	2/19/1998
1997	1997 January Floods	Flood	Storms	DR-1155	1/2/97-1/31/97	1/4/1997
1996	Torrential Winds and Rain	Flood	Storms	GP 96-01	1/21/1996	–
1995	1995 Late Winter Storms	Flood	Storms	DR-1046	Proclaimed	1/10/1995
1995	1995 Severe Winter Storms	Flood	Storms	DR-1044	1/6/95-3/14/95	1/13/1995
1989	Loma Prieta Earthquake	Earthquake	Earthquake	DR-845	10/18/89-10/30/89	10/18/1989
1986	1986 Storms	Flood	Storms	DR-758	2/18-86-3/12/86	2/18/1986
1983	Winter Storms	Flood	Flood	DR-677	12/8/82-3/21/83	2/9/1983
1982	High Tides and Rains	Flood	Storms	-	12/8/1982	–
1982	Heavy Rains and Flooding	Flood	Storms	DC 82-03	4/1/1982	–
1980	Delta Levee Break	Flood	Levee break	EM-3078	1/23/1980	1/23/1980
1977	1977 Drought	Drought	Drought	EM-3023	–	1/20/1977

Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
1973	Southern Pacific Railroad Fires and Explosions (Roseville)	Fire	Explosion	–	4/30/1973	–
1972	Andrus Island Levee Break	Flood	Levee break	DR-342	6/21/1972	6/27/1972
1969	1969 Storms	Flood	Storms	DR-253	1/23/69-3/12/69	1/26/1969
1964	1964 Late Winter Storms	Flood	Storms	DR-183	–	12/24/1964
1963	1963 Floods	Flood	Storms	–	2/14/1964	–
1958	1958 April Storms and Floods	Flood	Storms	DR-52	4/5/1958	4/4/1958
1958	1958 February Storms and Floods	Flood	Storms	CDO 58-03	2/26/1958	–
1955	1955 Floods	Flood	Flood	DR-47	12/22/1955	12/23/1955
1950	1950 Floods	Flood	Flood	OCD 50-01	11/21/1950	–

Source: Cal OES, FEMA

Table 4-5 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	3	2008, 2014, 2021	1	1977
Economic	1	2001	0	–
Earthquake	1	1989	2	1989, 2014
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)
Hurricane	0	–	1	2005
Levee Break	2	1972, 1980	2	1972, 1980
Pandemic	1	2020	1	2020
Fire	1	1973	0	–
Totals	**28**	–	**21**	**–**

Source: Cal OES, FEMA

Disasters since 2016 Plan

As detailed above, there have been four federal disaster declarations and four state disaster declarations since the 2016 plan:

- 2017 Floods (three federal and two state)
- 2020 Pandemic (state and federal)
- 2021 Drought (state only)

4.2 Sacramento County Assets at Risk

As a starting point for analyzing the Sacramento County Planning Area's vulnerability to identified hazards, the HMPC used a variety of data to establish a baseline against which all disaster impacts could be compared. If a catastrophic disaster were to occur, this section describes significant assets at risk in the Planning Area. This baseline assessment included:

- Values at risk;
- Critical facility inventory;
- Cultural, historical, and natural resources; and
- Growth and development trends.

Data Sources

Data used to support this assessment included the sources listed below. Where data and information from these studies, plans, reports, and other data sources were used, the source is referenced as appropriate throughout this vulnerability assessment.

- CalAtlas
- California Department of Finance
- California Department of Fish and Game
- California Department of Parks and Recreation Office of Historic Preservation
- California Natural Diversity Database
- Hazus MH 4.2
- State of California Department of Conservation
- US Census Bureau

4.2.1. Values at Risk

Parcel Inventory and Assessed Values

This analysis captures the values associated with assessed values located within Sacramento County. The 2020 Sacramento County Parcel/Assessor's data, obtained from Sacramento County, was used for as the basis of this analysis. This data provided by Sacramento County represents best available data.

Understanding the total assessed value of Sacramento County is a starting point to understanding the overall value of identified values at risk in the County. When the total assessed values are combined with potential

values associated with other community assets such as public and private critical infrastructure, historic and cultural resources, and natural resources, the big picture emerges as to what is potentially at risk and vulnerable to the damaging effects of natural hazards within the County.

Methodology

Sacramento County's 2020 Assessor Data and the County's GIS parcel data were used as the basis for the inventory of assessed values for both improved and unimproved parcels within the County. This data provides the land, improved, and property values assessed for each parcel, along with key information such as property use. Other GIS data, such as jurisdictional boundaries, roads, streams, and area features, was also obtained from Sacramento County and CalAtlas to support countywide mapping and analysis of values at risk. The Sacramento County GIS parcel data contained 480,365 parcels for the County and the jurisdictions in the County.

Data Limitations & Notations

Although based on best available data, the resulting information should only be used as an initial guide to overall values in the County. In the event of a disaster, structures and other infrastructure improvements are at the greatest risk of damage. Depending on the type of hazard and resulting damages, the land itself may not suffer a significant loss. For that reason, the values of structures and other infrastructure improvements are of greatest concern. As such, it is critical to note a specific limitation to the assessed values data within the County, created by Proposition 13. Instead of adjusting property values annually, no adjustments are made until a property transfer occurs. As a result, overall property value information is most likely low and may not reflect current market or true potential loss values for properties within the County.

Another limitation to this data is found in the Williamson Act, also known as the California Land Conservation Act of 1965, that enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. When the County enters into a contract with the landowners under the Williamson Act, the landowner agrees to limit the use of the land to agriculture and compatible uses for a period of at least ten years and the County agrees to tax the land at a rate based on the agricultural production of the land rather than its real estate market value. This further affects the County's overall values for assessed taxable lands.

The 2020 GIS parcel and Assessor data was obtained to perform the spatial analysis. GIS was used to convert the parcel polygons into centroids representing each record in the assessor database. For the purposes of this analysis, the centroids which were not coincident in locations were re-positioned to overlay on the corresponding polygons so that each assessor record (with a unique assessor parcel number) was spatially positioned on the corresponding parcel. In addition, multiple parcels polygons in the GIS data were constructed as multi-part features, of which only one centroid was representative of each parcel polygon. The position of the centroids may result in less accurate hazard analysis overlay results.

Property Use Categories

Sacramento County's GIS data contained land use designations which provide detailed descriptive information about how each property is generally used, such as agricultural, commercial, government, industrial, institutional, recreational, residential, and right of way. The land use codes from County assessor data were refined and categorized into ten property use categories and linked back to the Sacramento County Assessor data. The final property use categories for Sacramento County are:

- Agricultural
- Care/Health
- Church/Welfare
- Industrial
- Miscellaneous
- Office
- Public/Utilities
- Recreational
- Residential
- Retail / Commercial
- Unknown
- Vacant

Once the land use descriptions were grouped into categories, the number of total and improved parcels, as well as land, improved, and personal property values were inventoried for the County by property use.

Estimated Content Replacement Values

Sacramento County's assigned property use categories were used to develop estimated content replacement values (CRVs) that are potentially at loss from hazards. FEMA's standard CRV factors were utilized to develop more accurate loss estimates for all mapped hazard analyses. FEMA's CRV factors estimate value as a percent of improved structure value by property use. Table 4-6 shows the breakdown of the different property uses in the County and their estimated CRV factors.

Table 4-6 Sacramento County – Content Replacement Factors by Property Use

Sacramento County Property Use Categories	Hazus Property Use Categories	Hazus Content Replacement Values
Agricultural	Agricultural	100%
Care / Health	Commercial	100%
Church / Welfare	Agriculture	100%
Industrial	Industrial	150%
Miscellaneous	Commercial	100%
Office	Commercial	100%
Public / Utilities	Commercial	100%
Recreational	Commercial	100%
Residential	Residential	50%

Sacramento County Property Use Categories	Hazus Property Use Categories	Hazus Content Replacement Values
Retail / Commercial	Commercial	100%
Unknown	–	0%
Vacant	–	0%

Source: Hazus

Sacramento County Values at Risk Results

Values associated with land, and improved structures were identified and summed in order to determine assessed values at risk in the Sacramento County Planning Area. Together, the land and improved structure values make up the majority of assessed values associated with each identified parcel or asset. Improved parcel counts were based on the assumption that a parcel was improved if a structure value was present. Content replacement values were then added to the assessed values, as described below, to provide an estimate of values at risk in the Planning Area.

Table 4-7 shows the values or exposure for the Sacramento County Planning Area (using CRV multipliers from Table 4-6). This table is important as potential losses to the County include structure contents. In addition, loss estimates contained in the hazard vulnerability sections of this Chapter will use calculations based on these values, including content replacement values. The values for unincorporated Sacramento County are broken out by property use and are provided in Table 4-8. Value by property use for each jurisdiction are shown in their respective annexes to this LHMP Update.

Table 4-7 Sacramento County Planning Area – Values at Risk by Jurisdiction

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Citrus Heights	26,777	25,821	$2,277,237,402	$5,468,554,811	$3,145,021,676	$10,890,813,812
City of Sacramento	155,590	142,896	$16,332,022,285	$43,393,435,771	$29,079,630,819	$88,805,089,586
Elk Grove	55,584	51,809	$6,262,511,293	$16,354,975,148	$9,440,010,477	$32,057,496,894
Folsom	27,058	23,614	$4,438,593,844	$10,586,357,670	$6,529,539,035	$21,554,490,501
Galt	7,986	7,448	$644,457,481	$1,729,332,844	$1,012,152,850	$3,385,943,179
Isleton	536	338	$22,717,211	$41,268,279	$26,053,556	$90,039,044
Rancho Cordova	23,785	21,532	$2,696,956,614	$6,828,148,604	$4,998,621,168	$14,523,726,265
Unincorporated Sacramento County	183,049	169,427	$19,422,480,231	$43,355,681,994	$26,570,892,145	$89,349,054,509
Grand Total	**480,365**	**442,885**	**$52,096,976,361**	**$127,757,755,121**	**$80,801,921,726**	**$260,656,653,790**

Source: Sacramento County 2020 Parcel/Assessor's Data

Table 4-8 Unincorporated Sacramento County – Values at Risk by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	2,613	1,449	$801,660,657	$658,862,428	$658,862,428	$2,119,385,513
Care / Health	216	198	$131,900,158	$614,090,007	$614,090,007	$1,360,080,172
Church / Welfare	459	397	$145,947,373	$661,326,743	$661,326,743	$1,468,600,859
Industrial	1,592	1,235	$719,553,030	$1,947,938,284	$2,921,907,432	$5,589,398,729
Miscellaneous	3,718	24	$12,701,744	$693,587	$693,587	$14,088,918
Office	1,379	1,239	$506,954,191	$1,473,664,075	$1,473,664,075	$3,454,282,341
Public / Utilities	662	1	$1,229,203	$1,483,565	$1,483,565	$4,196,333
Recreational	222	132	$65,013,903	$114,175,555	$114,175,555	$293,365,013
Residential	163,880	162,310	$14,776,101,762	$35,445,531,283	$17,722,765,349	$67,944,398,550
Retail / Commercial	2,248	2,097	$1,286,423,724	$2,401,923,404	$2,401,923,404	$6,090,270,532
Unknown	9	7	$85,000	$517,602	$0	$602,602
Vacant	6,051	338	$974,909,486	$35,475,461	**$0**	$1,010,384,947
Unincorporated Sacramento County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**

Source: Sacramento County 2020 Parcel/Assessor's Data

4.2.2. Critical Facility Inventory

Sacramento County continues to utilize their critical facility definition initially developed for their 2010 LHMP. However, this critical facility dataset has been recently updated and may not in all cases align with the definition; it is included here as the critical facility dataset continues to be updated and refined for the Sacramento County Planning Area with the intent to include all facilities that meet this definition.

For purposes of this plan, a critical facility is defined as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

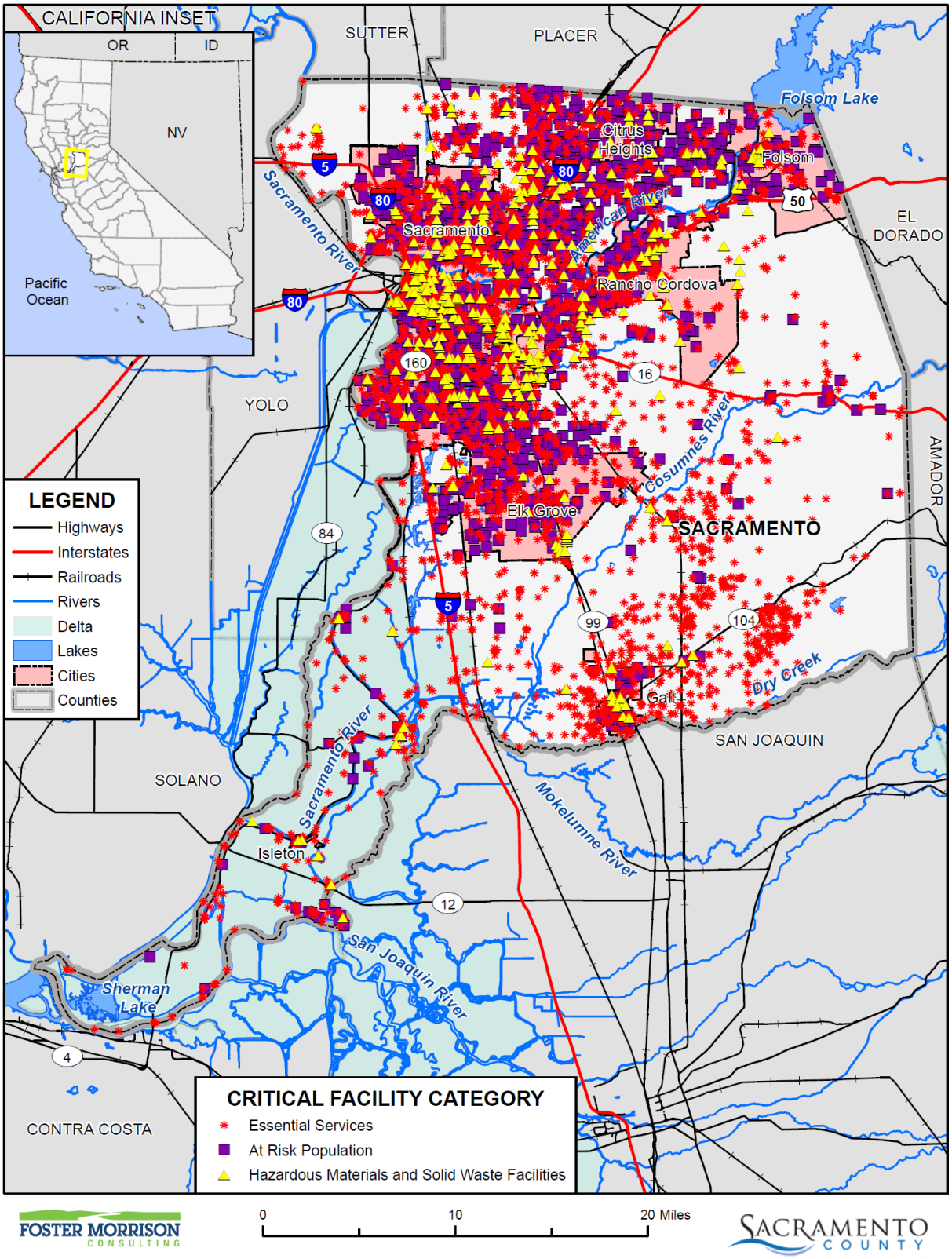
A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities,

- Essential Services Facilities include, without limitation, public safety, emergency response, emergency medical, designated emergency shelters, communications, public utility plant facilities and equipment, and government operations facilities.

- At Risk Population Facilities include, without limitation, pre-schools, public and private primary and secondary schools, before and after school care centers with 12 or more students, daycare centers with 12 or more children, group homes, and assisted living residential or congregate care facilities with 12 or more residents.
- Hazardous Materials and Solid Waste Facilities include, without limitation, any facility that could, if adversely impacted, release of hazardous materials or waste in sufficient amounts during a hazard event that would create harm to people, the environment and property.

A summary of critical facilities in the Sacramento County Planning Area can be found in Figure 4-1 and Table 4-9. Table 4-10 details critical facilities by category. Additional details of individual critical facilities can be found in Appendix F of this Plan Update.

Figure 4-1 Sacramento County Planning Area – Critical Facilities



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 4-9 Sacramento County Planning Area – Critical Facility Summary by Jurisdiction

Jurisdiction/Critical Facility Category	Facility Count
Citrus Heights	
Essential Services Facilities	76
At Risk Population Facilities	108
Hazardous Materials and Solid Waste Facilities	12
Citrus Heights Total	**196**
City of Sacramento	
Essential Services Facilities	1,284
At Risk Population Facilities	843
Hazardous Materials and Solid Waste Facilities	250
City of Sacramento Total	**2,377**
Elk Grove	
Essential Services Facilities	318
At Risk Population Facilities	171
Hazardous Materials and Solid Waste Facilities	18
Elk Grove Total	**507**
Folsom	
Essential Services Facilities	152
At Risk Population Facilities	89
Hazardous Materials and Solid Waste Facilities	10
Folsom Total	**251**
Galt	
Essential Services Facilities	111
At Risk Population Facilities	38
Hazardous Materials and Solid Waste Facilities	11
Galt Total	**160**
Isleton	
Essential Services Facilities	9
At Risk Population Facilities	4
Hazardous Materials and Solid Waste Facilities	3
Isleton Total	**16**
Rancho Cordova	
Essential Services Facilities	225
At Risk Population Facilities	153
Hazardous Materials and Solid Waste Facilities	20
Rancho Cordova Total	**398**

Jurisdiction/Critical Facility Category	Facility Count
Unincorporated Sacramento County	
Essential Services Facilities	2,552
At Risk Population Facilities	952
Hazardous Materials and Solid Waste Facilities	176
Unincorporated Sacramento County Total	**3,680**
Grand Total	**7,585**

Source: Sacramento County GIS

Table 4-10 Sacramento County Planning Area – Critical Facilities by Jurisdiction and Facility Type

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
Citrus Heights		
Essential Services Facilities	Emergency Evacuation Center	8
	EMS Stations	4
	FDIC Insured Banks	13
	Fire Station	5
	Law Enforcement	2
	Microwave Service Towers	17
	Water Well	27
	Total	**76**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Day Care Center	27
	Mobile Home Parks	10
	Places of Worship	37
	School	31
	Total	**108**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	12
	Total	**12**
Citrus Heights Total		**196**
City of Sacramento		
Essential Services Facilities	Airport	1
	Bridge	26
	Cellular Tower	2
	Emergency Evacuation Center	91
	EMS Stations	26

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
	FDIC Insured Banks	82
	Fire Station	22
	Floodgate	43
	Hospital or Urgent Care	16
	Law Enforcement	27
	Microwave Service Towers	501
	Port Facilities	6
	Power Plants	7
	Public Transit Stations	41
	Pump Station	200
	Sewage Treatment Plant	9
	State Government Buildings	33
	Water Well	151
	Total	**1,284**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	11
	Community Center	2
	Day Care Center	140
	Major Sports Venues	3
	Mobile Home Parks	22
	Places of Worship	427
	School	238
	Total	**843**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	2
	EPA ER TRI Facility	39
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	174
	Solid Waste Facility	23
	Tank Farm	4
	Waste Transfer Station	5
	Total	250
City of Sacramento Total		**2,377**
Elk Grove		
Essential Services Facilities	Cellular Tower	2
	Emergency Evacuation Center	8
	EMS Stations	7
	FDIC Insured Banks	26

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
	Fire Station	6
	Hospital or Urgent Care	1
	Law Enforcement	2
	Microwave Service Towers	107
	Sewage Treatment Plant	1
	Water Well	158
	Total	**318**
At Risk Population Facilities	Day Care Center	36
	Mobile Home Parks	1
	Places of Worship	89
	School	45
	Total	**171**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	6
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	4
	Solid Waste Facility	4
	Waste Transfer Station	1
	Total	**18**
Elk Grove Total		**507**
Folsom		
Essential Services Facilities	Bridge	1
	Cellular Tower	7
	Emergency Evacuation Center	4
	FDIC Insured Banks	19
	Fire Station	5
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	86
	Power Plants	5
	Public Transit Stations	3
	Water Well	14
	Total	**152**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	1
	Community Center	1
	Day Care Center	13
	Mobile Home Parks	6

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
	Places of Worship	40
	School	28
	Total	**89**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	8
	Total	**10**
Folsom Total		**251**
Galt		
Essential Services Facilities	Cellular Tower	2
	Emergency Evacuation Center	5
	EMS Stations	2
	FDIC Insured Banks	6
	Fire Station	3
	Law Enforcement	2
	Microwave Service Towers	55
	Sewage Treatment Plant	1
	Water Well	35
	Total	**111**
At Risk Population Facilities	Day Care Center	6
	Mobile Home Parks	4
	Places of Worship	14
	School	14
	Total	**38**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	3
	Leaky Underground Storage Tank	7
	Waste Transfer Station	1
	Total	**11**
Galt Total		**160**
Isleton		
Essential Services Facilities	Emergency Evacuation Center	1
	EMS Stations	1
	Fire Station	2
	Law Enforcement	1
	Microwave Service Towers	2
	Water Well	2
	Total	**9**

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
At Risk Population Facilities	Day Care Center	1
	Mobile Home Parks	1
	School	2
	Total	**4**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	3
	Total	**3**
Isleton Total		**16**
Rancho Cordova		
Essential Services Facilities	Bridge	16
	Cellular Tower	14
	City Facility	5
	Drainage Pump Station	6
	Emergency Evacuation Center	6
	EMS Stations	6
	FDIC Insured Banks	11
	Fire Station	4
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	77
	Power Plants	1
	Public Transit Stations	4
	State Government Buildings	1
	Water Well	66
	Total	**225**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Community Center	5
	Day Care Center	23
	Mobile Home Parks	8
	Places of Worship	77
	School	34
	Senior Living or Other Living	3
	Total	**153**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	12
	Solid Waste Facility	2

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
	Tank Farm	2
	Waste Transfer Station	1
	Total	**20**
Rancho Cordova Total		**398**
Unincorporated Sacramento County		
Essential Services Facilities	Airport	3
	Bridge	51
	Cellular Tower	23
	Emergency Evacuation Center	54
	EMS Stations	49
	FDIC Insured Banks	58
	Fire Station	57
	Hospital or Urgent Care	4
	Law Enforcement	26
	Microwave Service Towers	1,018
	Port Facilities	46
	Power Plants	40
	Public Transit Stations	7
	Pump Station	7
	Sandbag Site	3
	Sewage Treatment Plant	4
	State Government Buildings	3
	Water Well	1,099
	Total	**2,552**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	12
	Community Center	4
	Day Care Center	140
	Mobile Home Parks	65
	Places of Worship	414
	School	317
	Total	**952**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	2
	EPA ER TRI Facility	23
	EPA ER TSCA Facility	1
	Leaky Underground Storage Tank	127
	Solid Waste Facility	22

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
	Waste Transfer Station	1
	Total	**176**
Unincorporated Sacramento County Total		**3,680**
Grand Total		**7,585**

Source: Sacramento County GIS

4.2.3. Cultural, Historical, and Natural Resources

Assessing Sacramento County's vulnerability to disasters also involves inventorying the cultural, historical, and natural resource assets of the area. This information is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- In the event of a disaster, an accurate inventory of cultural, historical and natural resources allows for more prudent care in the disaster's immediate aftermath when the potential for additional impacts is higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, for example, wetlands and riparian and sensitive habitats which help absorb and attenuate floodwaters and thus support overall mitigation objectives.

Cultural and Historical Resources

Sacramento County has a large stock of historically significant homes, public buildings, and landmarks. To inventory these resources, information was collected from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. The OHP is responsible for the administration of federally and state mandated historic preservation programs to further the identification, evaluation, registration, and protection of California's irreplaceable archaeological and historical resources. OHP administers the National Register of Historic Places, the California Register of Historical Resources, California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements.

- The **National Register of Historic Places** is the nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.
- The **California Register of Historical Resources** program encourages public recognition and protection of resources of architectural, historical, archeological, and cultural significance and identifies historical resources for state and local planning purposes; determines eligibility for state historic

preservation grant funding; and affords certain protections under the California Environmental Quality Act. The Register is the authoritative guide to the state's significant historical and archeological resources.

- **California Historical Landmarks** are sites, buildings, features, or events that are of statewide significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. Landmarks #770 and above are automatically listed in the California Register of Historical Resources.
- **California Points of Historical Interest** are sites, buildings, features, or events that are of local (city or county) significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. Points designated after December 1997 and recommended by the State Historical Resources Commission are also listed in the California Register.

Historical resources included in the programs above are identified in Table 4-11.

Table 4-11 Sacramento County Planning Area – Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
A. W. Clifton House, Compton Mansion (C17)			X		2/1/2002	Sacramento
Adams And Company Building (607)		X			5/22/1957	Sacramento
Alkali Flat Central Historic District (N1294)	X				7/26/1984	Sacramento
Alkali Flat North Historic District (N1279)	X				4/19/1984	Sacramento
Alkali Flat West Historic District (N1295)	X				7/26/1984	Sacramento
Alta Mesa Farm Bureau Hall (N1476)	X				1/7/1987	Wilton
American River Grange Hall #172 (P823)	X			X	5/15/1996	Rancho Cordova
Archway, The (P614)				X	5/18/1983	Rio Linda
B. F. Hastings Building (606)		X			5/22/1957	Sacramento
Blue Anchor Building (N1171)	X				2/3/1983	Sacramento
Brewster Building (N2099)	X				8/16/2000	Galt
Brewster House (N638)	X				6/23/1978	Galt
Brighton School (N952)	X				4/3/1981	Sacramento
Brown, John Stanford, House (N2252)	X				7/28/2004	Walnut Grove
Business & Professional Building, Consumer Affairs Building (C8)			X		2/10/2000	Sacramento
California Almond Growers Exchange Processing Facility (967)		X			10/1/1985	Sacramento

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
California Governor's Mansion (N60)	X				11/10/1970	Sacramento
California State Capitol (N222)	X				4/3/1973	Sacramento
California's Capitol Complex (872)	X	X			5/6/1974	Sacramento
California's First Passenger Railroad (526)		X			3/7/1955	Sacramento
Calpak Plant No. 11 (N1285)	X				5/17/1984	Sacramento
Camp Union, Sacramentoville (666)		X			11/5/1958	Sacramento
Capitol Extension District (N1288)	X				5/24/1984	Sacramento
Chevra Kaddisha (Home of Peace Cemetery) (654)		X			7/28/1958	Sacramento
Chinese Diggings, Natoma Station Ground Sluice (P712)				X	11/22/1988	Folsom
Chung Wah Cemetery (N1918)	X				8/21/1995	Folsom
Cohn House (N1001)	X				1/21/1982	Folsom
Coloma Road at Nimbus Dam (746)		X			7/5/1960	Folsom
Coloma Road at Sacramento's Fort (745)		X			7/5/1960	Sacramento
Coolot Company Building (N671)	X				9/20/1978	Sacramento
Cranston--Geary House (N2010)	X				1/23/1998	Sacramento
Crocker, E. B., Art Gallery (N86)	X	X			5/6/1971	Sacramento
Curran Farmhouse (P666)				X	12/17/1985	Sacramento
D. O. Mills Bank Building (609)		X			5/22/1957	Sacramento
Delta Meadows Site (N130)	X				11/5/1971	Locke
Dunlap's Dining Room (N1764)	X				4/2/1992	Sacramento
Eagle Theater (595)		X			5/22/1957	Sacramento
Eastern Star Hall (P754)	X			X	8/8/1991	Sacramento
Ebner's Hotel (602)		X			5/22/1957	Sacramento
Ehrhardt, William, House (N2209)	X				7/10/2003	Elk Grove
Elk Grove Grammar School / Elk Grove Unified School Distr (P717)				X	6/12/1989	Elk Grove
Elk Grove Historic District (N1553)	X				3/1/1988	Elk Grove
Fifteen Mile House-Overland Pony Express Route in California (698)		X			9/11/1959	Rancho Cordova
Fire Station No. 6 (N1686)	X				4/25/1991	Sacramento
Firehouse No. 3 (N1743)	X				10/29/1991	Sacramento
First Transcontinental Railroad (780)		X			11/20/1962	Sacramento

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
First Transcontinental Railroad-Western Base of The Sierra Nevada (780)		X			11/20/1962	Sacramento
Five Mile House-Overland Pony Express Route in California (697)		X			9/11/1959	Sacramento
Folsom Depot (N1035)	X				2/19/1982	Folsom
Folsom Powerhouse (N258)	X				10/2/1973	Folsom
Folsom-Overland Pony Express Route in California (702)		X			9/11/1959	Folsom
Galarneaux, Mary Haley, House (N2121)	X				2/12/2001	Sacramento
George Hack House (P800)				X	8/5/1994	Sacramento
Goethe House (N1036)	X				2/19/1982	Sacramento
Governor's Mansion (823)		X			6/7/1968	Sacramento
Grave of Alexander Hamilton Willard (657)		X			9/26/1958	Franklin
Grave of Elitha Cumi Donner Wilder (719)		X			12/2/1959	Elk Grove
Greene, John T., House (N1092)	X				4/15/1982	Sacramento
Headquarters of The Big Four (600)		X			5/22/1957	Sacramento
Heilbron House (N462)	X				12/12/1976	Sacramento
Hotel Regis (N1147)	X				10/29/1982	Sacramento
Hotel Senator (N782)	X				5/30/1979	Sacramento
Howe, Edward P., Jr., House (N1037)	X				2/19/1982	Sacramento
Hubbard-Upson House (N543)	X				12/2/1977	Sacramento
I Street Bridge (N1094)	X				4/22/1982	Sacramento
Imperial Theatre (N1148)	X				10/29/1982	Walnut Grove
Indian Stone Corral (N349)	X				4/16/1975	Orangevale
Isleton Chinese And Japanese Commercial Districts (N1674)	X				3/14/1991	Isleton
J Street Wreck (N1692)	X				5/16/1991	Sacramento
Jean Harvie School, Walnut Grove Community Center (P665)				X	8/20/1985	Walnut Grove
Joe Mound (N121)	X				10/14/1971	Sacramento
Johnson, J. Neely, House (N438)	X				9/13/1976	Sacramento
Joseph Hampton Kerr Homesite (P126)				X	6/6/1969	Sacramento
Judah, Theodore, School (N1985)	X				7/25/1997	Sacramento
Kuchler Row (N1121)	X				6/25/1982	Sacramento

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Lady Adams Building (603)		X			5/22/1957	Sacramento
Lais, Charles, House (N1350)	X				2/28/1985	Sacramento
Libby Mcneil And Libby Fruit and Vegetable Cannery (N1050)	X				3/2/1982	Sacramento
Liberty Schoolhouse (P579)				X	12/21/1981	Galt
Locke Historic District (N87)	X				5/6/1971	Locke
McClatchy, C.K., Senior High School (N2148)	X				11/2/2001	Sacramento
Merchants National Bank of Sacramento (N1936)	X				2/16/1996	Sacramento
Merrium Apartments (N1654)	X				9/13/1990	Sacramento
Mesick House (N1002)	X				1/21/1982	Sacramento
Michigan (468)		X			8/30/1950	Sacramento
Motor Vehicle Building, Department of Food & Agriculture (C4)			X		11/5/1999	Sacramento
Murphy's Ranch (680)		X			5/11/1959	Elk Grove
Negro Bar (P798)				X	5/31/1994	Folsom
New Helvetia Cemetery (592)		X			5/22/1957	Sacramento
Nisenan Village Site (N562)	X				3/21/1978	Carmichael
Nisipowinan Village Site (900)	X	X			6/16/1976	Sacramento
Old Elk Grove Hotel Site (P532)				X	6/29/1979	Sacramento
Old Fair Oaks Bridge (N2342)	X				9/25/2006	Fair Oaks
Old Folsom Powerhouse (633)		X			3/3/1958	Folsom
Old Folsom Powerhouse-Sacramento Station A (633)		X			3/3/1958	Sacramento
Old Sacramento (812)	X	X			12/30/1965	Sacramento
Old Tavern (N1242)	X				9/15/1983	Sacramento
Original Sacramento Bee Building (611)		X			5/22/1957	Sacramento
Overton Building (610)		X			5/22/1957	Sacramento
Pioneer Telegraph Station (366)		X			10/9/1939	Sacramento
Pony Express Terminal (N66000220)	X				10/15/1966	Sacramento
Prairie City (464)		X			8/30/1950	Prairie City
Public Works Office Building, Caltrans Building (C5)			X		11/5/1999	Sacramento
Rae House (P743)				X	5/8/1991	Galt
River Mansion (P149)				X	11/3/1969	Sacramento

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Rosebud Ranch (N846)	X				12/31/1979	Hood
Ruhstaller Building (N1003)	X				1/21/1982	Sacramento
Runyon House (N2109)	X				10/27/2000	Courtland
Rusch Home (P737)				X	2/11/1991	Citrus Heights
Sacramento Air Depot Historic District (N1747)	X				1/21/1992	North Highlands
Sacramento Bank Building (N1004)	X				1/21/1982	Sacramento
Sacramento City Cemetery (566)		X			2/25/1957	Sacramento
Sacramento City Library (N1784)	X				7/30/1992	Sacramento
Sacramento Hall of Justice (N2067)	X				9/24/1999	Sacramento
Sacramento Junior College Annex and Extensions (N1874)	X				8/22/1994	Sacramento
Sacramento Masonic Temple (N2131)	X				5/17/2001	Sacramento
Sacramento Memorial Auditorium (N566)	X				3/29/1978	Sacramento
Site of China Slough (594)		X			5/22/1957	Sacramento
Site of Congregational Church (613)		X			5/22/1957	Sacramento
Site of First and Second State Capitols at Sacramento (869)		X			1/11/1974	Sacramento
Site of First County Free Library Branch in California (817)		X			6/1/1967	Elk Grove
Site of Grist Mill Built by Jared Dixon Sheldon (439)		X			6/2/1949	Slough house
Site of Home of Newton Booth (596)		X			5/22/1957	Sacramento
Site of Orleans Hotel (608)		X			5/22/1957	Sacramento
Site of Sacramento Union (605)		X			5/22/1957	Sacramento
Site of Sam Brannan House (604)		X			5/22/1957	Sacramento
Site of Stage and Railroad (First) (598)		X			5/22/1957	Sacramento
Site of The First African American Episcopal Church Established on The Pacific Coast (1013)		X			5/5/1994	Sacramento
Site of The First Jewish Synagogue Owned by A Congregation on The Pacific Coast (654)		X			7/28/1958	Sacramento
Site of Pioneer Mutual Volunteer Firehouse (612)		X			5/22/1957	Sacramento
Slocum House (N744)	X				1/31/1979	Fair Oaks
Sloughhouse (575)		X			5/17/1957	Sloughhouse

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Southern Pacific Railroad Company's Sacramento Depot (N353)	X				4/21/1975	Sacramento
Southern Pacific Railroad Superintendent House (N2411)	X				6/13/2008	Folsom
St. Elizabeth's Church (P611)				X	3/2/1983	Sacramento
Stanford-Lathrop House (614)		X			5/22/1957	Sacramento
Sacramento's Fort (525)		X			11/1/1954	Sacramento
Sacramento's Landing (591)		X			5/22/1957	Sacramento
Sacramentoville (593)		X			5/22/1957	Sacramento
Temporary Detention Camps for Japanese Americans-Sacramento Assembly Center (934)		X			5/13/1980	Sacramento
Terminal of California's First Passenger Railroad (558)		X			12/31/1956	Folsom
The Villa (Serve Our Seniors, Incorporated) (P764)				X	2/14/1992	Orangevale
Tower Bridge (N1116)	X				6/24/1982	Sacramento
Travelers' Hotel (N680)	X				10/19/1978	Sacramento
U.S. Post Office, Courthouse and Federal Building (N855)	X				1/25/1980	Sacramento
Utah Condensed Milk Company Plant (N650)	X				8/3/1978	Galt
Van Voorhies House (N535)	X				11/17/1977	Sacramento
Wagner, Anton, Duplex (N923)	X				11/10/1980	Sacramento
Walnut Grove Chinese-American Historic District (N1630)	X				3/22/1990	Walnut Grove
Walnut Grove Commercial/Residential Historic District (N1634)	X				4/12/1990	Walnut Grove
Walnut Grove Gakuen Hall (N882)	X				6/17/1980	Walnut Grove
Walnut Grove Japanese-American Historic District (N1631)	X				3/22/1990	Walnut Grove
Western Hotel (601)		X			5/22/1957	Sacramento
Westminster Presbyterian Church (N2203)	X				5/22/2003	Sacramento
Wetzlar, Julius, House (N1183)	X				3/31/1983	Sacramento
What Cheer House (597)		X			5/22/1957	Sacramento
Whitter Ranch (Originally Saylor Ranch), Witter Ranch (P744)				X	5/8/1991	Sacramento
Winters House (N2046)	X				1/25/1999	Sacramento

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Witter, Edwin, Ranch (N1675)	X				3/14/1991	Sacramento
Woodlake Site (N88)	X				5/6/1971	Sacramento
Yeong Wo Cemetery (P810)				X	5/30/1995	Folsom

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Natural Resources

Natural resources are important to include in cost/benefit analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as reducing the force of and storing floodwaters.

Sacramento County is home to a variety of important vegetation and wildlife. Natural habitats in the County include vernal pools, wetlands, special status species habitats, riparian, oak woodland and grassland prairies. Wetland and riparian areas in the County include historic backwater basins along the Sacramento River, the American River Parkway, and the nationally significant valley oak riparian forest along the lower Cosumnes River.

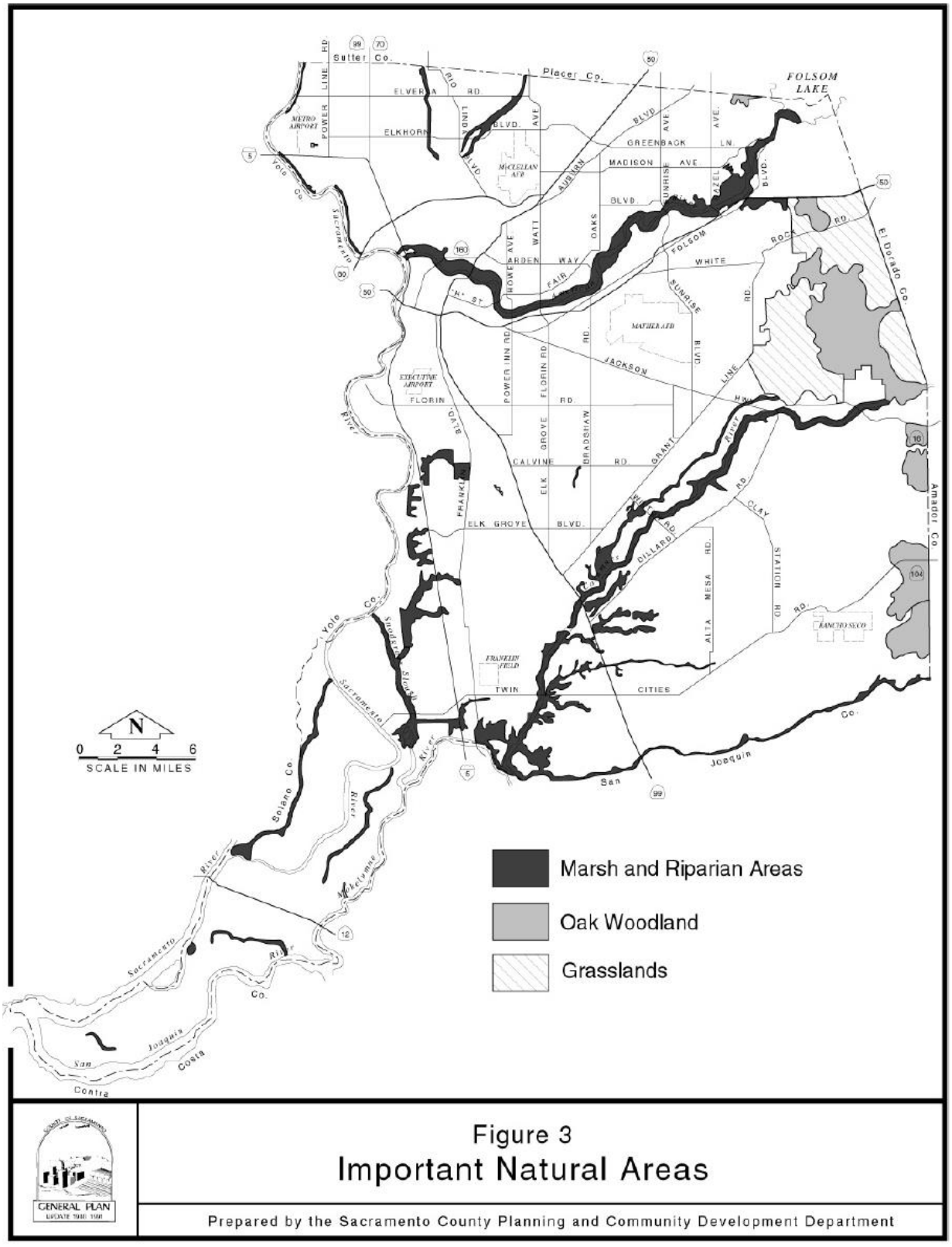
The Beach/Stone Lakes area, a designated National Wildlife Refuge, hosts thousands of waterfowl migrating along the Central Valley leg of the Pacific Flyway. The area is a dynamic and vigorous habitat supporting, among other species, American white pelican, great blue heron, northern harrier, coyote, grey fox, beaver, and possibly bobcat. The County's American River Parkway, bisecting the urban environs, has protected a vibrant riparian forest stretching along the lower American River. The undammed Cosumnes, exemplary of what was once expansive woodlands, represents a comparatively unaltered Central Valley ecosystem with slough, wetland, and riparian habitats, each slightly different in its ecological balance. Other significant wetland and riparian areas exist along Delta sloughs and seasonal creeks flowing into the major drainages.

Sacramento County is home to a variety of native tree and grassland habitats. The native tree habitats are defined as oak woodlands, oak savannah, and mixed riparian woodlands and the dominant grassland habitat being that of the California Prairie. These vegetative habitats are very important to the future of Sacramento County; however, due to the combined effects of urbanization, agricultural conversion, overgrazing, the introduction of invasive plant and wildlife species, climatic changes, and fuel wood harvesting, California's native vegetation have been unable to maintain existing populations.

Sacramento County once supported limited oak savannah and riparian woodland, with an herbaceous layer of perennial grasses and both annual and perennial wildflowers. These woodland areas were centered on the County's three main rivers: Sacramento, American and Cosumnes. Expansive native valley grassland, also referred to as California prairie, stretched out from the edge of these woodlands and blanketed the bulk of the County's landscape. Vernal pools were scattered in both low and high density clusters throughout the valley grassland habitat. After European settlement of the County, many of the native perennial grasses were replaced by Mediterranean annual grasses. However, within the vernal pools native vegetation uniquely suited to springtime inundation survived. Today these vernal pools harbor a number of listed plant and animal species. In addition to vernal pools, other seasonal and emergent wetlands occurred, mostly in association with the many natural drainage systems that previously flowed through the County, but which are now either channelized or confined within a system of artificial levees.

The County of Sacramento is fortunate to have several locations where vestiges of the once vast and diverse Central Valley natural habitat areas still exist. Habitat areas include riparian zones, riverine habitats, wetlands, woodlands, and grasslands. These are shown in Figure 4-2. This map delineates areas considered primarily natural such as riparian zones, marshlands, and oak woodlands. The boundaries are drawn based on review of reports and maps of public and private agencies including the U.S. Fish and Wildlife Service's (USFWS) National Wetlands Inventory maps, the State Department of Water Resource's Delta Atlas, the California Department of Fish and Game's Natural Diversity Database, and aerial photography.

Figure 4-2 Important Natural Areas in Sacramento County



Source: Sacramento County General Plan Open Space Element Background

Remaining marsh and riparian areas in the County include backwater basins and riparian woodlands along the Sacramento, American, and Cosumnes Rivers and other smaller waterways, and in the Delta. These biologically dynamic areas host thousands of waterfowl migrating along the Central Valley leg of the Pacific Flyway. In addition, numerous other migratory and resident species, some of which are listed as threatened or endangered, inhabit the County's natural areas. Species include majestic colony birds such as the American egret and great blue heron, the opportunistic coyote, the industrious beaver, deer, and elusive grey fox and bobcat.

The wetland and riparian areas are regarded as the County's most important resource. Such habitat becomes all the more significant when viewed against the acreage lost since the time of European settlement. Approximately 95 percent of the Central Valley's wetlands have disappeared in the last 100 years, reducing habitat for millions of migratory waterfowl. Riparian habitat has suffered a similar fate. In the Sacramento River Valley only 25,000 of the estimated 500,000 acres of the riparian habitat existing in 1850 exists today.

The aquatic environment of the County supports tens of thousands of anadromous fish and rears a comparable number of resident species. Anadromous fish include salmon, bass, shad, and sturgeon. Resident fish include trout, catfish, sunfish, and bullhead. With the development of urban areas and water projects, fisheries have declined. This loss has been generated by habitat destruction, water diversion, and temperature increases.

Extending out from the riparian zone are the distinctive upland habitats of the Central Valley, scattered with oak, blanketed with grazing lands, and dotted with vernal pools. Native oaks, signature trees of the Central Valley have declined in population over the years to accommodate agriculture and development. Concentrated efforts will need to be undertaken if the County is to preserve the isolated groves and diminishing woodlands. Native grasslands have virtually disappeared due to grazing and development. The once prolific and well adapted bunchgrass has been displaced by invasive weeds from the Mediterranean region. The vernal pools which once dotted vast areas of the Central Valley landscape, are found only in concentrations in the southern section of the County. The pools sustain flora and fauna adapted to the ephemeral nature of these small yet vibrant habitats.

The preservation and restoration of the diverse habitats located throughout the County is extremely important to help support ecosystem processes and functions. Each habitat type or plant community must be conserved to maintain a viable, self-perpetuating ecosystem. For instance, not only do nesting sites need to be preserved for the Swainson's Hawk, but foraging habitat must also be protected to provide a viable food source. A full range of native biodiversity, maintained in an integrated manner, helps promote sustainable habitat and wildlife populations. Large landscape level preserves interconnected by habitat corridors are increasingly recognized as the most effective method to protect species by preserving ecological landscapes.

Significant Natural Areas of Sacramento County

Sourced from information provided in the Sacramento County General Plan Background Report, Table 4-12 below outlines the location and rationale for listing of significant natural areas in Sacramento County.

Table 4-12 Description of Significant Natural Areas in Sacramento County

Location	Comments
Mokelumne/Cosumnes Drainage	
Lower Cosumnes River	Support more than 100,000 waterfowl; sandhill crane here; important and unique natural area; variety of hydrological conditions in small area at merging of Valley River and Delta systems; undammed, represents unaltered valley ecosystem; system of sloughs and marshes each slightly different in its ecological balance; intermixing of habitats enhances ecological diversity.
Deer Creek - Cosumnes Riparian Corridor	Good riparian woodland cover along most of both banks of both water courses; occasional clear spots; generally is narrow band along each watercourse, occasionally widens to hardwood forest in valley portion.
Badger Creek	Wetlands, riparian and valley oaks amid valley grassland. Excellent example of historical Sacramento Valley habitat. Especially scenic from Highway 99.
Lower Mokelumne, Dry Creek, Grissley and Bear Sloughs	Riparian vegetation along all water courses; excellent grassland, riparian, woodland mix along Bear Slough; some of grassland and woodland along Mokelumne has been leveled since 1973.
Mokelumne River	Riparian vegetation on levee side of river.
Dry Creek	Riparian corridor occasionally widening to woodland areas.
Laguna Creek	Intermittent stream with riparian habitat; two miles of riparian woodland with large trees; lower reaches include seasonal marsh along creek and tributaries.
Stones Lake/Delta	
Beach Lake/ Morrison Creek*	Permanent and seasonal marsh in what used to be Beach Lake; riparian forest along Morrison Creek, essentially intact since 1937, dominated by cottonwood and willow; a riparian area abundantly rich in wildlife and plant communities.
Lower Laguna Creek*	Seasonal wetland, ponds and vernal pools with adjacent grassland; channel modifications in conjunction with upstream improvements along Laguna Creek.
North Stone Lake*	Morrison Creek levee on north, I-5 on east, Hood-Franklin Road on south and Southern Pacific Railroad on west.
South Stone Lake	Includes 93 acres riparian, 446 acres marsh, 186 acres upland, 121 acres water; rest of 3,480 acres is agriculture; supports excellent warm water fishery; supplements North Stone Lake as important wildlife area; part of number one ranked site for new western National Wildlife Refuge; with North Stone Lake, is one of the most important ecological complexes in Delta.
Snodgrass Slough	Shrub brush and occasional riparian woodland along northernmost Delta slough in Sacramento.
Delta Meadows*	Significant prime natural resource area; remnant of valley oak woodland; in excess of 110 bird species, abounds with small mammals; state park acquisition project.
Lost Slough	Waterway and adjacent riparian habitat linking Lower Cosumnes and Delta Meadows, Snodgrass Slough and the Delta river system.
Steamboat Slough	Riparian shrub-brush and woodland at south end near Howard Landing and along north portion.
Grand Island Tip	Mason's lilaeopsis, Delta tule pea, and Sacramento anthacid beetle found here; state designated significant natural area.
Georgiana Slough	Shrub-brush and occasional woodland riparian along open slough.
Seven Mile Slough	Riparian trees and shrub-brush along a little-used slough.

Location	Comments
Brannan Island*	Site of Antioch Dunes evening primrose, very rare plant; state designated significant nature area.
Mayberry Slough	Deadend slough, isolated for wildlife habitat.
Southwest Tip of County	Upland habitat; blue heron rookery; several rare and endangered species.
Chain Island	Isolated island, formerly diked with coastal brackish marsh habitat; Mason's ilaeopsis and Suisun marsh aster; state designated significant natural area.
Eastern Sacramento County	
Upper Laguna Creek	Dense stand of riparian vegetation listed as one of three most important sections on Laguna Creek (the other two are now urban creek sections).
Sloughhouse South	One of best sites of valley elderberry longhorn beetle habitat; state designated significant natural area.
Meiss-Ione Road Overlook	Only lesser nighthawks in Sacramento County; vernal pools with unusual dwarf plant.
Scott Road Raptor Area	Open shortgrass prairie with sparse to dense valley and blue oak thickets, mostly in southern area; dense cottonwood-willow riparian vegetation along stream courses; habitat for one of largest concentrations of raptoral birds in Sacramento region; grand wildflower displays in spring.
Sloughhouse Vernal Pools	Concentrations of vernal pools; very rare Sacramento orcutt grass found near County dump; state designated significant natural area.
Rancho Seco Lake*	About 500 plants of Sacramento orcutt grass; state designated significant natural area.
Jackson Highway Oak Woodland	None
Twin Cities Road Oak Woodland	None
South Area Vernal Pools	Quality of pools is unknown; may contain rare and endangered plants.
North Sacramento	
Garden Highway	Greatest concentration of riparian woodland in Sacramento County along Sacramento River; riparian woodlands are seven times greater in extent than disturbed riprap areas to south; coexists with several homes; Swainson's hawk nests.
Alder Creek	Excellent riparian area; diverse vegetation and wildlife; spillway and marsh; upstream ponds add diversity; good beaver and muskrat habitat.
Fair Oaks Bald Spot*	Excellent examples of vernal pools with Sacramento orcutt grass; state designated significant natural area.
Lake Natoma*	American River bluffs, 100 feet high, cut by several small canyons; rich foothill woodland plant community; some of most varied and dense floral displays in Sacramento County; cottonwood dredger tailing riparian at Negro Bar with jungle-like mixture of oak, buckeye, elderberry, et al on higher ground.
East Main Drain*	Waterfowl habitat; year round habitat; much disturbance, dumping.
Dry Creek*	Dual channel with grassland/farming in between creates good wildlife habitat. Good riparian cover along creek channels.
American River Parkway*	Mix of riparian, freshwater marsh, oak woodland, grassland, inhabited by great variety of plant and wildlife species.

Source: Sacramento General Plan Background Report

* indicates all or a major part of the area is in public or quasi-public ownership

Special Status Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the Planning Area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

The California Natural Diversity Database, a program that inventories the status and locations of rare plants and animals in California, was queried to create an inventory of special status species in Sacramento County. A summary list of these species is found below in Table 4-13. Appendix E list the name, federal status, state status, California Department of Fish and Wildlife status, and the California Rare Plant rank of species in Sacramento County.

Table 4-13 Sacramento County Planning Area – Summary of Special Status Species

Type	Number
Animals - Amphibians	2
Animals - Birds	52
Animals – Crustaceans	5
Animals - Fish	18
Animals - Insects	8
Animals - Mammals	10
Animals – Mollusks	2
Animals – Reptiles	3
Community – Terrestrial	9
Plants – Vascular	36

Source: California Natural Diversity Database

Wetlands

Wetlands are habitats in which soils are intermittently or permanently saturated or inundated. Wetland habitats vary from rivers to seasonal ponding of alkaline flats and include swamps, bogs, marshes, vernal pools, and riparian woodlands. Wetlands are considered to be waters of the United States and are subject to the jurisdiction of the U.S. Army Corps of Engineers as well as the California Department of Fish and Wildlife. Where the waters provide habitat for federally endangered species, the USFWS may also have authority.

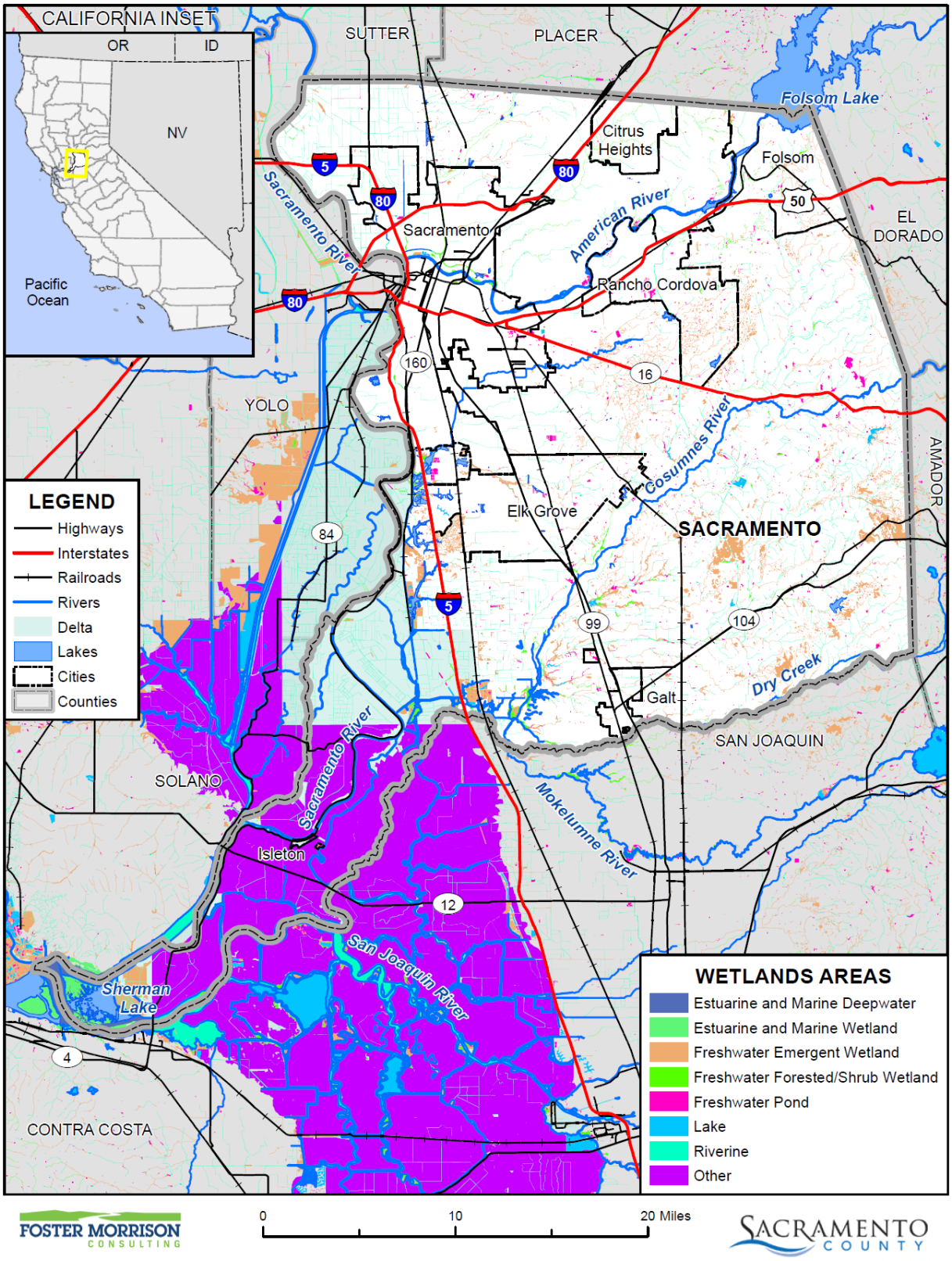
Wetlands function as natural sponges that trap and slowly release surface water, rain, snowmelt, groundwater and flood waters. Trees, root mats, and other wetland vegetation also slow the speed of floodwaters and distribute them more slowly over the floodplain. This combined water storage and braking

action lowers flood heights and reduces erosion. Wetlands within and downstream of urban areas are particularly valuable, counteracting the greatly increased rate and volume of surface- water runoff from pavement and buildings. The holding capacity of wetlands helps control floods and prevents water logging of crops. Preserving and restoring wetlands, together with other water retention, can often provide the level of flood control otherwise provided by expensive dredge operations and levees.

Wetlands are a valuable natural resource for communities providing beneficial impact to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation is vital, and reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water.

The USFWS has mapped wetlands areas throughout the United States. Figure 4-3 shows the wetlands areas in the County. These areas are detailed in Table 4-14 by wetland type.

Figure 4-3 Sacramento County – Wetlands Areas



Data Source: U.S. Fish and Wildlife Service National Wetlands Inventory 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 05/2021.

Table 4-14 Unincorporated Sacramento County – Wetlands Areas by Area Type

Wetlands Area Type	Wetlands Area (in Acres)
Estuarine and Marine Deepwater	1
Estuarine and Marine Wetland	104
Freshwater Emergent Wetland	5,945
Freshwater Forested/Shrub Wetland	940
Freshwater Pond	1,686
Lake	34
Riverine	2,390
Other	50
Unincorporated Sacramento County Total	**11,150**

Source: USFWS

Wetlands: Natural and Beneficial Functions

Wetlands are often found in floodplains and depressional areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flow. Wetlands perform a variety of ecosystem functions including food web support, habitat for insects and other invertebrates, fish and wildlife habitat, filtering of waterborne and dry-deposited anthropogenic pollutants, carbon storage, water flow regulation (e.g., flood abatement), groundwater recharge, and other human and economic benefits.

Wetlands, and other riparian and sensitive areas, provide habitat for insects and other invertebrates that are critical food sources to a variety of wildlife species, particularly birds. There are species that depend on these areas during all parts of their lifecycle for food, overwintering, and reproductive habitat. Other species use wetlands and riparian areas for one or two specific functions or parts of the lifecycle, most commonly for food resources. In addition, these areas produce substantial plant growth that serves as a food source to herbivores (wild and domesticated) and a secondary food source to carnivores.

Wetlands slow the flow of water through the vegetation and soil, and pollutants are often held in the soil. In addition, because the water is slowed, sediments tend to fall out, thus improving water quality and reducing turbidity downstream.

These natural floodplain functions associated with the natural or relatively undisturbed floodplain that moderates flooding, such as wetland areas, are critical for maintaining water quality, recharging groundwater, reducing erosion, redistributing sand and sediment, and providing fish and wildlife habitat. Preserving and protecting these areas and associated functions are a vital component of sound floodplain management practices for the Sacramento County Planning Area.

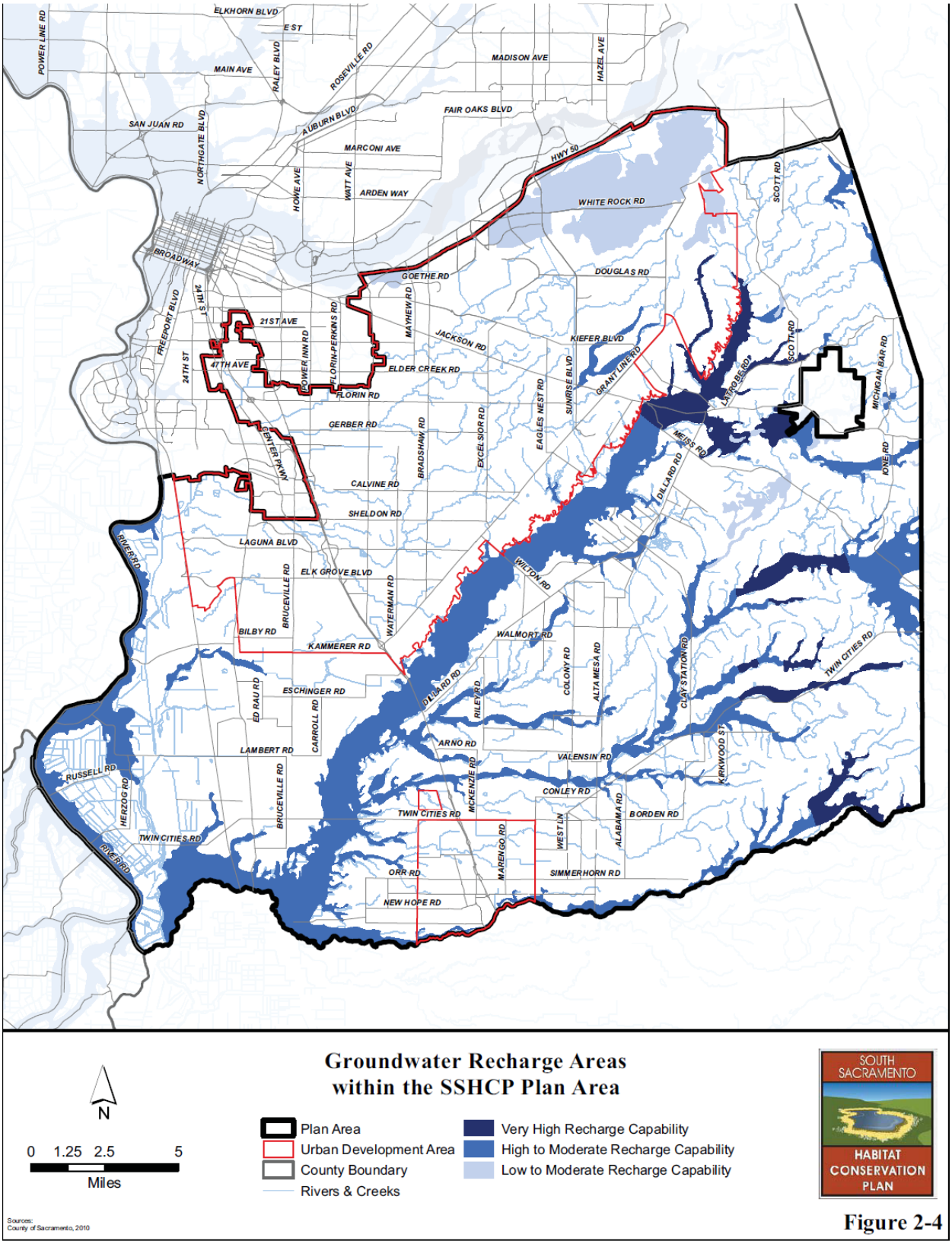
A prime example of a natural floodplain functions in Sacramento is the American River Parkway. American River Parkway provides 23-miles of fishing, boating, guided natural and historic tours, bike paths, and much more.

Groundwater Recharge

The South Suburban Habitat Conservation Plan (SSHCP) Plan Area is entirely within the 20,000-square-mile Central Valley Aquifer System, but is split between two basins, the Sacramento Valley Groundwater Basin and the San Joaquin Valley Groundwater Basin. Precipitation that does not run off, or is not lost through evaporation and transpiration, travels beneath the surface as subsurface water. The pattern of movement of water, from the time it enters the ground to the time it emerges either naturally or by pumping from a well, is controlled by the subsurface conditions encountered. Upon entering the ground, water moves downward until it reaches a zone of saturation. This happens whenever water from precipitation, stream flow, applied irrigation, and various other water sources sinks into the ground through the open spaces in permeable materials. The size of these open spaces ranges from minute pores in clays to intergranular openings in deposits of sand and gravel, and open crevices along bedrock fractures. The area over which this is accomplished is called a recharge area.

Within the SSHCP Plan Area, most recharge occurs in locations along river channel deposits where they cross exposures of water-transmitting rocks. Here the channel deposits are very permeable, allowing for rapid infiltration of water down to water-bearing materials. Water flows over these recharge areas during the entire year and affords partial replenishment of the groundwater body (Figure 4-4). In addition to river channel recharge, recharge can occur through percolation of precipitation, percolation of irrigation return flows, and subsurface boundary inflow from adjacent aquifers.

Figure 4-4 Groundwater Recharge in Sacramento County



Source: South Sacramento Habitat Conservation Plan

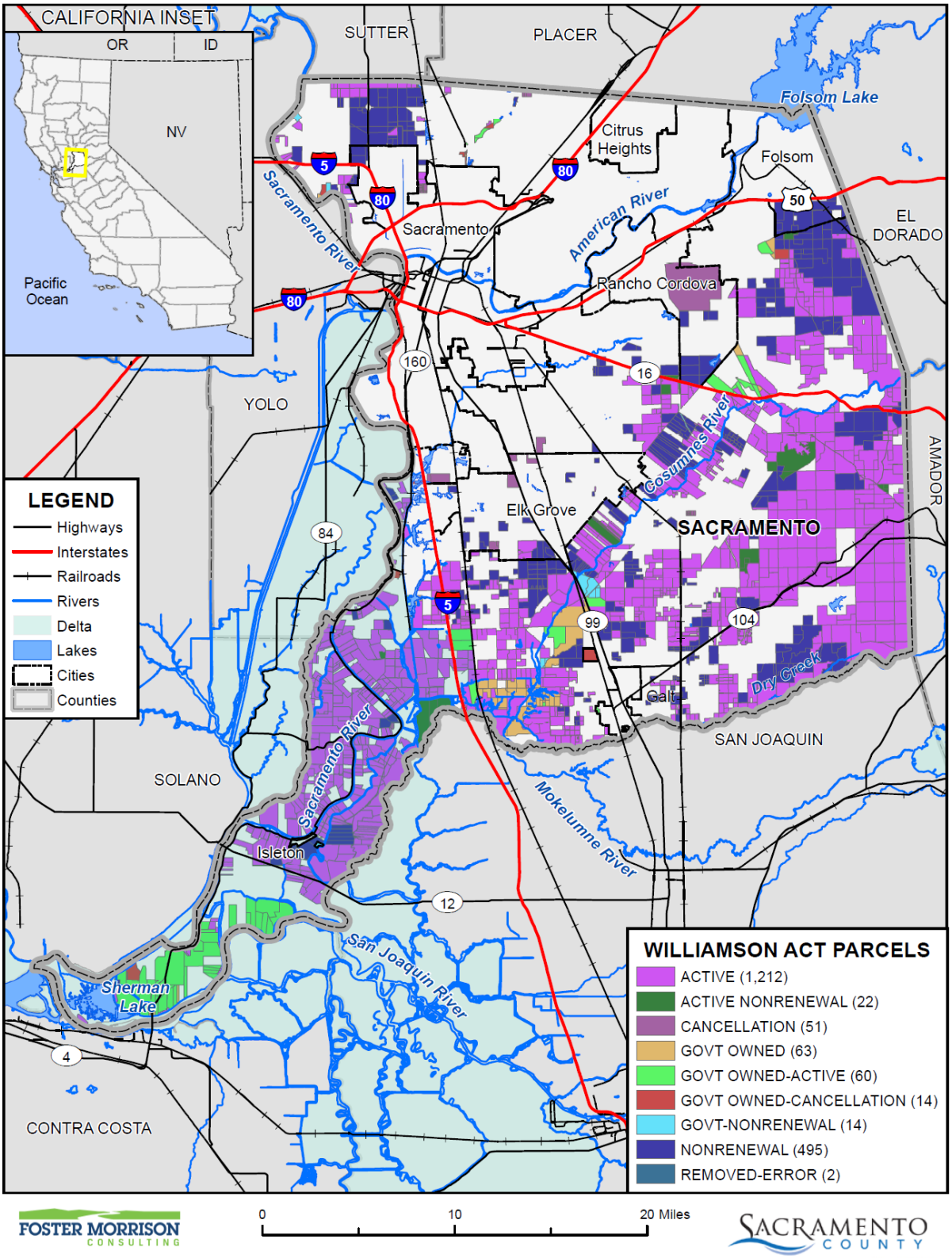
Farmlands

Farmlands are important considerations in many counties in California. Sacramento County is located within the northern portion of California's Central Valley in the area known as the Sacramento Valley. It contains some of the richest soils in the State. These soils make the County's agricultural resources very productive.

Williamson Act

The Williamson Act, also known as the California Land Conservation Act of 1965, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. When the County enters into a contract with the landowners under the Williamson Act, the landowner agrees to limit the use of the land to agriculture and compatible uses for a period of at least ten years and the County agrees to tax the land at a rate based on the agricultural production of the land rather than its real estate market value. This affects the County's overall values for assessed taxable lands. The County has designated areas as agricultural preserves within which the county will enter into contracts for the preservation of the land in agriculture. These are shown on Figure 4-5.

Figure 4-5 Sacramento County – Williamson Act Lands



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 05/2021.

Source: California Department of Conservation

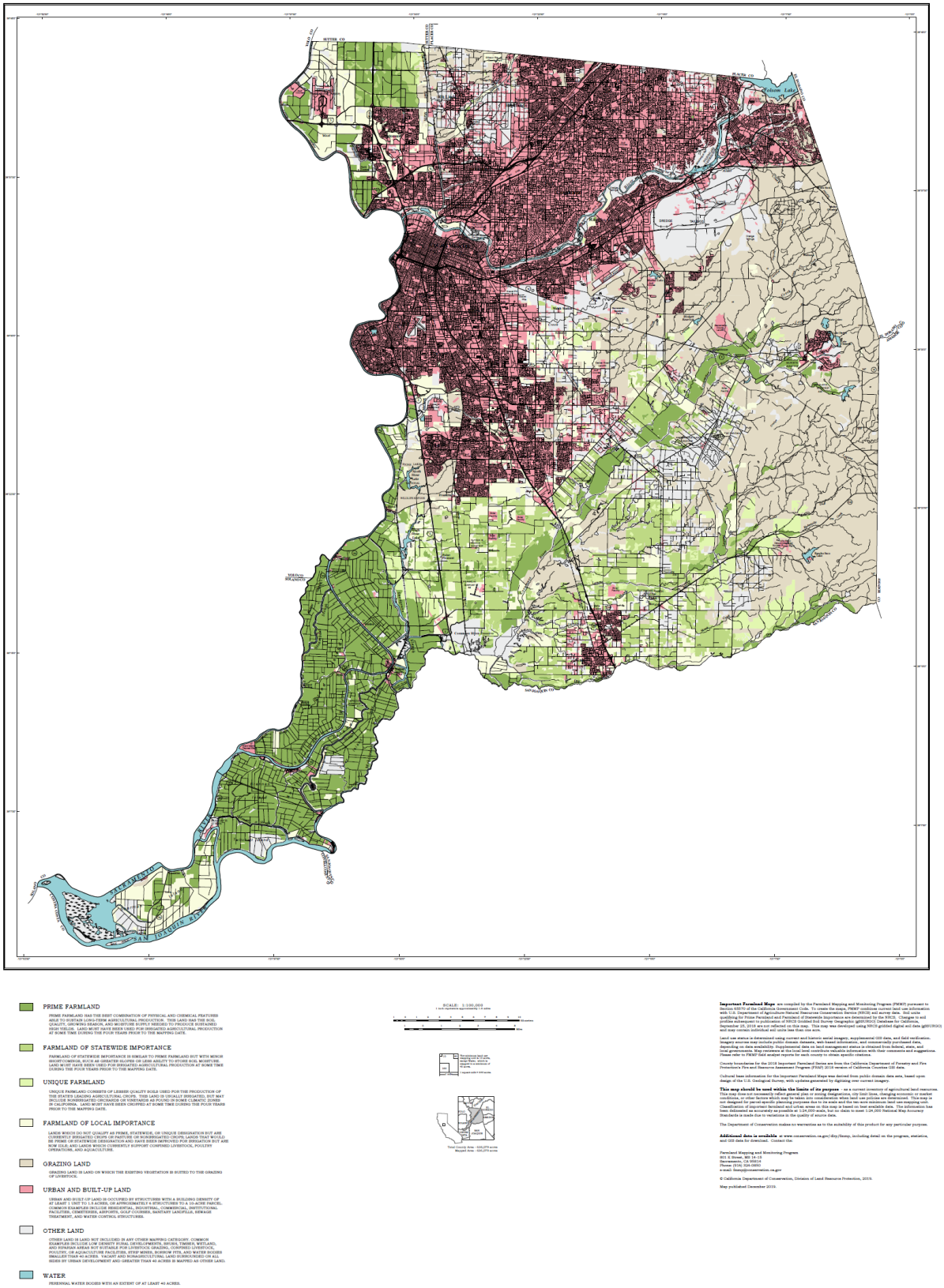
State Inventory of Important Farmland

The Farmland Mapping and Monitoring Program was established in 1984 to document the location, quality, and quantity of agricultural lands and conversion of those lands over time. The program provides impartial analysis of agricultural land use changes throughout California. For inventory purposes, several categories were developed to describe the qualities of land in terms of its suitability for agricultural production. The State Department of Conservation utilizes the following classification system:

- The Prime Farmland category describes farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- Farmland of Statewide Importance is farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- Unique Farmland is farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.
- Farmland of Local Importance is either currently producing crops or has the capability of production. This farmland category is determined by each county's board of supervisors and a local advisory committee.

The 2018 maps are the most recent versions. These lands are shown in Figure 4-6.

Figure 4-6 Sacramento County – Farmland of Importance



Source: California Department of Conservation

4.2.4. Growth and Development Trends

As part of the planning process, changes in growth and development, both past and future were identified and examined the context of hazard-prone areas, and how the changes in growth and development affect vulnerability over time. Information from the Sacramento County General Plan Housing Element, the California Department of Finance, and the US Census Bureau form the basis of this discussion.

Current Status and Past Populations

The estimated population of Sacramento County (both incorporated communities and the unincorporated County) for January 1, 2020 was 1,555,365 (of which 593,801 were in the unincorporated County), representing an eleven-fold increase from 141,199 people in 1930. Table 4-15 illustrates the pace of population growth in Sacramento County dating back to 1930. Growth in the County has been steady, with smaller growth coming in the last decade. Table 4-16 shows the recent growth in the County and its incorporated jurisdictions.

Table 4-15 Sacramento County Planning Area – Population Growth 1930-2020

Year	Population	Percent Change
1930	141,199	–
1940	170,333	20.0%
1950	277,140	62.7%
1960	502,778	81.4%
1970	631,498	25.6%
1980	783,381	24.1%
1990	1,041,219	32.9%
2000	1,223,499	17.5%
2010	1,445,327	18.1%
2020	1,555,365	7.6%

Sources: California Department of Finance, US Census Bureau

Table 4-16 Population Growth for Jurisdictions in Sacramento County, 2000-2020

Area	2000	2010	2020	% Change 2000 to 2020
Citrus Heights	85,071	87,752	87,811	3.2%
Elk Grove*	0	121,803	176,154	–
Folsom	51,884	66,242	81,610	57.3%
Galt	19,472	22,856	25,849	32.7%
Isleton	828	822	828	0.0%
Rancho Cordova*	0	55,099	78,381	–
Sacramento	407,018	453,592	510,931	25.5%
Unincorporated	659,226	560,483	593,801	-9.9%**

Area	2000	2010	2020	% Change 2000 to 2020
Total	**1,223,499**	**1,445,327**	**1,555,365**	**20.2%**

Source: US Census Bureau, California Department of Finance

*Elk Grove was incorporated in 2000; Rancho Cordova was incorporated in 2002

**This number is misleading, as two current cities were part of the unincorporated County in 2000.

Special Populations and Disadvantaged Communities

The County noted multiple special populations and disadvantaged communities within the County. These are captured in the following sections:

- Sacramento Homeless/Transient Populations Tracking
- Center for Disease Control Social Vulnerability Index
- CA DWR Special Population and Disadvantaged Community Mapping
- Climate Change and Health Profile Report – Sacramento County

Sacramento Homeless/Transient Populations Tracking

The County provided data from homeless "heat maps." Location of these areas (Address or Cross Streets) include:

- 21st Ave and Stockton Blvd, Sacramento
- 65th St and Stockton Blvd
- 7010 Auburn Blvd, Citrus Heights
- 6483 Watt Ave, North Highlands
- Elk Horn Blvd and Linda Lane, Rio Linda
- Antelope and Roseville Road
- Marconi between Fair Oaks Blvd & Walnut
- Madison and Hwy 80
- 5700 Stockton Blvd.
- 3534 51st Ave.
- Florin and East Parkway
- Florin and 65th
- 7171 Bowling Drive
- Roseville Road
- McDonalds on Alhambra
- Trinity Cathedral
- St Johns

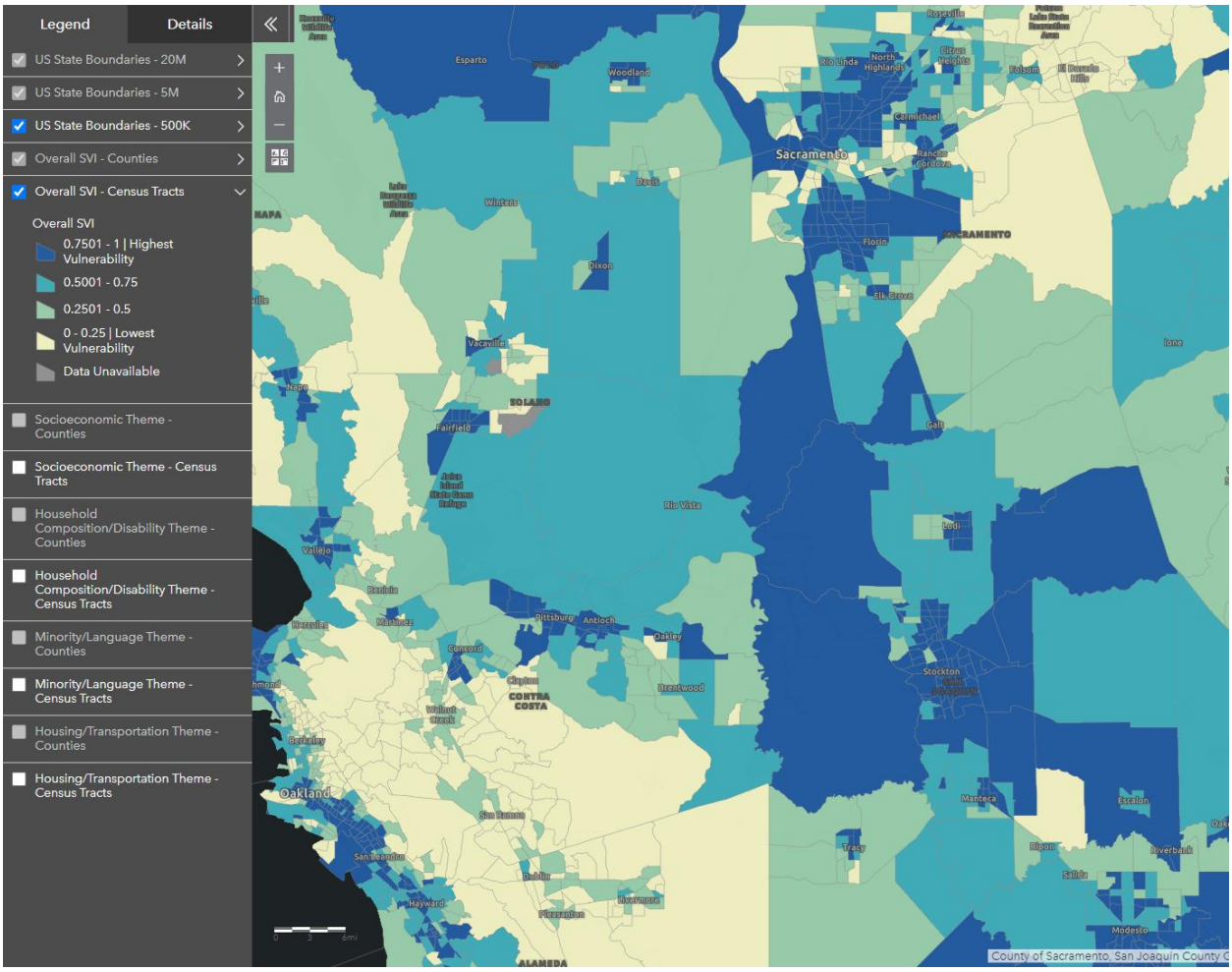
Center for Disease Control Social Vulnerability Index

Every community must prepare for and respond to hazardous events, whether a natural disaster like a tornado or disease outbreak, or a human-made event such as a harmful chemical spill. A number of factors, including poverty, lack of access to transportation, and crowded housing may weaken a community's ability to prevent human suffering and financial loss in a disaster. These factors are known as social vulnerability.

Social vulnerability refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused disasters, or disease outbreaks. Reducing social vulnerability can decrease both human suffering and economic loss. CDC Social Vulnerability Index (CDC SVI) uses 15 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters.

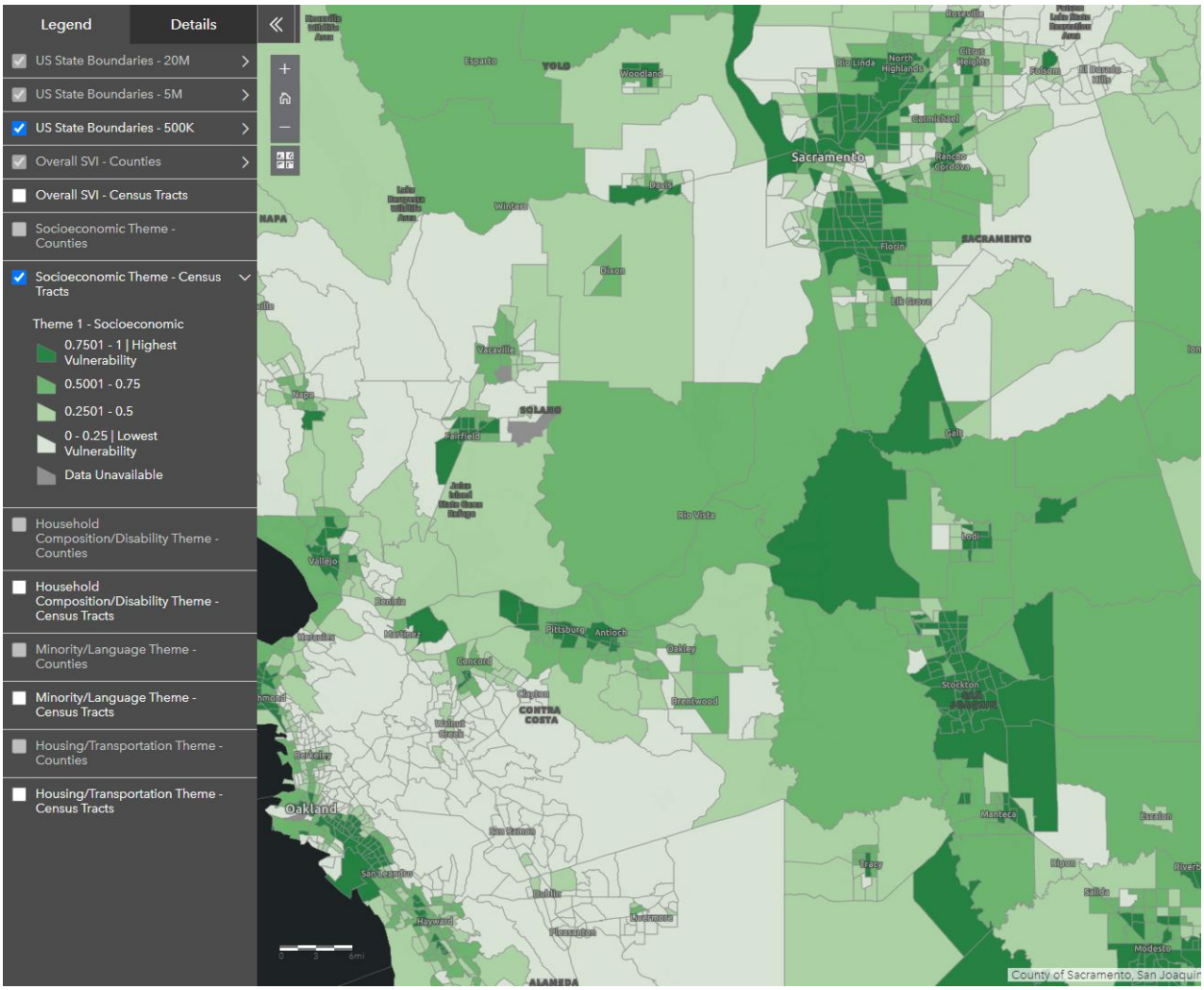
ATSDR's Geospatial Research, Analysis & Services Program (GRASP) created databases to help emergency response planners and public health officials identify and map communities that will most likely need support before, during, and after a hazardous event. CDC SVI uses U.S. Census data to determine the social vulnerability of every census tract. Census tracts are subdivisions of counties for which the Census collects statistical data. The CDC SVI ranks each tract on 15 social factors, including poverty, lack of vehicle access, and crowded housing, and groups them into four related themes. Each tract receives a separate ranking for each of the four themes, as well as an overall ranking. Maps of the four themes are shown in the figure below. The overall SVI map is shown in Figure 4-7; the socioeconomic SVI for the County is shown in Figure 4-8; the household composition SVI for the County is shown in Figure 4-9; the minority and language SVI for the County is shown in Figure 4-10; and the housing and transportation SVI for the County is shown in Figure 4-11.

Figure 4-7 Sacramento County – Overall Social Vulnerability



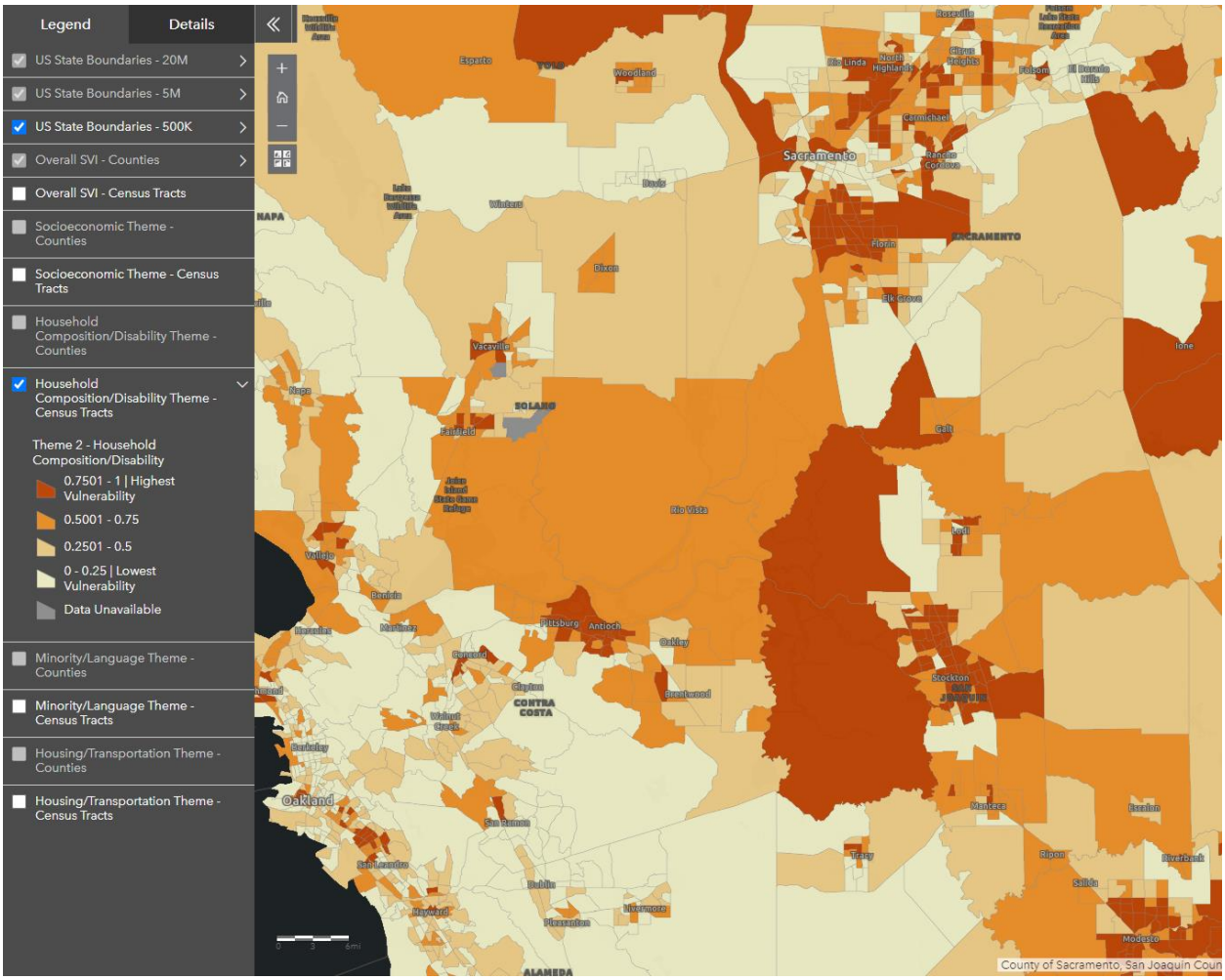
Source: CDC Social Vulnerability Index – map retrieved 5/18/2021

Figure 4-8 Sacramento County – Socioeconomic Status Vulnerability



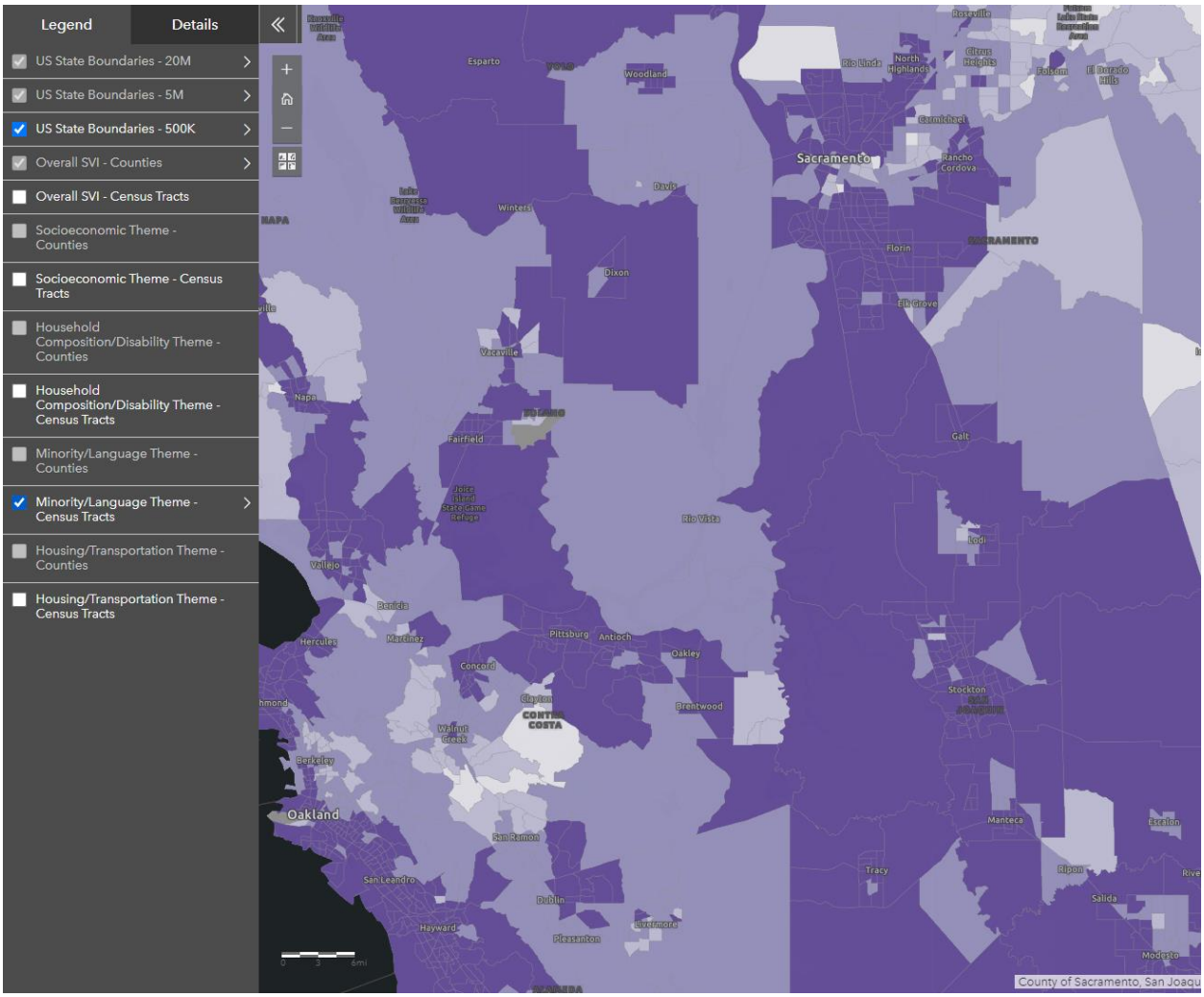
Source: CDC Social Vulnerability Index – map retrieved 5/18/2021

Figure 4-9 Sacramento County – Household Composition and Disabilities Social Vulnerability



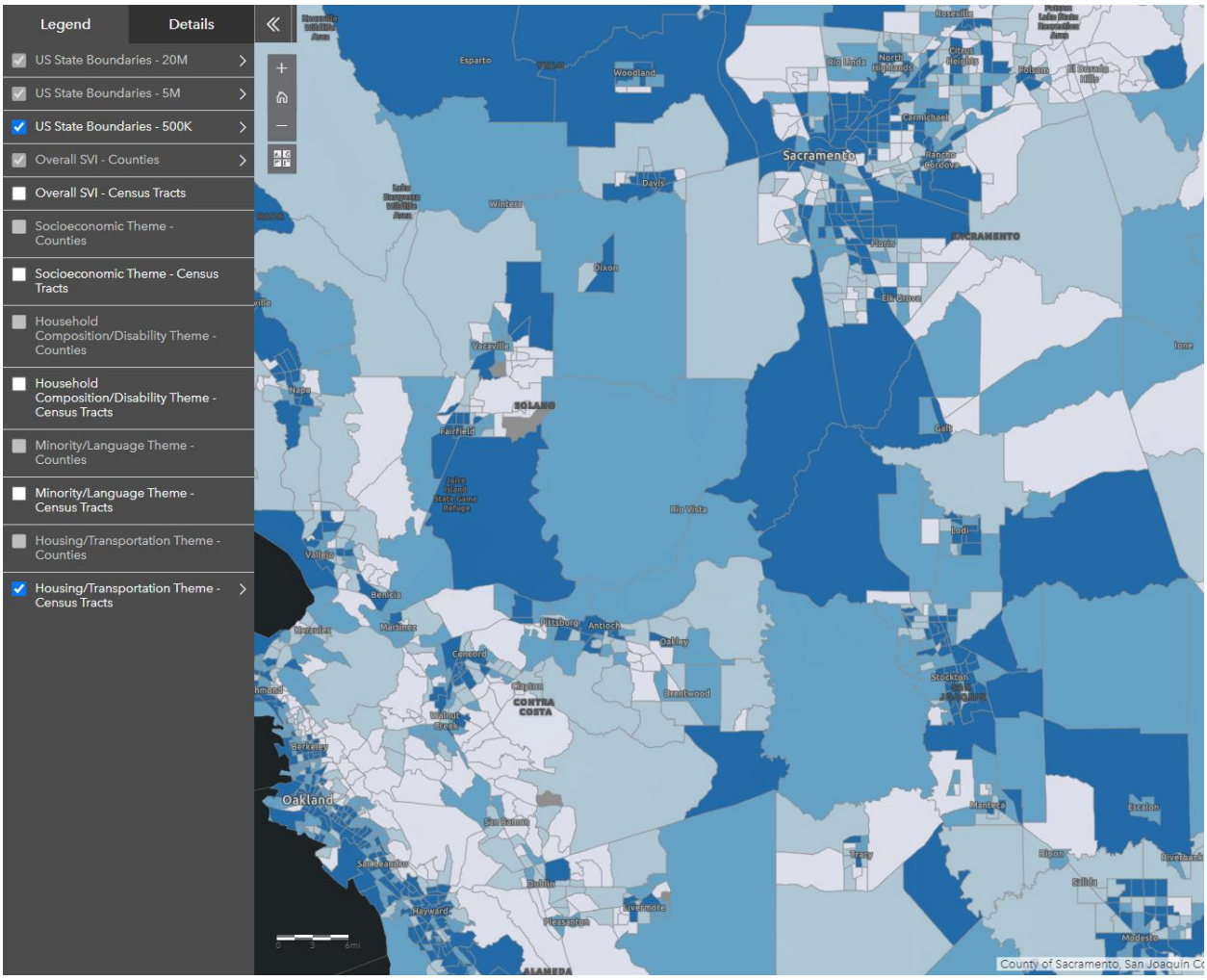
Source: CDC Social Vulnerability Index – map retrieved 5/18/2021

Figure 4-10 Sacramento County – Minority/Language Social Vulnerability



Source: CDC Social Vulnerability Index – map retrieved 5/18/2021

Figure 4-11 Sacramento County – Housing/Transportation Social Vulnerability



Source: CDC Social Vulnerability Index – map retrieved 5/18/2021

CA DWR Special Population and Disadvantaged Community Mapping

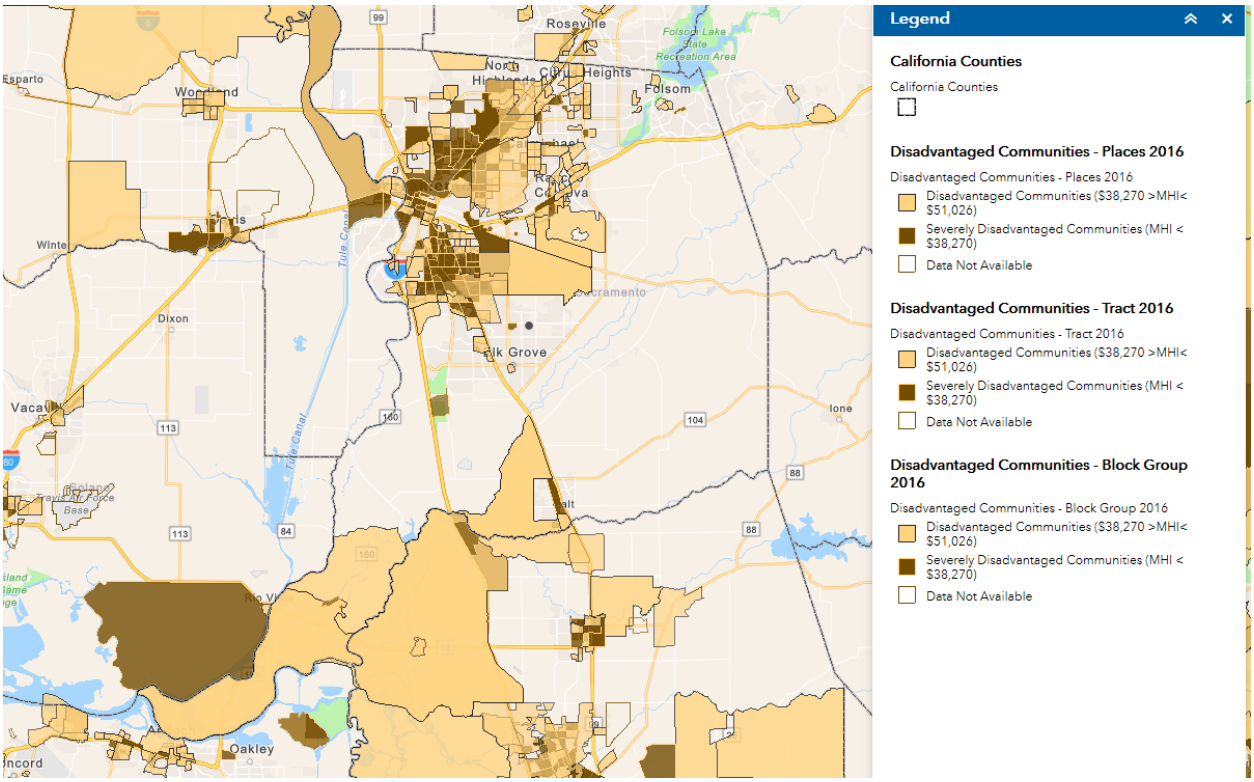
CA DWR has developed a web-based application to assist local agencies and other interested parties in evaluating disadvantaged community (DAC) status throughout the State, using the definition provided by Proposition 84 Integrated Regional Water Management (IRWM) Guidelines (2015). The DAC Mapping Tool is an interactive map application that allows users to overlay the following three US Census geographies as separate data layers:

- Census Place
- Census Tract
- Census Block Group

Only those census geographies that meet the DAC definition are shown on the map (i.e., only those with an annual median household income (MHI) that is less than 80 percent of the Statewide annual MHI (PRC Section 75005(g)). In addition, those census geographies having an annual MHI that is less than 60 percent

of the Statewide annual MHI are shown as "Severely Disadvantaged Communities" (SDAC). The DAC map for Sacramento County is shown in Figure 4-12.

Figure 4-12 Sacramento County – Disadvantaged Communities



Source: CA DWR, retrieved 1/10/2021

Climate Change and Health Profile Report – Sacramento County

The 2017 Climate Change and Health Profile Report for Sacramento County was done by the California Department of Public Health and the University of California-Davis. The report noted that there are special populations in the County.

> ***Climate change affects the social and environmental drivers of health outcomes. The effects of climate change can exacerbate existing health conditions and compound the risks of adverse health outcomes. The age-adjusted death rate, which takes into account the effect of the population's age distribution, is a basic indicator of the health status of communities.***
>
> ***In 2010, the age-adjusted death rate in Sacramento County was higher than the state average. Disparities in death rates among race/ethnicity groups highlight how certain populations disproportionately experience health impacts. Within the county, the highest death rate occurred among Pacific Islanders and the lowest death rate occurred among Asians.***

In 2012, nearly 43% of adults (460,358) reported one or more chronic health conditions including heart disease, diabetes, asthma, severe mental stress or high blood pressure. In 2012, 15% of adults reported having been diagnosed with asthma. In 2012, approximately 28% of adults were obese (statewide average was 25%). In 2012, nearly 13% of residents aged 5 years and older had a mental or physical disability (statewide average was 10%).

In 2005-2010, there was an annual average of 188 heat-related emergency room visits and an age-adjusted rate of 13 emergency room visits per 100,000 persons (the statewide age-adjusted rate was 10 emergency room visits per 100,000 persons).

Among climate-vulnerable groups in 2010 were 101,063 children under the age of 5 years and 158,551 adults aged 65 years and older. In 2010, there were approximately 23,787 people living in nursing homes, dormitories, and other group quarters where institutional authorities would need to provide transportation in the event of emergencies.

Social and demographic factors and inequities affect individual and community vulnerability to the health impacts of climate change. In 2010, 7% of households (37,143) did not have a household member 14 years or older who spoke English proficiently (called linguistically isolated; statewide average was 10%). In 2010, approximately 15% of adults aged 25 years and older had less than a high school education (statewide average was 19%).

In 2010, 14% of the population had incomes below the poverty level (the statewide average was 14%). Nineteen percent of households paid 50% or more of their annual income on rent or a home mortgage (statewide average was 22%). In 2012, approximately 163,000 (44%) low-income residents reported they did not have reliable access to a sufficient amount of affordable, nutritious food (called food insecurity; statewide average was 42%).

In 2010, Sacramento County had approximately 35,847 outdoor workers whose occupation increased their risk of heat illness. In 2010, roughly seven percent of households did not own a vehicle that could be used for evacuation (statewide average was 8%). In 2012, approximately 81% of residents did not live within a half mile to frequent public transit. In 2009, approximately 0% of households were estimated to lack air conditioning, a strategy to counter adverse effects of heat (statewide average was 36%). In 2011, tree canopy, which provides shade and other environmental benefits, was present on 13% of the county's land area (statewide average was 8%).

Social capital is embedded in social relationships and networks and refers to the existence of trust and mutual aid among the members of society. These relationships are important in building resilience when confronted with extreme climates. There is evidence that populations with higher levels of political participation also have greater social capital. Sixty-two percent of registered voters voted in the 2010 general election (statewide average was 58%).

Natural disasters worsened by climate change increase the displacement of victims, which in turn increases population densities and tensions over resources. Violent crime also increases during heat events.32 Safe neighborhoods that are free of crime and violence are an integral component of healthy neighborhoods and community resilience. In 2010, Sacramento County experienced approximately 6 violent crimes per 1,000 residents (statewide rate was 4 per 1,000 residents).

Development since 2016 Plan

The Sacramento County Building Department tracks total building permits issued since 2016 for unincorporated Sacramento County. A summary of this development is shown in Table 4-17. All development in the identified hazard areas, including the 1% annual chance floodplains and high wildfire risk areas, were completed in accordance with all current and applicable development codes and standards and should be adequately protected. Thus, with the exception of more people living in the area potentially exposed to natural hazards, this growth should not cause a significant change in vulnerability of the County to identified priority hazards.

Table 4-17 Sacramento County Development 2016-2020 Summary

Property Use	2016	2017	2018	2019	2020
Residential					
Improvement Plan	13	160	42	20	43
Grading Plan	15	21	7	6	8
Commercial					
Improvement Plan	22	20	30	51	22
Grading Plan	0	1	0	0	9
Subdivision					
Improvement Plan	349	463	546	664	377
Grading Plan	0	0	0	0	0
Total	**399**	**665**	**625**	**741**	**459**

Source: Sacramento County Building Department

With respect to development within hazard areas, the County does not collectively track development in these areas after the fact. However, all development is subject to development standards and requirements

specific to permitting development in hazard areas such as in the 1% annual chance floodplain or in Very High Fire Hazard Severity Zones. Thus it should be assumed that this recent development was done in accordance with these requirements to mitigate the affects of hazards. Further, given the hazard environment Sacramento County, it should be assumed that much of this development occurred in areas protected by levees and in dam inundation areas, especially those associated with Folsom Dam.

While the data shows changes in development in the County since the 2016 Plan, including likely development in mapped hazard areas, all development is subject to current building standards to include any requirements for building in hazard areas which act to mitigate hazard exposure. Further, development in hazard areas is only one factor of many that contribute to an overall change in hazard vulnerability. Based on these considerations, it cannot be definitively stated as to whether the development or even lack of development in areas contributed to an increase or decrease in vulnerability for Sacramento County.

Future Development

Future development in the County is discussed in the sections below.

Future Population Projections

As indicated in the previous section, Sacramento County had been steadily growing from 1930 to 2010, with a recent slowing in population growth. Long term forecasts by the California Department of Finance project population growth in Sacramento County continuing through 2060. Table 4-18 shows the population projections for the County as a whole through 2060. Based on this data, population growth continues steadily through 2060.

Table 4-18 Population Projections for Sacramento County (incorporated and unincorporated), 2020-2060

	2020	2030	2040	2050	2060
Sacramento County	1,567,975	1,697,555	1,799,258	1,876,422	1,939,608

Source: California Department of Finance P-1 Report

Future Land Use

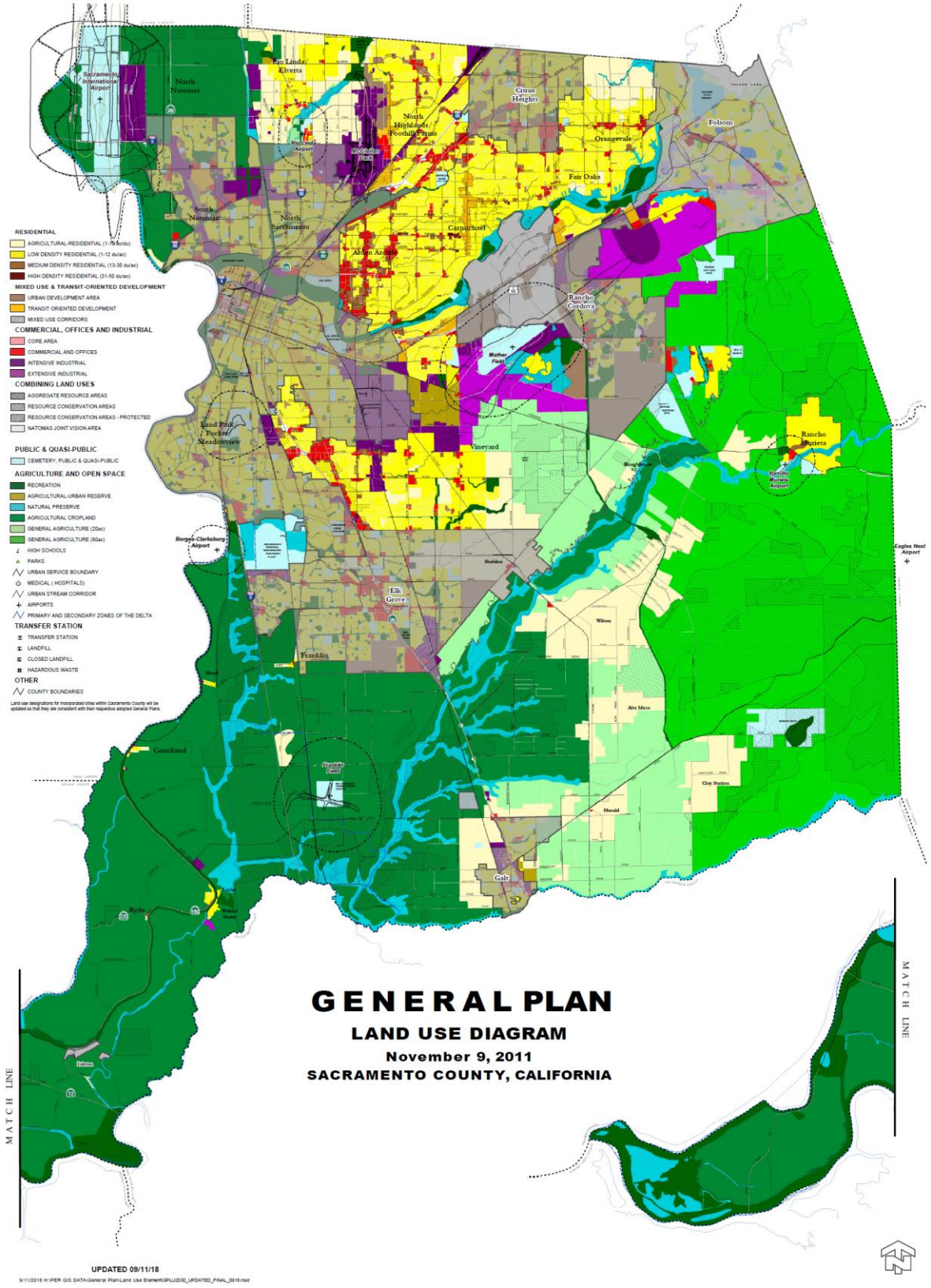
Future land use and growth management strategies in Sacramento County aim to concentrate future development into and toward existing communities through various policies relating to zoning and minimum development standards and requirements. Zoning designations prescribe allowed land uses and minimum lot sizes for the purpose of supporting efficient infrastructure design, conservation of natural resources, and to avoid conflicting uses.

Descriptions of allowed uses for each classification are detailed in the Sacramento County General Plan Land Use Element. Figure 4-13 is sourced from this section. The Diagram provides a broad outline of future land use patterns in the unincorporated county. It graphically illustrates the existing and potential locations for a number of uses, including residential, transit-oriented development, commercial and offices, public and quasi-public, open space and disposal facilities. The uses allowed within each of the basic

categories are detailed in the land use summary table and are governed by policies contained in the Land Use Element.

Land uses shown for other jurisdictions, including the cities of Sacramento, Citrus Heights, Elk Grove, Folsom, Galt, Isleton, and Rancho Cordova, are taken from their adopted General Plans. Although the County has no control over land uses in other jurisdictions, including them emphasizes the County's role as a leader in countywide planning and regional collaboration efforts. Showing all of the land uses within the County on a single map allows for a comprehensive look at development patterns and transportation systems within the metropolitan area, facilitating regional planning efforts.

Figure 4-13 Sacramento County General Plan Land Use



Source: Sacramento County 2030 General Plan Land Use Element

Future Development GIS Analysis

Unincorporated Sacramento County has defined seven future growth areas. These areas were provided by Sacramento County and were mapped into GIS format. Using GIS, the following methodology was used in determining parcel counts and acres associated with future development in the unincorporated Sacramento County Planning Area. Sacramento County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the seven future development projects were mapped. These areas can be seen on Figure 4-14 and detailed in Table 4-19. Analysis of future developments for each City in the County can be found in their respective annexes to this Plan Update.

Figure 4-14 Unincorporated Sacramento County – Future Development Areas

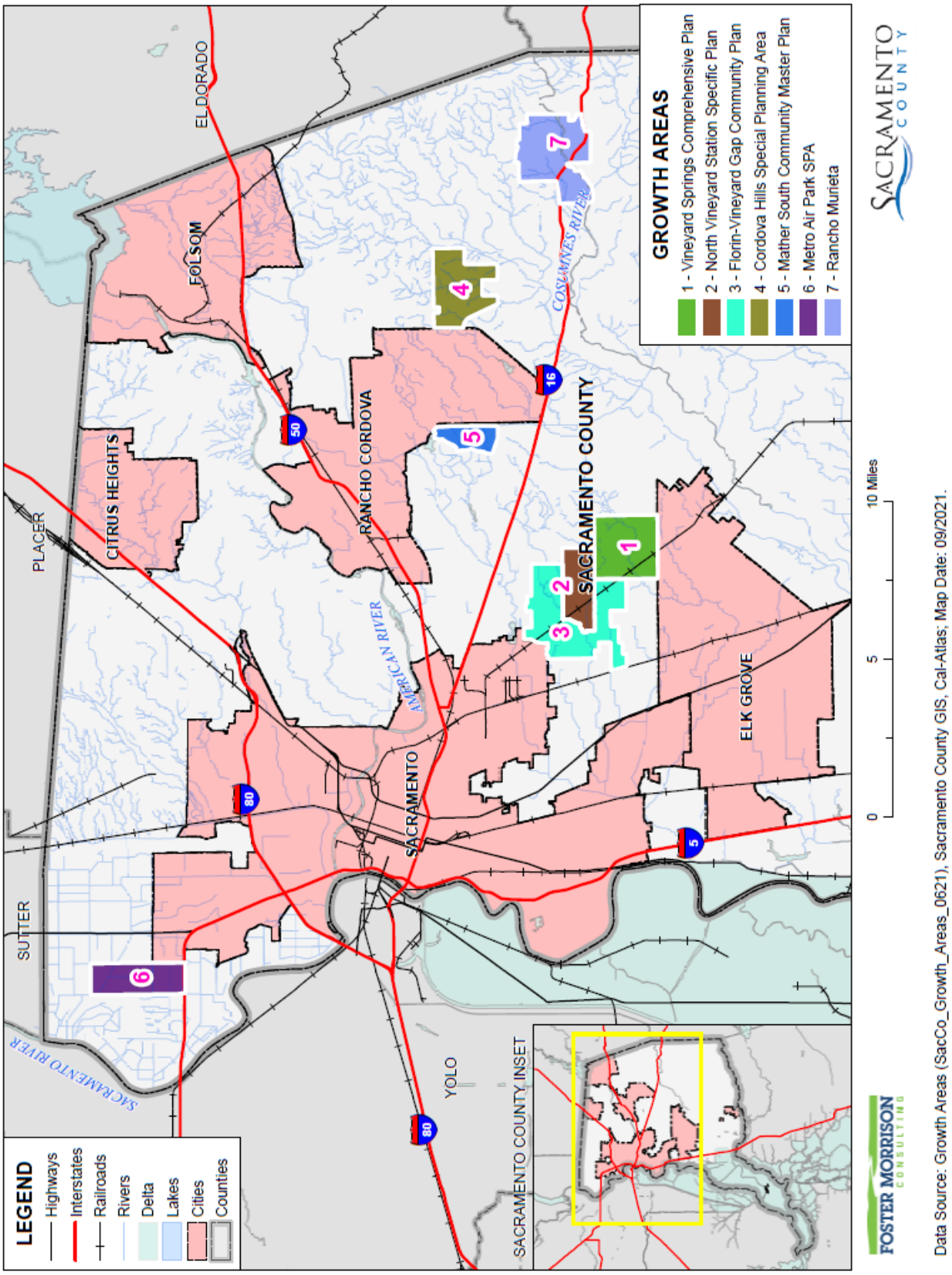


Table 4-19 Unincorporated Sacramento County – Future Development Areas

Map Number	Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
1	Vineyard Springs Comprehensive Plan	2,784	2,591	2,354
2	North Vineyard Station Specific Plan	1,850	1,466	1,497
3	Florin-Vineyard Gap Community Plan	1,036	821	3,699
4	Cordova Hills Special Planning Area	14		2,406
5	Mather South Community Master Plan	4		1,007
6	Metro Air Park SPA	74	4	1,807
7	Rancho Murieta	2,943	2,592	3,223
Grand Total		**8,705**	**7,474**	**15,994**

Source: Sacramento County GIS

4.3 Hazard Profiles and Vulnerability Assessment

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The hazards identified in Section 4.1 Hazard Identification, are profiled individually in this section. These hazard profiles set the stage for the Vulnerability Assessment, where the vulnerability is quantified for each of the hazards.

Hazard Profiles

Each hazard is profiled in the following format:

- **Hazard/Problem Description**—This section gives a description of the hazard and associated issues followed by details on the hazard specific to the Sacramento County Planning Area and the unincorporated County. Where known, this includes information on the hazard location, extent, seasonal patterns, speed of onset/duration, and magnitude and/or any secondary effects.
- **Past Occurrences**—This section contains information on historical hazard events, including location, impacts, and damages where known. Hazard research, historical incident worksheets and other input from the HMPC were used to capture information on past occurrences.
- **Frequency/Likelihood of Future Occurrence**—The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. It was determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance of the event happening in any given year (e.g., three droughts over a 30-year period equates to a 10 percent chance of experiencing a drought in any given year). The likelihood of future occurrences is categorized into one of the following classifications:
  - ✓ **Highly Likely**—Near 100 percent chance of occurrence in next year or happens every year

- ✓ **Likely**—Between 10 and 100 percent chance of occurrence in next year or has a recurrence interval of 10 years or less
- ✓ **Occasional**—Between 1 and 10 percent chance of occurrence in the next year or has a recurrence interval of 11 to 100 years
- ✓ **Unlikely**—Less than 1 percent chance of occurrence in next 100 years or has a recurrence interval of greater than every 100 years.

- **Climate Change**—This section contains the effects of climate change (if applicable). The possible ramifications of climate change on each hazard are discussed.

Vulnerability Assessment

With Sacramento County's hazards identified and profiled, a vulnerability assessment was conducted to describe the vulnerability and impact that each hazard would have on the County. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to identified hazards and estimates potential losses. This section focuses on the vulnerabilities of the Sacramento County Planning Areas (i.e., unincorporated Sacramento County) as a whole.

An estimate of the vulnerability of the Sacramento County Planning Area and the unincorporated County to each identified hazardis provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Other information can be collected in regard to the hazard area, such as the location of critical community facilities, historic structures, and valued natural resources. Together, this information conveys the impact, or vulnerability, of the Sacramento County Planning Area to that hazard.

The vulnerability assessment identified five hazards in the Planning Area for which specific geographical hazard areas have been defined and for which sufficient data exists to support a quantifiable vulnerability analysis. These five hazards are dam failure, earthquake, flood, levee failure, and wildfire. The vulnerability of the flood dam failure, (1%/0.2% annual chance), levee failure, and wildfire hazards were analyzed using GIS and County parcel and assessor data.

FEMA's loss estimation software, HAZUS-MH, was used to analyze the County's vulnerability to earthquakes.

For dam failure, flood (1%/0.2% annual chance), levee failure, and wildfire, the following elements were inventoried for each community, to the extent possible, to quantify vulnerability in identified hazard areas:

- General vulnerability and hazard-related impacts, including impacts to life, safety, and health
- Values at risk (i.e., types, numbers, and value of land and improvements)
- Population at risk
- Critical facilities at risk
- Overall community impact
- Future development/development trends within the identified hazard area

The vulnerability and potential impacts from priority hazards that do not have specific mapped areas nor the data to support additional vulnerability analysis are discussed in more general terms. These include:

- Climate Change
- Drought & Water Shortage
- Floods: Localized Stormwater
- Landslides, Mudslides, and Debris Flow
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Severe Weather: Wind and Tornado
- Subsidence
- Volcano

The following sections provide the hazard profile and vulnerability assessments for each of the hazards identified in Section 4.1 Hazard Identification. The severe weather hazards are discussed first to paint the picture of the County's climate and hazard environment which often lead to other hazards such as flood and wildfire. The remainder of the hazards follow alphabetically.

Power Shortage/Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional.

Intentional Disruptions

There are four types of intentional disruptions:

- **Planned**: Some disruptions are intentional and can be scheduled based maintenance or upgrading needs
- **Unscheduled**: Some intentional disruptions must be done "on the spot." in response to an emergency
- **Demand-Side Management**: Some customers (i.e., on the demand side) have entered into an agreement with their utility provider to curtail their demand for electricity during periods of peak system loads
- **Load Shedding**: When the power system is under extreme stress due to heavy demand and/or failure of critical components, it is sometimes necessary to intentionally interrupt the service to selected customers to prevent the entire system from collapsing, resulting in rolling blackouts

The California Independent System Operator (CAISO) is tasked with managing the power distribution grid that supplies most of California, except in areas served by municipal utilities. CAISO is thus the entity that coordinates statewide flow of electrical supply. CAISO uses a series of stage alerts to the media based on system conditions. The alerts are:

- Stage 1 – reserve margin falls below 7 percent
- Stage 2 – reserve margin falls below 5 percent
- Stage 3 – reserve margin falls below 1.5 percent

Rotating blackouts become a possibility when Stage 3 is reached. Rotating outages and/or blackouts such as those experienced in 2000/2001 and 2006 can occur due to losses in transmission or generation and/or extremely severe temperatures that lead to heavy electric power consumption.

On January 17, 2001, CAISO declared a Stage 3 Emergency and notified the then Governor's Office of Emergency Services (Cal OES) that PG&E was dropping firm load of 500 megawatts (MW) in Northern California leading to rolling black-outs. Cal OES, in turn, issued an Electrical Emergency Message to all Emergency Services Agencies to prepare for rolling blackouts. This scenario was repeated the following day, January 18, 2001, and again on March 19, 2001.

A July 2006 heat storm event affected the entire state as well as most of the West, producing record energy demand levels in California. The state was able to avoid rotating outages due to a combination of favorable factors that included no major transmission outages, lower than typical generator outages, significant customer response to pleas for energy conservation, high imports from the Pacific Northwest despite unusually high loads, outstanding cooperation among western control area operators, and prompt response to fires that potentially threatened major interties. However, the event brought to light the vulnerability of the electric distribution system, as over 3,500 distribution transformers failed, leaving over two million customers without power at various times over the ten-day event, many for several hours and a small minority for up to three days.

In 2020, the state battled both extreme heat and wildfires. As a result of extreme heat, the CAISO declared a Stage 3 emergency. PG&E initiated rotating outages in August at the request of California's grid operator. The outages, which impacted 220,000 customers, occurred during periods of high heat. These rolling blackouts lasted less than a week. During this time, SMUD issued no PSPS outages.

Unintentional Disruptions

Unintentional or unplanned disruptions are outages that come with essentially no advance notice. This type of disruption can be the most problematic. The following are categories of unplanned disruptions:

- Accident by the utility, utility contractor, or others
- Malfunction or equipment failure
- Equipment overload (utility company or customer)
- Reduced capability (equipment that cannot operate within its design criteria)
- Tree contact other than from storms
- Vandalism or intentional damage
- Weather, including lightning, wind, earthquake, flood, and broken tree limbs taking down power lines
- Wildfire that damages transmission lines

Climate Change and Energy Shortage

Changing climate is expected to bring more frequent and intense natural disasters. Key climate parameters are starting to move outside of historically observed variability at a rate that makes historical data a poor predictor of future climate. For example, the warmest years on record in California occurred in 2014, 2015, 2016, and 2019. 2020 is on pace to be a remarkably hot year as well. In addition, the 2016-2017 year broke the record as the wettest ever recorded in the northern Sierra Nevada Mountains.

Changes in temperatures, precipitation patterns, extreme events, and sea level rise have the potential to decrease the efficiency of thermal power plants and substations, decrease the capacity of transmission lines, render hydropower less reliable, spur an increase in electricity demand, and put energy infrastructure at risk of flooding.

With climate warming, higher costs from increased demand for cooling in the summer are expected to outweigh the decreases in heating costs in the cooler seasons. Hotter temperatures in California will mean more energy (typically measured in "cooling-degree days") needed to cool homes and businesses both during heat waves and on a daily basis, during the daytime peak of the diurnal temperature cycle. During future heat waves, historically cooler coastal cities (e.g., San Francisco and Los Angeles) are projected to experience greater relative increases in temperature, such that areas that never before relied on air conditioning will experience new cooling demands.

Secondary impacts of energy shortages are most often felt by vulnerable populations. For example, those who rely on electric power for life-saving medical equipment, such as respirators, are extremely vulnerable to power outages. Also, during periods of extreme heat emergencies, the elderly and the very young are more vulnerable to the loss of cooling systems requiring power sources.

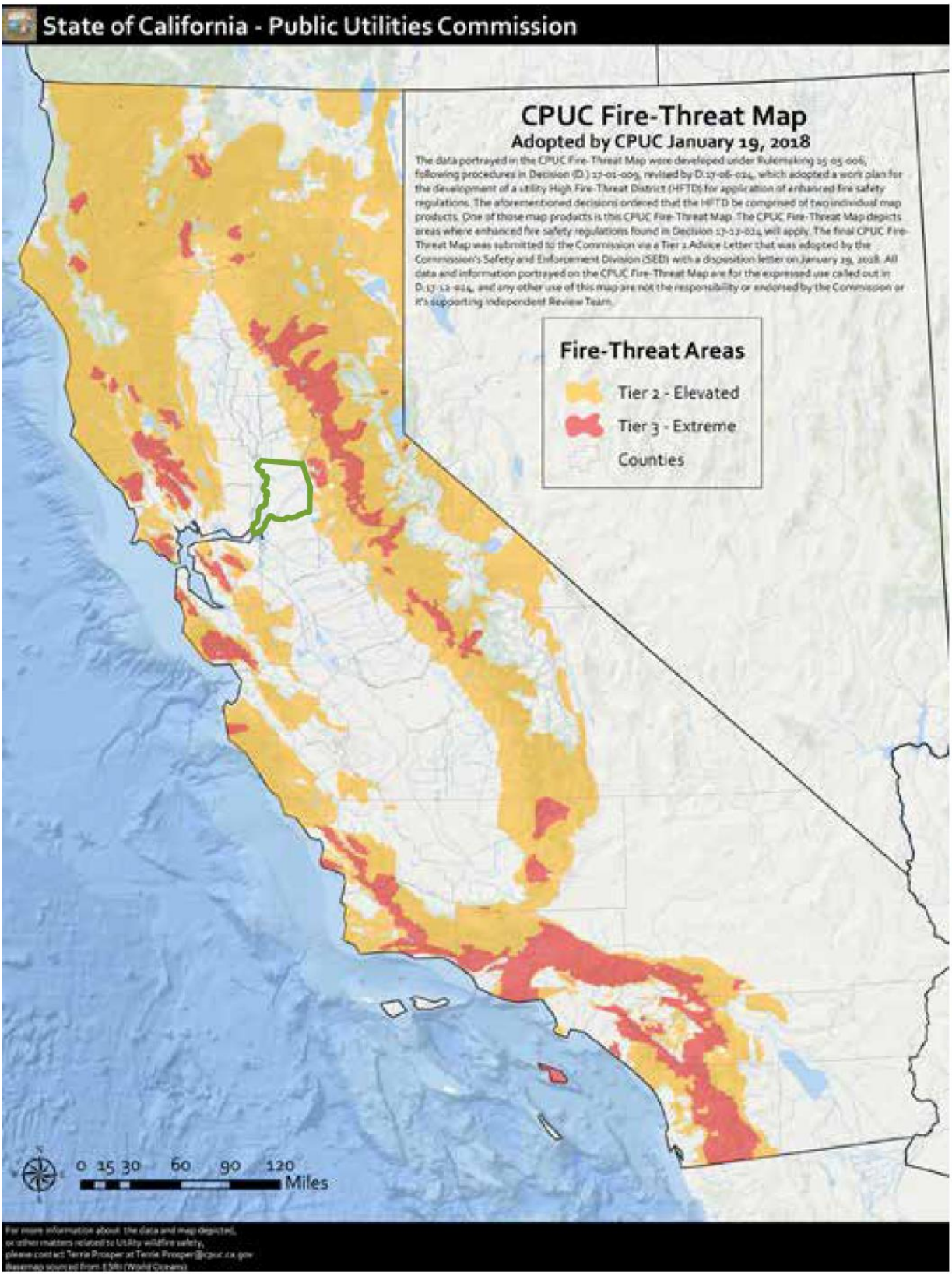
Additional impacts from a power disruption affect remote areas. This includes evacuation messaging and coordination difficulties, and a reduction in firefighting capabilities due to lack of water access in more remote areas (especially for those on wells).

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power shortage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E and SMUD), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a Public Safety Power Shutoff (PSPS).

Power in the County is provided by PG&E and SMUD. Only a portion of the Delta south of Locke and Walnut Creek is supplied by PG&E. The remainder of the County lies in SMUDs service territory (see Figure 4-15). SMUD directly participated in the development of the CPUC's Fire-Threat Map, which defines a Statewide high fire threat district (HFTD). SMUD has incorporated the HFTD map into its construction, inspection, maintenance, repair and clearance practices, where applicable.

Figure 4-15 SMUD Service Territory



Source: SMUD

SMUD has never experienced a catastrophic wildfire involving its facilities. SMUD's service area has a much lower wildfire risk profile than other areas in the State that have suffered destructive wildfires in recent years. When ignition events occur they have historically been limited in scope. This is largely due to SMUD's more urban environment, flatter terrain, grasslands and other fuel sources outside forested areas and fewer wind events.

No SMUD or PG&E PSPS events have occurred in the County.

Public Safety Power Shutoff Criteria

The Wildfire Safety Operations Center (WSOC) monitors fire danger conditions across PG&E and SMUD service area and evaluates whether to turn off electric power lines in the interest of safety. While no single factor will drive a Public Safety Power Shutoff, some factors include:

- A Red Flag Warning declared by the National Weather Service
- Low humidity levels generally 20% and below
- Forecasted sustained winds generally above 25 mph and wind gusts in excess of approximately 45 mph, depending on location and site-specific conditions such as temperature, terrain and local climate
- Condition of dry fuel on the ground and live vegetation (moisture content)
- On-the-ground, real time observations from PG&E's WSOC and field observations from PG&E crews

The most likely electric lines to be considered for shutting off for safety will be those that pass through areas that have been designated by the CPUC as at elevated (Tier 2) or extreme (Tier 3) risk for wildfire (seen on Figure 4-15). This includes both distribution and transmission lines. The specific area and number of affected customers will depend on forecasted weather conditions and which circuits PG&E and/or SMUD needs to turn off for public safety. Although a customer may not live or work in a high fire-threat area, their power may also be shut off if their community relies upon a line that passes through an area experiencing extreme fire danger conditions. This means that any customer who receives electric service from PG&E and/or SMUD, especially those located in Tier 2 or 3 boundaries, should be prepared for a possible PSPS.

PG&E and SMUD noted that extreme weather threats can change quickly. When possible, PG&E/SMUD will provide customers with advance notice prior to turning off the power, as well as updates until power is restored. Timing of notifications (when possible) are:

- Approximately 48 hours before power is turned off
- Approximately 24 hours before power is turned off
- Just before power is turned off
- During the public safety outage
- Once power has been restored

Data Sources

In general, information provided by the County and HMPC members is integrated into this section with information from other data sources. The data sources listed below formed the basis for this Hazard Profiles

and Vulnerability section of this Plan. Where data and information from these studies, plans, reports, and other data sources were used, the source is referenced as appropriate throughout this risk assessment.

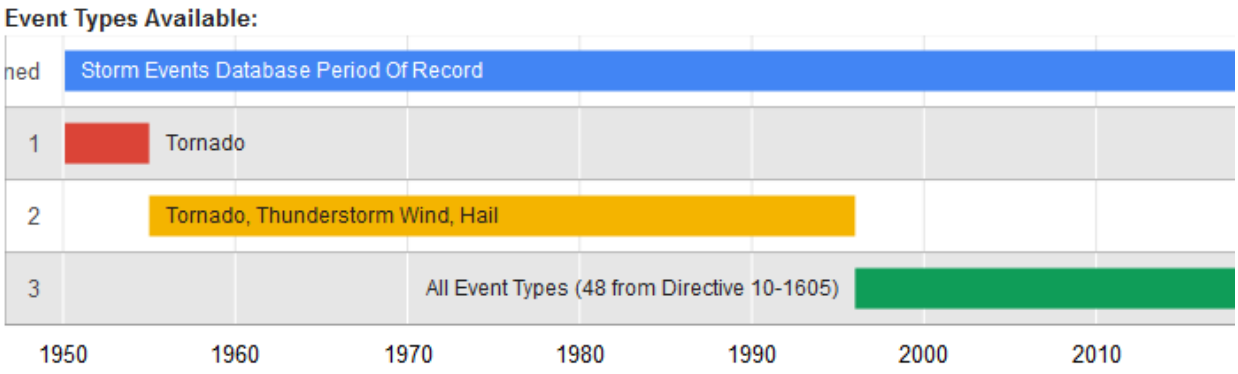
- 2018 California State Hazard Mitigation Plan
- ArkStorm at Tahoe - Stakeholder Perspectives on Vulnerabilities and Preparedness for an Extreme Storm Event in the Greater Lake Tahoe, Reno and Carson City Region. 2014.
- Bureau of Land Management
- CA DWR Best Available Maps
- CAL FIRE GIS datasets
- Cal OES
- Cal-Adapt
- Cal-Adapt – Annual Average of Acres Burned
- Cal Adapt – Extended Drought Scenarios
- Cal-Adapt – Number of Extreme Heat Days by Year
- Cal-Adapt – Precipitation: Decadal Averages Map
- California Adaptation Planning Guide
- California Climate Adaptation Strategy (CAS) – 2014
- California Department of Water Resources
- California Department of Water Resources (CA DWR) Division of Safety of Dams
- California Department of Water Resources Best Available Maps
- California Division of Mines and Geology
- California Geological Survey
- California Office of Emergency Services – Dam Inundation Data
- California's Drought of 2007-2009, An Overview. State of California Natural Resources Agency, California Department of Water Resources.
- Climate Change and Health Profile Report – Sacramento County
- Existing plans and studies
- FEMA
- FEMA: Building Performance Assessment: Oklahoma and Kansas Tornadoes
- FEMA's HAZUS-MH 4.2 GIS-based inventory data
- Integrated Regional Water Management Plan
- IPCC Fifth Assessment Synthesis Report (2014)
- Kenward, Alyson PhD, Adams-Smith, Dennis, and Raja, Urooj. Wildfires and Air Pollution – The Hidden Health Hazards of Climate Change. Climate Central. 2013.
- Levees in History: The Levee Challenge. Dr. Gerald E. Galloway, Jr., P.E., Ph.D., Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR.
- Liu, J.C., Mickley, L.J., Sulprizio, M.P. et al. Climatic Change. 138: 655. doi:10.1007/s10584-016-1762-6. 2016.
- Multi-Hazard Identification and Risk Assessment, FEMA 1997
- National Drought Mitigation Center
- National Drought Mitigation Center – Drought Impact Reporter
- National Integrated Drought Information System
- National Levee Database
- National Oceanic and Atmospheric Administration's National Climatic Data Center
- National Weather Service
- Natural Resource and Conservation Service

- NOAA Storm Prediction Center
- Pacific Gas and Electric Company
- Personal interviews with planning team members and staff from the County
- Sacramento County Climate Adaptation Plan (2017 Final and 2021 Draft Update)
- Sacramento County 2035 General Plan
- Sacramento County Department of Water Resources
- Sacramento County General Plan Environmental Impact Report
- Sacramento County General Plan Open Space Element Background
- Sacramento Bee
- Sacramento County Airport System
- Sacramento County Agricultural Commissioner's Reports, 2010-2014
- Sacramento County Flood Insurance Study, June 16, 2015
- Sacramento County Department of Water Resources – 2011 to 2015 Storm Reports
- Sacrament County 2035 General Plan
- Sacramento County General Plan Background Report
- Sacramento County Watershed Management Plan
- Sacramento County WMA Strategic Plan
- Proceedings of the National Academy of Sciences
- Public Health Alliance of Southern California
- Public Policy Institute of California
- Science Magazine
- Statewide GIS datasets from other agencies such as Cal OES, FEMA, USGS, CGS, Cal Atlas, and others
- U.S. Census Bureau 2010 Household Population Estimates
- U.S. Fish and Wildlife Service
- U.S. Fish and Wildlife Service's National Wetlands Inventory maps
- U.S. Forest Service GIS datasets
- U.S. Geological Survey
- U.S. Occupational Safety and Health Administration
- United States Geological Survey Open File Report 2015-3009
- University of California
- US Army Corps of Engineers
- US Department of Agriculture
- US Farm Service Agency
- US Fish and Wildlife Service
- USDA Forest Service Region 5
- USGS Bulletin 1847
- USGS National Earthquake Information Center
- USGS Publication 2014-3120
- Vaisala National Lightning Detection Network
- Western Regional Climate Center
- World Health Organization
- Written descriptions of inventory and risks provided by Sacramento County

4.3.1. Severe Weather: General

Severe weather is generally any destructive weather event, but usually occurs throughout the Sacramento County Planning Area as localized storms that bring heavy rains and floods; severe cold, and winter weather; extreme heat, and strong winds. The NOAA's NCDC has been tracking severe weather since 1950. Their Storm Events Database contains data on the following events shown on Figure 4-16.

Figure 4-16 NCDC Storm Events Database Period of Record



Event Types Available:
Add more info about event types here. Link to collections page/tab when referencing data collection source.

1. Tornado: From 1950 through 1954, only tornado events were recorded.

2. Tornado, Thunderstorm Wind and Hail: From 1955 through 1992, only tornado, thunderstorm wind and hail events were keyed from the paper publications into digital data. From 1993 to 1995, only tornado, thunderstorm wind and hail events have been extracted from the Unformatted Text Files.

3. All Event Types (48 from Directive 10-1605): From 1996 to present, 48 event types are recorded as defined in NWS Directive 10-1605.

Source: NCDC

The NCDC's Storm Events Database contains data on the following: all weather events from 1993 to current (except from 6/1993-7/1993); and additional data from the Storm Prediction Center, which includes tornadoes (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains 338 severe weather events that occurred in Sacramento County between January 1, 1950, and May 31, 2020. Table 4-20 summarizes these events.

*Table 4-20 NCDC Severe Weather Events for Sacramento County 1950-5/31/2020**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Cold/Wind Chill	14	0	1	0	0	$0	$0
Dense Fog	6	6	1	38	0	$2,120,000	$0
Dense Smoke	2	0	0	0	0	$0	$0
Drought	32	0	0	0	0	$0	$0

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Excessive Heat	5	6	2	1	0	$0	$0
Extreme Cold/Wind Chill	1	0	0	0	0	$0	$0
Flash Flood	4	1	0	0	0	$4,400,000	$0
Flood	80	1	0	1	0	$8,877,000	$7,800,000
Frost/Freeze	8	0	0	0	0	$200,000	$5,000,000
Funnel Cloud	7	0	0	0	0	$0	$0
Hail	9	0	0	0	0	$111,030	$0
Heat	33	0	1	30	1	$0	$0
Heavy Rain	28	0	0	1	0	$365,000	$50,000
Heavy Snow	1	0	0	0	0	$0	$0
High Surf	1	0	0	0	0	$0	$0
High Wind	40	1	0	0	0	$8,957,000	$39,000
Lightning	1	0	0	0	0	$150,000	$0
Strong Wind	26	0	2	2	1	$3,651,000	$0
Thunderstorm Winds	9	0	0	0	0	$50,000	$0
Tornado	13	0	0	0	0	$1,480,000	$0
Wildfire	7	0	1	2	0	$5,000,000	$0
Winter Storm	2	0	0	0	0	$0	$0
Total	**329**	**15**	**8**	**75**	**2**	**$35,361,030**	**$12,889,000**

Source: NCDC

*Note: Losses reflect totals for all impacted areas, some of which fell outside of Sacramento County

The NCDC table above summarize severe weather events that occurred in Sacramento County. Only a few of the events actually resulted in state and federal disaster declarations. It is further interesting to note that different data sources capture different events during the same time period, and often display different information specific to the same events. The value in this data is that it provides data depicting the County's "big picture" hazard environment.

As previously mentioned, many of Sacramento County's state and federal disaster declarations have been a result of severe weather. For this plan, severe weather is discussed in the following subsections:

- Extreme Cold and Freeze
- Extreme Heat
- Heavy Rains and Storms
- High Winds and Tornadoes

For purposes of this Plan, the City of Sacramento co-op weather station (elevation: 70 feet above mean sea level (msl)) was used to illustrate and inform the severe weather hazards. This station was chosen due to its length of record (1877 to 2016).

4.3.2. Severe Weather: Extreme Cold and Freeze

Hazard Profile

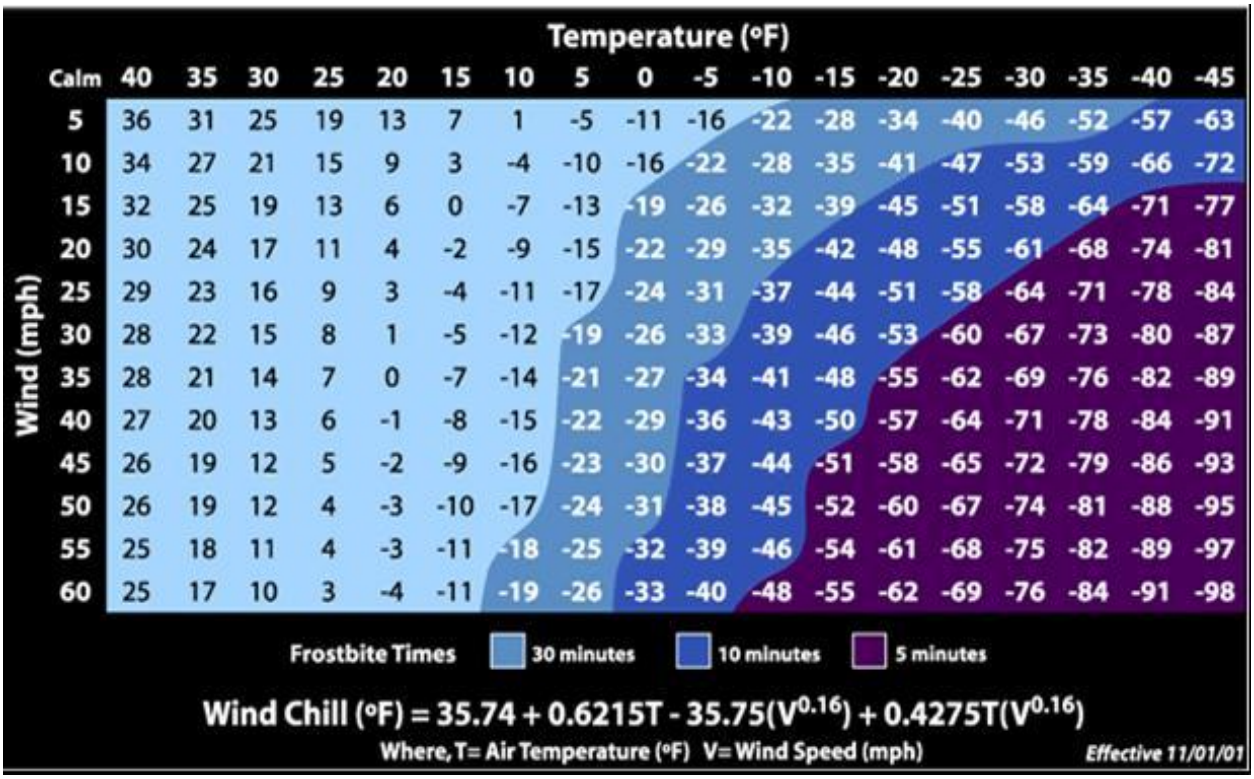
This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

According to the National Weather Service (NWS) and the Western Regional Climate Center (WRCC), extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures can cause significant damage to the agricultural industry.

In 2001, the NWS implemented an updated Wind Chill Temperature index (shown in Figure 4-17), which is reproduced below. This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4-17 Wind Chill Temperature Chart



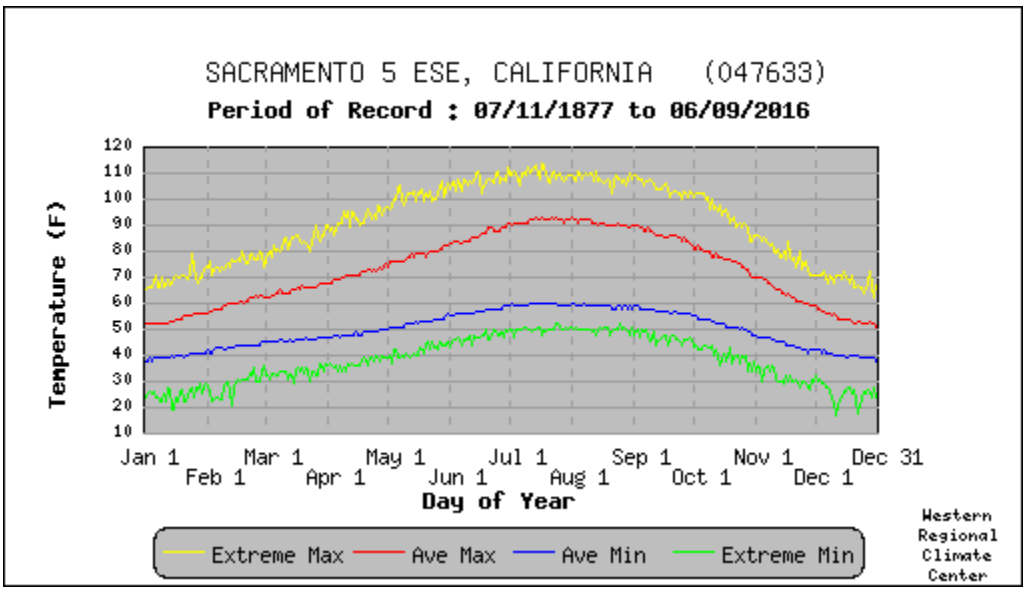
Source: National Weather Service

Information on extreme cold and freeze from the WRCC coop station for the County is shown below.

Sacramento County— Sacramento 5 ESE Weather Station, Period of Record 1877 to 2016

According to the WRCC, monthly average minimum temperatures in the County from November through April range from the upper-30s to the upper-50s. The lowest recorded daily extreme was 17°F on December 11, 1932. In a typical year, minimum temperatures fall below 32°F on 8.3 days with no days falling below 0°F. Average daily temperatures for Sacramento County are shown in Figure 4-18. Table 4-21 shows the record low temperatures by month for Sacramento County.

Figure 4-18 Sacramento County— Daily Temperature Averages and Extremes



Source: Western Regional Climate Center

Table 4-21 Sacramento County – Record Low Temperatures 1877 to 2016

Month	Record Low	Date	Month	Record Low	Date
January	19°	1/14/1888	July	47°	7/3/1901
February	21°	2/13/1884	August	48°	8/30/1887
March	29°	3/15/1880	September	44°	9/18/1882
April	34°	4/10/1927	October	34°	10/30/1935
May	37°	5/3/1950	November	27°	11/28/1880
June	43°	6/1/1929	December	17°	12/11/1932

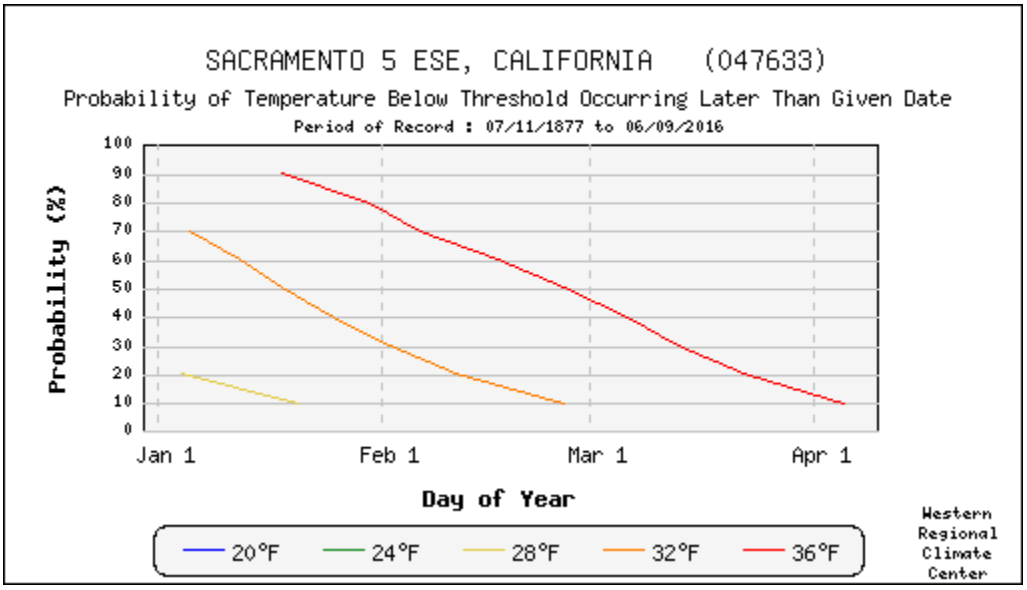
Source: Western Regional Climate Center

Location and Extent

Extreme cold and freeze events occur on a regional basis. Extreme cold can occur in any location of the County. All portions of the County are at risk to extreme cold. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of freeze, temperature data for the County from the WRCC

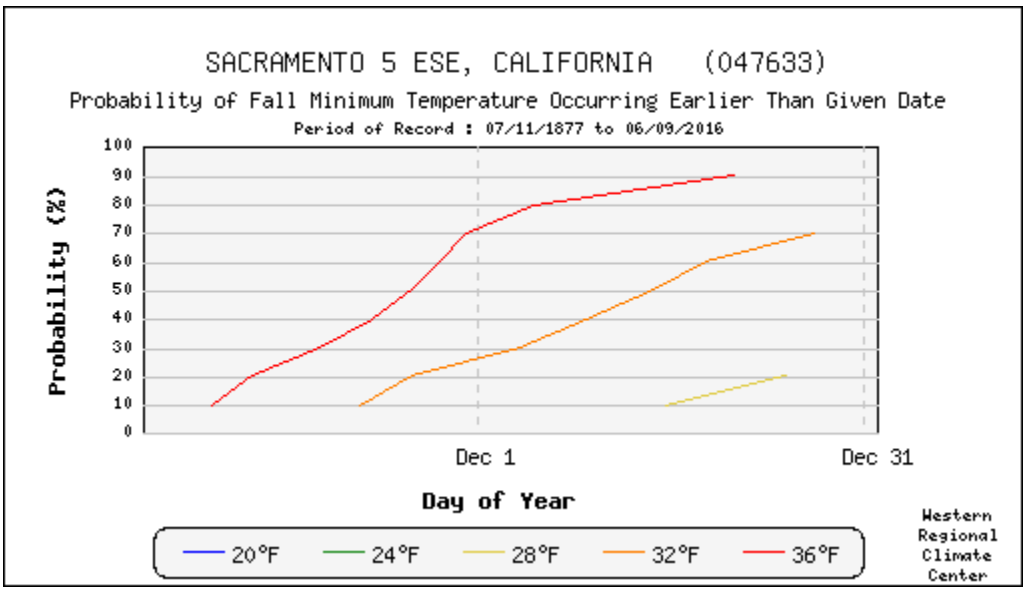
indicates that there are 8.3 days that fall below 32°F. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days to weeks at a time. Figure 4-19 and Figure 4-20 show the probabilities in the County of freeze for both spring and fall.

Figure 4-19 Sacramento County – Spring Freeze Probabilities



Source: Western Regional Climate Center

Figure 4-20 Sacramento County – Fall Freeze Probabilities



Source: Western Regional Climate Center

Past Occurrences

Disaster Declaration History

The County has had no past federal or state disaster declarations for extreme cold and freeze, as shown on Table 4-4.

NCDC Events

The NCDC reports 26 events of past extreme cold and freeze for Sacramento County since 1996 as shown on Table 4-22. Specific events from the NCDC database that caused injuries, deaths, or damages in Sacramento County are discussed below the table.

*Table 4-22 NCDC Winter Storm and Freeze Events for Sacramento County 1996-5/31/2020**

Event Type	Number of Events	Deaths	Deaths (indirect	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Cold/Wind Chill	14	0	1	0	0	$0	$0
Extreme Cold/Wind Chill	1	0	0	0	0	$0	$0
Frost/Freeze	8	0	0	0	0	$200,000	$5,000,000
Heavy Snow	1	0	0	0	0	$0	$0
Winter Storm	2	0	0	0	0	$0	$0
Total	**26**	**0**	**1**	**0**	**0**	**$200,000**	**$5,000,000**

Source: NCDC

*Note: Losses reflect totals for all impacted areas, some of which fell outside of Sacramento County

- **December 4, 1998** – A substantial freeze occurred as valley temperatures dropped into the middle to upper 20s.
- **December 6, 1998** – The second Arctic blast in a five-day period produced well below normal temperatures. The cold air not only affected the Northern Sacramento Valley, but also seeped south into the Northern San Joaquin Valley. Record low temperatures as well as low maximum temperatures were recorded at the Sacramento Executive Airport. The City of Sacramento reported a low of 27°.
- **December 29, 1998** – The third Arctic airmass of the month to spread into the Central California interior was the coldest of the three and produced large amounts of crop damage/loss. Downtown Sacramento experienced 6 consecutive days with low temperatures at or below freezing. The lowest temperature recorded downtown was 26°. $2.4 million in crop damages were reported in Sacramento and surrounding counties. A USDA disaster declaration was declared for the County.
- **December 6, 2005 –** Morning temperatures dropped into the 20s across the Sacramento and Northern San Joaquin Valleys. A record low temperature was tied in Sacramento. The temperature at Sacramento Executive Airport dropped to 28°, which tied the record set in 1980.
- **November 30, 200**6 – Clear skies and a cold arctic airmass led to freezing temperatures across the Planning Area. Temperatures dropped to the mid to upper 20s, which was near record values for the date.
- **January 14-23, 2007** – A very cold arctic airmass settled over the region and temperatures in the Central Valley of California dropped sharply for a relatively prolonged period of time. Many

temperature records were tied and broken during the episode and the damage to area crops was extensive.

- **April 20-24, 2008** – A cool and dry airmass coupled with light winds resulted in cold morning temperatures from April 20th to the 24th in the Planning Area. Record low temperatures were set in several locations. Frost and freezing temperatures caused significant damage to young walnuts, prunes, peaches, pears, and wine grapes across the area.
- **December 4, 2008** – High pressure over the area brought light winds and clear skies. This allowed the unusual case of a record minimum and a record maximum both being tied on the same day in the northern Sacramento Valley. Light winds and clear skies brought cold morning temperatures to the northern Sacramento Valley.
- **December 6-10, 2009** – A very cold airmass brought a hard freeze and record cold to the northern Central Valley. Many pipes in homes and businesses froze and burst, including those for fire sprinkler systems. Some crop damage in orchards was also reported. A hard freeze caused pipes and sprinkler systems to burst throughout the southern Sacramento Valley, causing water damage to homes and businesses. There were nine water main breaks reported in Sacramento, with eighty-two customers reporting problems with leaking pipes.
- **February 19, 2018** – Almond trees were in critical bloom and early nutlet stage during the freeze/frost event. Damage has been projected as significant, but it is too early for specific details. Temperatures at Sacramento International Airport reached 26 on the 20th, 27 at Sacramento Mather Airport and at McClellan Airfield. Vacaville Nut Tree Airport reached 28 on the 20th and 21st.

Hazard Mitigation Planning Committee Events

County Office of Emergency Services (OES) and other departments provided input and After Action Reports that noted that extreme cold events continue to occur on an annual basis. Past events of note include:

- An extreme cold event took place in 2014:
  - ✓ The Sacramento region experienced an extreme cold event beginning Tuesday evening, December 30th, 2014 and extending through Friday morning, January 2nd, 2015. During that time, Sacramento experienced sustained cold indices ranging from 50-56 degree highs with associated low temperatures ranging from 27-36 degrees.
  - ✓ In preparation for the cold event, the County OES initiated a daily conference call, which began December 29th and included all of the community stakeholders and partnering agencies, to advise them of the situation and to plan for the event. The forecasted temperatures were expected to reach the temperature thresholds established in the Severe Weather Guidance Plan (SWG) beginning on Tuesday evening, December 30th at which time additional actions may be needed.
  - ✓ At the onset of the conference calls, the County and City of Sacramento made the decision to open a joint warming center located in the City of Sacramento at the Southside Park Pool Building at 2107 6th Street. At the same time, the City of Elk Grove and the City of Galt decided to open warming centers in their jurisdictions as well; the Wackford Community Center on Bruceville Rd. in Elk Grove and the Chabolla Community Center on Chabolla Ave. in Galt opened on December 31st. Sacramento County OES and Sacramento City OES opened and maintained the Southside Park warming center for three days, beginning Tuesday evening, December 30th and ending on Friday morning, January 2nd. The warming center was closed at 7:00 a.m. on January 2nd ending the County/City response to the cold event. At total of 36 people stayed at the warming center

during this cold weather event. While vouchers were available for families or for people with significant disabilities, no vouchers were issues.

- ✓ Both the City and County OES, along with the City Parks & Recreation, County Department of Human Assistance (DHA) Hands on Sacramento (HOS) Sacramento Medical Reserve Corp. (SMRC) and others worked cooperatively in activating and managing the warming center in order to provide a warm environment for the community including the homeless. Other services provided included light snacks and hot beverages. In addition to the County and City warming operations, the homeless providers continued to operate their independent facilities thereby providing a warm environment for the homeless.

- ➢ It was noted by the Sacramento County OES that due to environmental exposure due to extreme cold events:
  - ✓ 6 deaths occurred in 2018
  - ✓ Another six occurred in 2019
  - ✓ 2 deaths occurred in 2021

Likelihood of Future Occurrence

Highly Likely—Extreme cold and freeze are likely to continue to occur annually in the Sacramento County Planning Area. In a typical year, minimum temperatures fall below 32°F on 18.3 days in the County. This equates to a likelihood of future occurrences being considered highly likely.

Climate Change and Extreme Cold and Freeze

Climate change and extreme cold and freeze future occurrences are discussed in the following two sections:

- ➢ California Climate Adaptation Strategy (2014)
- ➢ Sacramento County Climate Action Plan, (2017/2021)

California Climate Adaptation Strategy

According to the CAS, freezing spells are likely to become less frequent in California as climate temperatures increase; if emissions increase, freezing events could occur only once per decade in large portion of the State by the second half of the 21st century. According to a California Natural Resources Report in 2014, it was determined that while fewer freezing spells would decrease cold related health effects, too few freezes could lead to increased incidence of disease as vectors and pathogens do not die off.

2017 Sacramento County Climate Action Plan (CAP)/2021 Draft Climate Action Plan Update

According to the 2017 CAP and the Draft 2021 CAP, which utilized Cal Adapt to model potential climate change impacts to Sacramento County, annual average low temperatures in Sacramento County of 49.8°F (from 1961-1990) would increase under the low admissions scenario by 1.6°F to 51.4°F. Under the high emissions scenario, the average annual low temperature is projected to increase by 6.0°F to 55.8°F by 2099.

Vulnerability Assessment

Vulnerability—Medium

Extreme cold and freeze events happen in Sacramento County each year. It can impact both populations and structures in the County.

Impacts

Extreme cold and freeze events happen in Sacramento County each year. Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to cold can cause frostbite or hypothermia and can be life-threatening. Vulnerable populations to cold and freeze include:

- Homeless
- Infants and children under age five
- Elderly (65 and older)
- Individuals with disabilities
- Individuals dependent on medical equipment
- Individuals with impaired mobility

Of significant concern is the impact to populations with special needs such as the elderly and those requiring the use of medical equipment. The residents of nursing homes and elder care facilities are especially vulnerable to extreme temperature events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of extreme cold and freeze. In addition to vulnerable populations, pets and livestock are at risk to freeze and cold.

Impacts to the County as a result of extreme cold and freeze include damage to infrastructure, utility and power outages, road closures, traffic accidents, and interruption in business and school activities. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Freezing temperatures and ice can cause accidents and road closures and can cause significant damage to the agricultural industry. Extreme cold can affect agricultural products and cattle in the County. Freeze damages reduce the values of agricultural crops. Delays in emergency response services can also occur.

Future Development

Future development built to code should be able to withstand extreme cold and freeze. Pipes at risk of freezing should be mitigated be either burying or insulating them from freeze as new facilities are improved or added. Current County codes provide such provisions for new construction. Vulnerability to extreme cold will increase as the average age of the population in the County shifts resulting in a larger number of senior citizens in the Planning Area.

4.3.3. Severe Weather: Extreme Heat

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died.

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds a level at which the body can remove it, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise, and heat-related illness may develop. Elderly persons, small children, chronic invalids, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions.

Extreme heat can also affect agriculture in Sacramento County. During times of high heat, low humidity, and winds, PSPS may also be issued for areas of the County. Other power outages are also a concern during extended heat events that occasionally overwhelm the utility companies, leading to temporary outages. Extreme heat conditions can also compound the effects of other hazards, such as drought and wildfire and can contribute to increases in tree mortality.

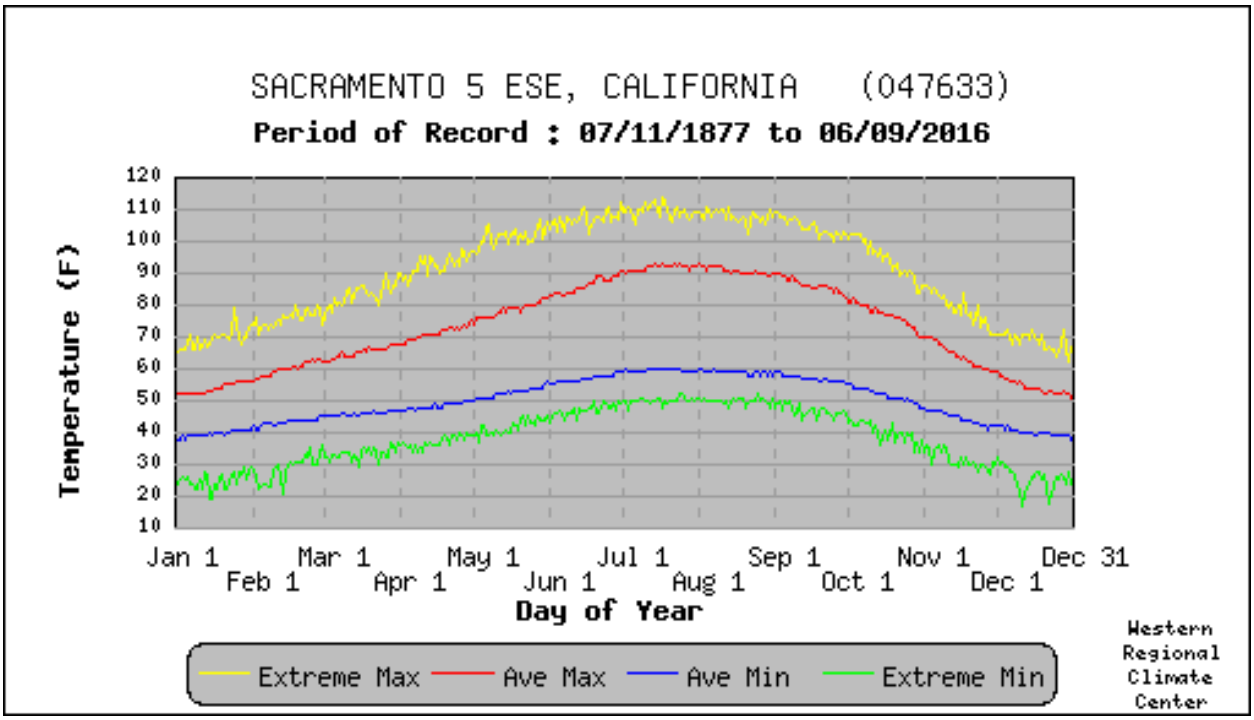
Location and Extent

Extreme heat events occur on a regional basis. Extreme heat can occur in any location of the County. All portions of the County are at some risk to extreme heat. Extreme heat occurs throughout the Planning Area primarily during the summer months. The WRCC maintains data on weather normal and extremes in the western United States. Information from the representative weather station introduced in Section 4.3.1 is summarized below.

Sacramento 5 ESE Weather Station, Period of Record 1877 to 2016 (Elevation of 70 feet above msl)

According to the WRCC, in Sacramento County, monthly average maximum temperatures in the warmest months (May through October) range from the upper-70s to the low-90s. The highest recorded daily extreme was 114°F on July 17, 1925. In a typical year, maximum temperatures exceed 90°F on 65.4 days. Figure 4-21 shows the average daily high temperatures and extremes for the County. Table 4-23 shows the record high temperatures by month for the County.

Figure 4-21 Sacramento County—Daily Temperature Averages and Extremes



Source: Western Regional Climate Center, www.wrcc.dri.edu/

Table 4-23 Sacramento County – Record High Temperatures

Month	Record High	Date	Month	Record High	Date
January	74°	1/31/1976	July	114°	7/17/1925
February	80°	2/18/1899	August	111°	8/13/1933
March	90°	3/31/1966	September	109°	9/1/1950
April	98°	4/26/2004	October	102°	10/2/1952
May	107°	5/28/1984	November	86°	11/1/1966
June	112°	6/30/1934	December	72°	12/15/1958

Source: Western Regional Climate Center

Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly take the lives of vulnerable populations. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios. While heat waves are obviously less dramatic, they are potentially deadlier. According to the 2018 California State Hazard Mitigation Plan, the worst single heat wave event in California occurred in Southern California in 1955, when an eight-day heat wave resulted in 946 deaths.

The NWS has in place a system or scale to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk

potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Table 4-24.

Table 4-24 National Weather Service HeatRisk Categories

Category	Level	Meaning
Green	0	No Elevated Risk
Yellow	1	Low Risk for those extremely sensitive to heat, especially those without effective cooling and/or adequate hydration
Orange	2	Moderate Risk for those who are sensitive to heat, especially those without effective cooling and/or adequate hydration
Red	3	High Risk for much of the population, especially those who are heat sensitive and those without effective cooling and/or adequate hydration
Magenta	4	Very High Risk for entire population due to long duration heat, with little to no relief overnight

Source: National Weather Service

The NWS office in Sacramento can issue the following heat-related advisory as conditions warrant.

- **Heat Advisories** are issued during events where the HeatRisk is on the Orange/Red threshold (Orange will not always trigger an advisory)
- **Excessive Heat Watches/Warnings** are issued during events where the HeatRisk is in the Red/Magenta output

Past Occurrences

Disaster Declaration History

There have been no FEMA or Cal OES disasters related to extreme heat, as shown in Table 4-4.

NCDC Events

The NCDC data showed 38 extreme heat incidents for Sacramento County since 1993. Events that caused specific injuries or damage are discussed below the table.

*Table 4-25 NCDC Heat Events for Sacramento County 1950-5/31/2020**

Event Type	Number of Events	Deaths	Deaths (indirect	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Excessive Heat	5	6	2	1	0	$0	$0
Heat	33	0	1	30	1	$0	$0
Total	**38**	**6**	**3**	**31**	**1**	**$ 0**	**$ 0**

Source: NCDC

*Note: Losses reflect totals for all impacted areas, some of which fell outside of Sacramento County

- **July 11, 1999** – Afternoon high temperatures averaged 10 to 20 degrees above normal across the central and northern interior. No fatalities or severe heat related injuries were noted by area hospitals, although

there was an increase in lesser heat related illnesses caused by prolonged dehydration. Area utilities indicated that facilities were stressed during the event and the voluntary brown out program had to be utilized. SMUD also indicated they broke an all-time record on the 12th for electrical production and distribution. No injuries or fatalities were reported.

- **May 21, 2000** – Daily maximum temperatures across the area reached record levels for three consecutive days and most official reporting sites were fifteen to twenty degrees above normal readings. Sacramento tied or broke records on one or more days. The normal maximum temperature for Sacramento for this period is 82°, yet temperatures reached 100°, 103°, and 99°, all new daily records. No injuries or fatalities were reported.
- **June 13, 2000** – Very hot weather persisted across interior Northern California for three days, resulting in record and near record temperatures at most reporting sites. Sixteen people were treated for heat stroke in Sacramento and Solano counties and one, a 16-year-old male in West Sacramento, died. A heavily used portion of I-80 between Sacramento and San Francisco was closed for several hours to repair three lanes in which the asphalt had buckled due to the sustained heat. Power outages were suffered by more than 100,000 customers during the event. Maximum temperatures were fifteen to twenty degrees above normal throughout the valley and foothills, but what made the weather especially difficult to handle was that the minimum temperatures were also ten to twenty degrees above normal for the period. The hottest day across the area was the 14th, with maximum temperatures of 107°F in Sacramento. The maximum temperatures on the 8th, less than a week earlier, were 71°. Sacramento set a daily high minimum temperature record by dropping only to 68° on the 13th. No injuries or fatalities were reported.
- **July 29, 2000** – Excessive heat impacted the Sacramento and northern San Joaquin Valleys during the last few days of July. Temperatures reached and exceeded 100° in many areas before peaking on the 31st at 104° in Sacramento. No injuries or fatalities were reported.
- **September 18, 2000** – Daily maximum temperature records were tied and broken across the Sacramento and northern San Joaquin valleys. The Sacramento temperature reached 101°, which tied the record previously set in 1984. No injuries or fatalities were reported.
- **September 20, 2000** – The daily high maximum temperature record was set in Sacramento when it reached 102°, breaking the previous record of 101° set in 1994. No injuries or fatalities were reported.
- **July 1, 2005** – July 2005 set a new record for heat in Sacramento. The average temperature in Sacramento was 81.8° for the month. This was the hottest average temperature ever recorded in Sacramento. The old record was 81.6° set in July 2003. In addition, the average low temperature for the month of July was 65.2°, breaking the old record of 65.1° set in July 2003. However, the average high temperature record was not broken. The average for July 2005 was 98.4°, which is well below the record average high of 99.6° set in 1988.
- **July 4-5, 2007** – High pressure over the western United States brought record heat to Northern California on July 4th and 5th. New daily high temperature records were set today at the Downtown Sacramento and the Sacramento Executive Airport sites. At Downtown Sacramento, the temperature reached 108°, which broke the old record of 107° set in 1931. At Sacramento Executive Airport, the temperature reached 107°, which broke the old record of 105° set in 1968.
- **August 23, 2007** – High pressure over California resulted in hot conditions in the Planning Area. Temperatures in excess of 100° were recorded at many locations in the Planning Area.
- **May 15-18, 2008** – A strong high pressure ridge over the region produced hot temperatures across interior Northern California from May 14th to May 17th, with many triple digit daily high temperature records set. Record daily high minimum temperatures were also set as clouds and northerly winds

maintained the heat overnight. The hot temperatures lingered into the 19th, especially for the northern San Joaquin Valley.

- **July 9, 2008** – A strong upper level ridge brought hot weather to much of the Planning Area from July 6th to the 10th. High temperatures well over the century mark were recorded, with records tied or set across the northern Central Valley on the 9th. Overnight temperatures also remained very warm, with several record high minimums set or tied.
- **August 15, 2008** – A strong high pressure ridge allowed high temperatures to reach triple digits across the northern Central Valley. In the Planning Area, temperatures of 102° to 108° were recorded.
- **August 26-29, 2008** – A strong upper level ridge brought hot weather to much of the area from the 26th to the 28th. High temperatures well over the century mark were recorded, with records tied or set across the northern Central Valley. A daily maximum temperature record of 104° was set at Sacramento Executive Airport. This broke the previous record of 103° set in 1950.
- **June 28, 2013** – Max temperatures in the Southern Sacramento Valley reached 100-107 degrees on Friday, and 105-110 degrees on Saturday. Minimum temperatures were approximately in the mid to upper 60s. The heat sickened at least 15 people, two critically, at a morning graduation ceremony Saturday at Del Oro High School in Loomis, which forced the cancellation of the event and sent several people to the local hospitals. Many of those stricken suffered heat exhaustion and heat stroke and ranged in age from 15 to 80 years of age and older. No deaths or damages were reported.
- **June 18, 2017** – The Sacramento County Coroner reported a total of 6 heat related deaths in the county. One victim was an 88-year-old woman found outside her home in Elk Grove on June 16th. She had been doing yard work. Her air conditioner was on inside her residence. Another decedent was a 36 year old male found collapsed behind his residence in the City of Sacramento on June 19th. Cause of death was hyperthermia due to environmental heat exposure in combination with acute methamphetamine intoxication. He died at Sacramento Medical Center. Another decedent was a 53 year old male found unresponsive on Two Rivers Trail at N. 7th Street in the City of Sacramento on June 21st. Cause of death was hyperthermia due to environmental heat exposure in combination with acute methamphetamine intoxication. He died at Sacramento Medical Center. Another decedent was a 56 year old male that collapsed in his home on June 22nd in the City of Sacramento. it is unknown if his air conditioner was broken, but no air was on when he was found. He made statements to family that he was hot, but refused to accept help. He died at Kaiser Hospital South. Another decedent was an 89 year old female with extensive medical history that was found unresponsive in her home on June 20th in the City of Sacramento. Decedent had an air conditioner. It is unknown if it was broken or just turned off. She died after an extended stay at Kaiser Hospital South from heat stroke. Another decedent was an 83 year old female with extensive medical history that was found unresponsive on June 20th in her home in the City of Sacramento. She had air conditioning, but it was turned off. She died after an extensive stay at Sacramento Medical Center. Cause of death was hyperthermia due to heat stroke. An Excessive Heat Warning was in effect for the area through the period. High temperatures in downtown Sacramento were 106° on the 18th (record), 107° on the 19th (record), 106° on the 20th, 106° on the 21st, and 108° on the 22nd (record).
- **August 1, 2017** – A 13-year-old was hospitalized Tuesday after suffering heat stroke during tryouts for the freshman football team at Lincoln High School on August 1. Temperatures at Lincoln Airport reached 100 degrees between 4 and 7 pm PDT.
- **June 22, 2018** – The NWS Experimental HeatRisk reached High readings that prompted a heat warning for the southern Sacramento Valley. PG&E activated their Emergency Operations Center in support of the June Heat Event. No damages, injuries, or deaths were reported.

- **July 24, 2018** – The NWS Experimental Heat Risk reached Moderate to High readings for several days prompting a Heat Advisory for the southern Sacramento Valley. Downtown Sacramento peaked at 109 on the 25th. Lows were in the mid-60s. No damages, injuries, or deaths were reported.

Hazard Mitigation Planning Committee Events

Members of the HMPC recalled the following events:

- **June 7 & 8 2013–** 100°-112°F
- **June 28-30, again July 1, 2013**– over 100°F for 7 days
- **July 1-4, 2013** – A strong high pressure ridge built over Northern California, keeping max temperatures in the Central Valley above 100 for at least 7 days. Overnight temperatures failed to recover, reaching generally down to the mid-60s to 90. The heat wave felt warmer due to the moisture in the air from the previous rainfall on June 26th, as well as from the intrusion of subtropical moisture from the south.
- **January 2014** – January was an abnormally dry and warm month for interior Northern California. Many record high temperatures were broken, and a state-wide drought was declared on January 17th.
- **June 2017** – Extreme heat began on the 13th and lasted through the 23rd. On June 19th, Mercy Folsom Hospital reported a power failure at 10:59 pm and closed to all ambulance traffic. Power was restored at approximately 5:30 am the next morning and the hospital was back to normal operations. Two days later, the hospital lost power again. Initial evacuation planning was conducted along with a regional bed poll in the event of an evacuation. Power was restored by SMUD at 11:45 pm and the hospital anticipated reopening at 2:00 am or once the temperature was low enough to open. The same day, Eskaton Village in Carmichael lost power and air conditioning affecting 200 units, 250 people and 20-30 pets. They had service to a common room and were making accommodations for residents. Eskaton stated that they were comfortable with their plan for the night and that they had plenty of water and ice on hand to distribute. They were making calls to family members if residents wanted to stay with family in more comfortable climate controlled environments. Briarwood Post Acute contacted and stated their facility has lost partial air conditioning in their patient care areas and are considering a partial evacuation. EMS was ready with bed polls and transfers; enough beds were available. They canceled their evacuation at 4:00 pm. Cooling centers were opened in the County during this time. 6 deaths were attributed to this heat wave in the County.
- **August/September 2020** – Extreme heat struck the County. Cooling centers were opened in 8 locations in the County. 4 deaths occurred from the extreme heat conditions. As the heat event ended, multiple wildfires around northern California were ignited by dry lightning. Sacramento County received smoke into the valley that was not pushed out by light winds. The cities of Folsom and Sacramento converted their cooling centers to cleaner air spaces to serve the public unable to get into an indoor space to escape the smoke.
- **July/August 2020** – Extreme heat struck the County. Multiple cooling centers were opened in locations throughout the County.

Likelihood of Future Occurrence

Highly Likely—Temperature extremes are likely to continue to occur annually in the Sacramento County Planning Area. Temperatures at or above 90°F are common most summer days in the County.

Climate Change and Extreme Heat

Climate change and its effect on extreme heat in the County has been discussed utilizing four sources:

- 2017 Sacramento County CAP/2021 Draft Climate Action Plan Update
- California Climate Adaptation Strategy (CAS) – 2014
- Climate Change and Health Profile Report – Sacramento County
- Cal-Adapt

2017 Sacramento County CAP/2021 Draft Climate Action Plan Update

According to the 2017 and Draft 2021 CAP, which utilized Cal Adapt to model potential climate change impacts to Sacramento County, it concluded that annual average high temperatures in Sacramento County of 73.1°F would increase under the low emissions scenario by 3.1°F to 76.2°F. Under the high emissions scenario, the average annual high temperature is projected to increase by 7.2°F to 80.3°F by 2099.

In addition, research published by California Environmental Protection Agency suggests that heat impacts are felt disproportionately in the northern portions of Sacramento County and the surrounding areas, due to prevailing wind patterns. This phenomenon is likely be exacerbated by climate change.

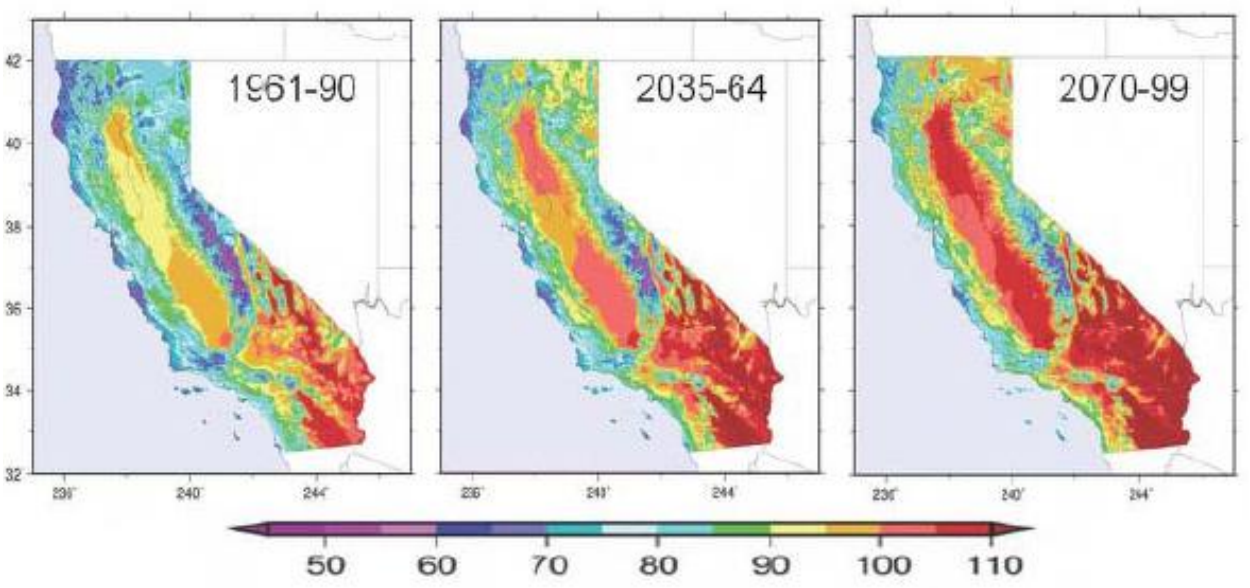
Extreme Heat Days. Extreme heat days are defined by Cal-Adapt for Sacramento County as 100°F or higher. From 1961 to 1990, Sacramento County has a historical average of four extreme heat days a year. From 2010 to 2016, extreme heat days increase in Sacramento County with a current average of 8 to 9 extreme heat days per year. Utilizing Cal-Adapt, the projected average annual number of extreme heat days under the low emissions scenario is approximately 15 days per year in 2050 and between 19 to 45 days per year at the end of the century. Under the high emissions scenario, Cal-Adapt predicts that Sacramento County will experience 25-31 extreme heat days per year in 2050 and 50 to 67 days per year by 2099. Also to be considered are warm nights. A warm night is defined as a day between April and October where the minimum temperature exceeds the historical minimum temperatures between 1961 and 1990. Historically, Sacramento County has an average of four warm nights a year, with a threshold of 65°F. Under the low- and high-emissions scenarios, the number of warm nights is expected to increase to an average of 12-33 nights by 2050 and 23 to 90 nights by 2099.

Frequency and Timing of Heat Waves. When these extreme temperatures are experienced over a period of several days or more, they are considered heat waves. Cal-Adapt defines a heat wave for Sacramento County as an event where the extreme heat day threshold of 100°F is exceeded for five days or more. Based on this analysis, heat waves consisting of a five-day period have occurred in Sacramento County at a rate of about one to two heat waves per decade between 1950 and 2000. The Cal-Adapt model projects an increase in heat waves as the century progresses. Under the low emissions scenario, Sacramento County is expected to experience approximately three heat waves per year around 2050 and up to four per year by 2099. Under the high emissions scenario, an average of three to five heat waves per year by 2050 are projected and up to 12 per year by the end of the century. Also to be noted, as shown in both emissions scenarios, the model projects that the occurrence of these heat waves will occur both earlier and later in the season.

Climate Adaptation Strategy

The 2014 CAS, citing a California Energy Commission study, states that "over the past 15 years, heat waves have claimed more lives in California than all other declared disaster events combined." This study shows that California is getting warmer, leading to an increased frequency, magnitude, and duration of heat waves. These factors may lead to increased mortality from excessive heat, as shown in Figure 4-22.

Figure 4-22 California Historical and Projected Temperature Increases – 1961 to 2099



Source: Dan Cayan; California Climate Adaptation Strategy 2014

As temperatures increase, California and Sacramento County will face increased risk of death from dehydration, heat stroke, heat exhaustion, heart attack, stroke and respiratory distress caused by extreme heat. According to the 2014 CAS report and the 2018 State of California Hazard Mitigation Plan, by 2100, hotter temperatures are expected throughout the state, with projected increases of 3-5.5°F (under a lower emissions scenario) to 8-10.5°F (under a higher emissions scenario). These changes could lead to an increase in deaths related to extreme heat in Sacramento County.

Climate Change and Health Profile Report – Sacramento County

The Climate Change and Health Profile Report (CCHPR) noted for Sacramento County that increased temperatures manifested as heat waves and sustained high heat days directly harm human health through heat-related illnesses (mild heat stress to fatal heat stroke) and the exacerbation of pre-existing conditions in the medically fragile, chronically ill, and vulnerable. Increased heat also intensifies the photochemical reactions that produce smog and ground level ozone and fine particulates (PM2.5), which contribute to and exacerbate respiratory disease in children and adults. Increased heat and carbon dioxide enhance the growth of plants that produce pollen, which are associated with allergies. Increased temperatures also add to the heat load of buildings in urban areas and exacerbate existing urban heat islands adding to the risk of high ambient temperatures.

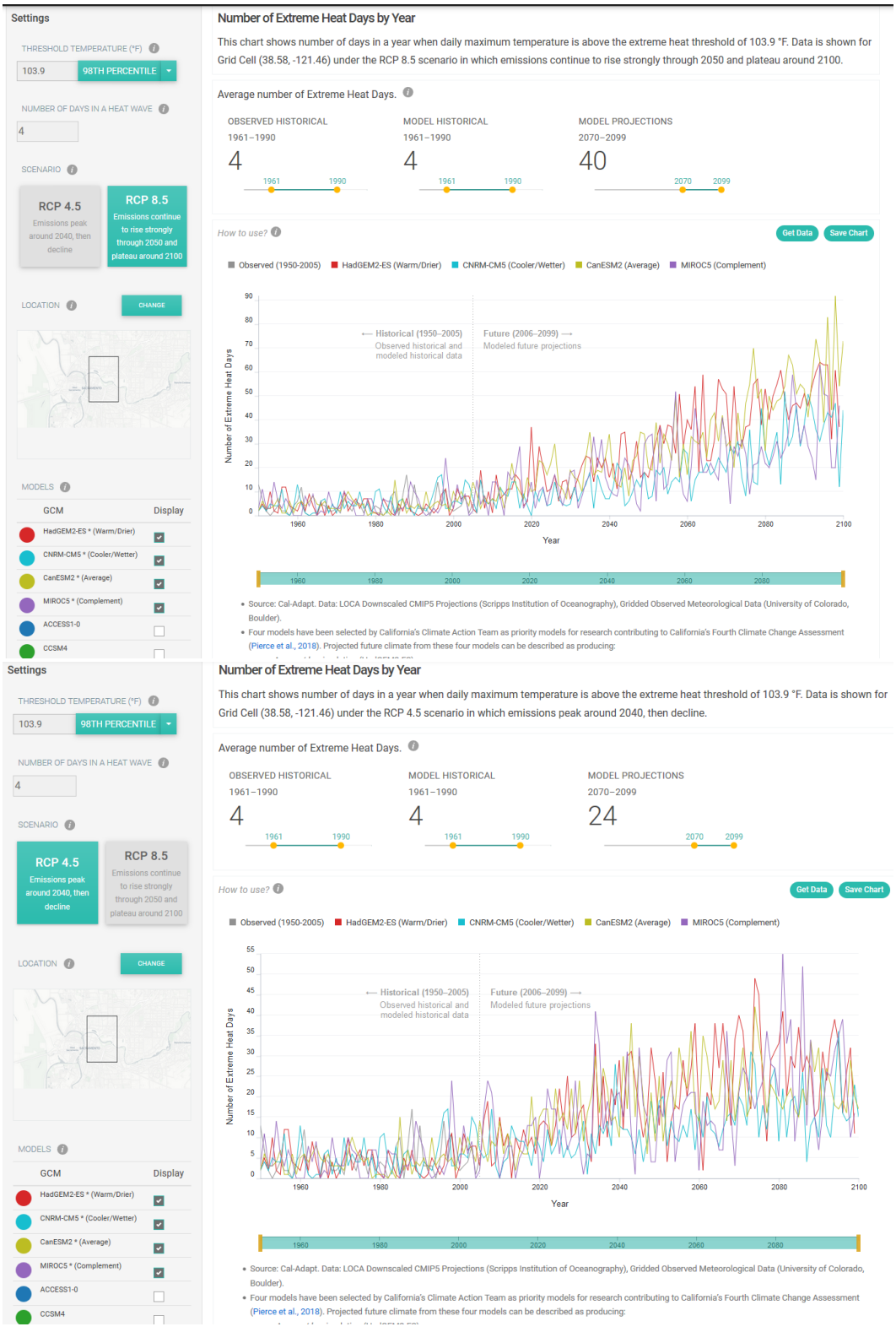
Cal-Adapt

Cal Adapt also noted that overall temperatures are expected to rise substantially throughout this century. During the next few decades, scenarios project average temperature to rise between 1 and 2.3°F; however, the projected temperature increases begin to diverge at mid-century so that, by the end of the century, the temperature increases projected in the higher emissions scenario (Representative Concentration Pathways (RCP) 8.5) are approximately twice as high as those projected in the lower emissions scenario (RCP 4.5).

These projections also differ depending on the time of year and the type of measurement (highs vs. lows), all of which have different potential effects to the state's ecosystem health, agricultural production, water use and availability, and energy demand. Future temperature estimates from Cal-Adapt for the Sacramento County Planning (using the quad that contains the City of Sacramento) are shown in Figure 4-23. It shows the following:

- The upper chart shows number of days in a year when daily maximum temperature is above the extreme heat threshold of 90.0°F. Data is shown for Sacramento County under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100.
- The lower chart shows number of days in a year when daily maximum temperature is above the extreme heat threshold of 90.0 °F. Data is shown for Sacramento County under the RCP 4.5 scenario in which emissions peak around 2040, then decline.

Figure 4-23 Sacramento County – Future Temperature Estimates in Low and High Emission Scenarios



Source: Cal-Adapt – Number of Extreme Heat Days by Year

Vulnerability Assessment

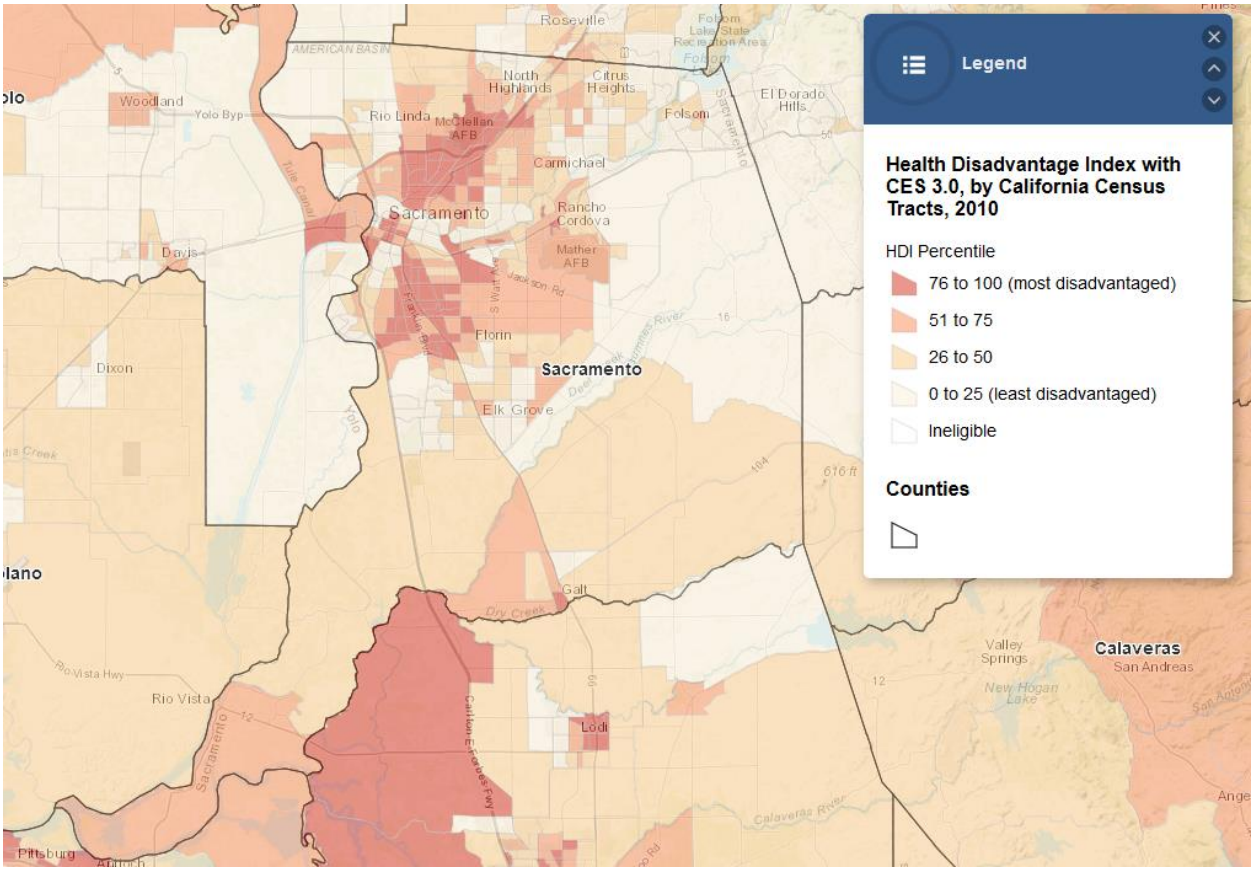
Vulnerability—Medium

Extreme heat happens in Sacramento County each year. Extreme heat rarely affects buildings in the County, but affects the population inside the County as well as the County's agricultural industry.

Impacts from Extreme Heat

Vulnerable populations are at the greatest risk to the effects of extreme heat. The Public Health Alliance has developed a composite index to identify cumulative health disadvantage in California. Factors such as those bulleted above were combined to show what areas are at greater risk to hazards like extreme heat. This is shown on Figure 4-24.

Figure 4-24 Health Disadvantage Index by California Census Tract



Source: Public Health Alliance of Southern California - retrieved 11/6/2020

Vulnerable populations to extreme heat include:

- Homeless
- Infants and children under age five
- Elderly (65 and older)

- Individuals with disabilities
- Individuals dependent on medical equipment
- Individuals with impaired mobility

In addition to vulnerable populations, pets and livestock are at risk to extreme heat. Heat can cause stress to agricultural crops and livestock in the County. Extreme heat dries out vegetation in the County, creating greater risks from wildfires, which is discussed in Section 4.3.16. Further, extreme heat, combined with low humidity and high winds, can cause a PSPS event to be issued for areas of the County as the risk of wildfire increases.

Future Development

As the County shifts in demographics, more residents will become senior citizens. The residents of nursing homes and elder care facilities are especially vulnerable to extreme temperature events. It is encouraged that such facilities have emergency plans or backup power to address power failure during times of extreme heat and in the event of a PSPS. Low income residents and homeless populations are also vulnerable. Cooling centers for these populations should be utilized when necessary.

4.3.4. Severe Weather: Heavy Rains and Storms

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

Storms in the Sacramento County Planning Area are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the Sacramento County area falls as rain, mainly in the fall, winter, and spring months.

The severe weather hazard is broken down in the following sections into:

- Heavy Rain and Storms
- Hail
- Lightning

Heavy Rain and Storms

The NWS reports that storms and thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 ft. As the

rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards earth's surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at Earth's surface and causes strong winds associated with thunderstorms.

Short-term, heavy storms can cause both widespread flooding as well as extensive localized drainage issues in the Sacramento County Planning Area. As storms continue to increase in intensity, the limited drainage infrastructure has become an increasingly important issue. In addition to the flooding that often occurs during these storms, strong winds, when combined with saturated ground conditions, can down very mature trees and cause power outages.

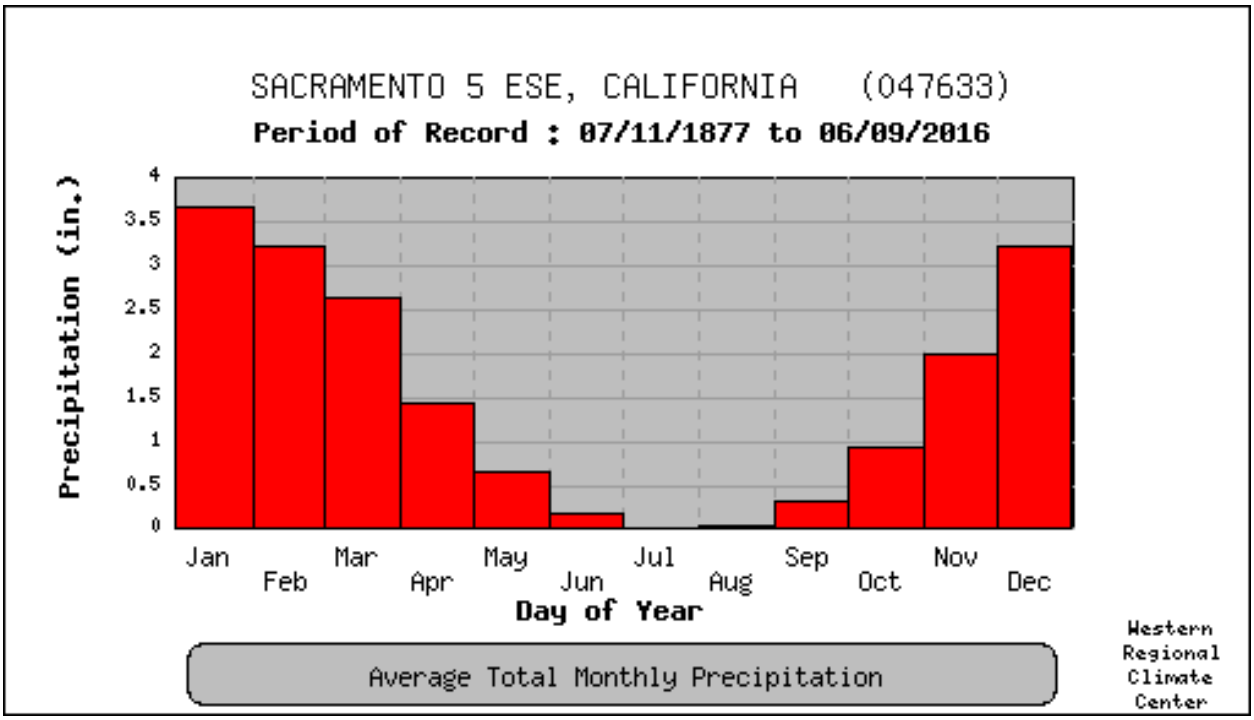
Location and Extent

Heavy rains in Sacramento County vary by season and location, but can occur anywhere in the County. There is no scale by which heavy rains are measured – usually it is measured in terms of rainfall amounts. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of thunderstorms in California is often short, ranging from minutes to hours. Information from the WRCC weather station in Sacramento County previously discussed in Section 4.3.1 is summarized below.

Sacramento 5 ESE Weather Station, Period of Record 1877 to 2016 (Elevation of 70 feet above msl)

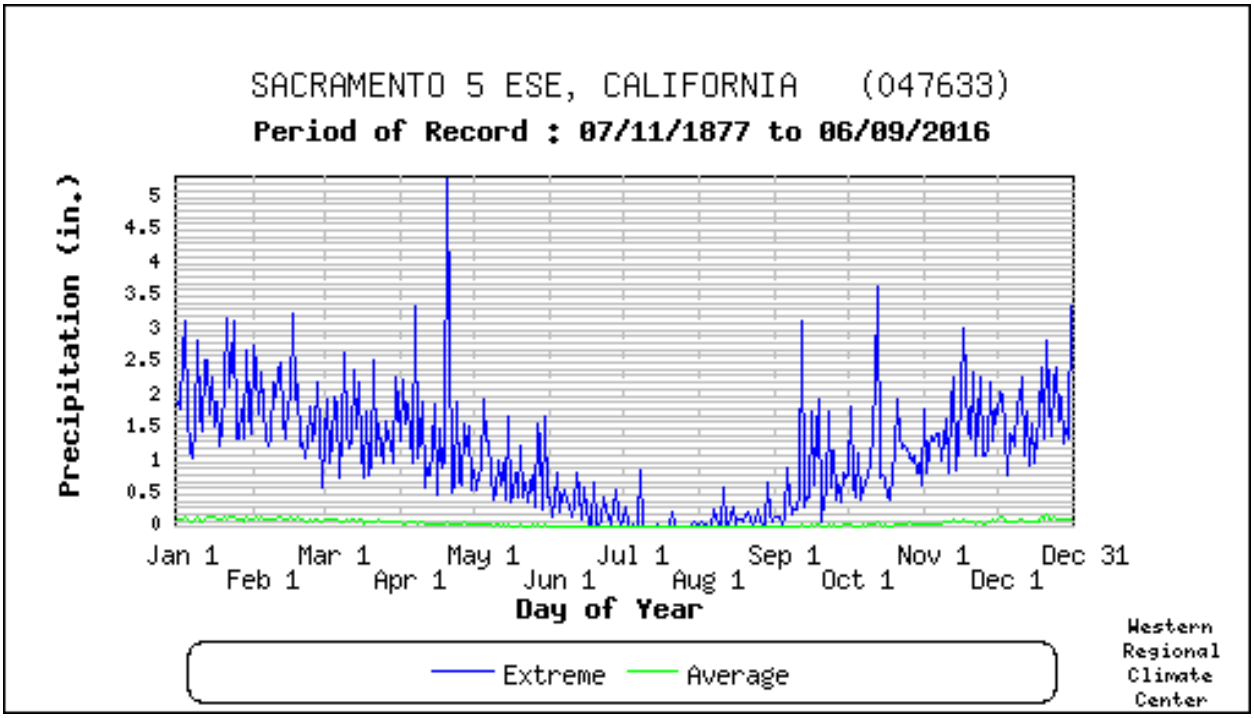
According to the WRCC, average annual precipitation in the County is 18.15 inches per year. The highest recorded annual precipitation is 37.62 inches in 1983; the highest recorded precipitation for a 24-hour period is 5.28 inches on April 20, 1962. The lowest recorded annual precipitation was 11.76 inches in 1976. Average monthly precipitation for Sacramento County is shown in Figure 4-25. Daily average and extreme precipitations are shown in Figure 4-26.

Figure 4-25 Sacramento County—Monthly Average Total Precipitation



Source: Western Regional Climate Center, www.wrcc.dri.edu/

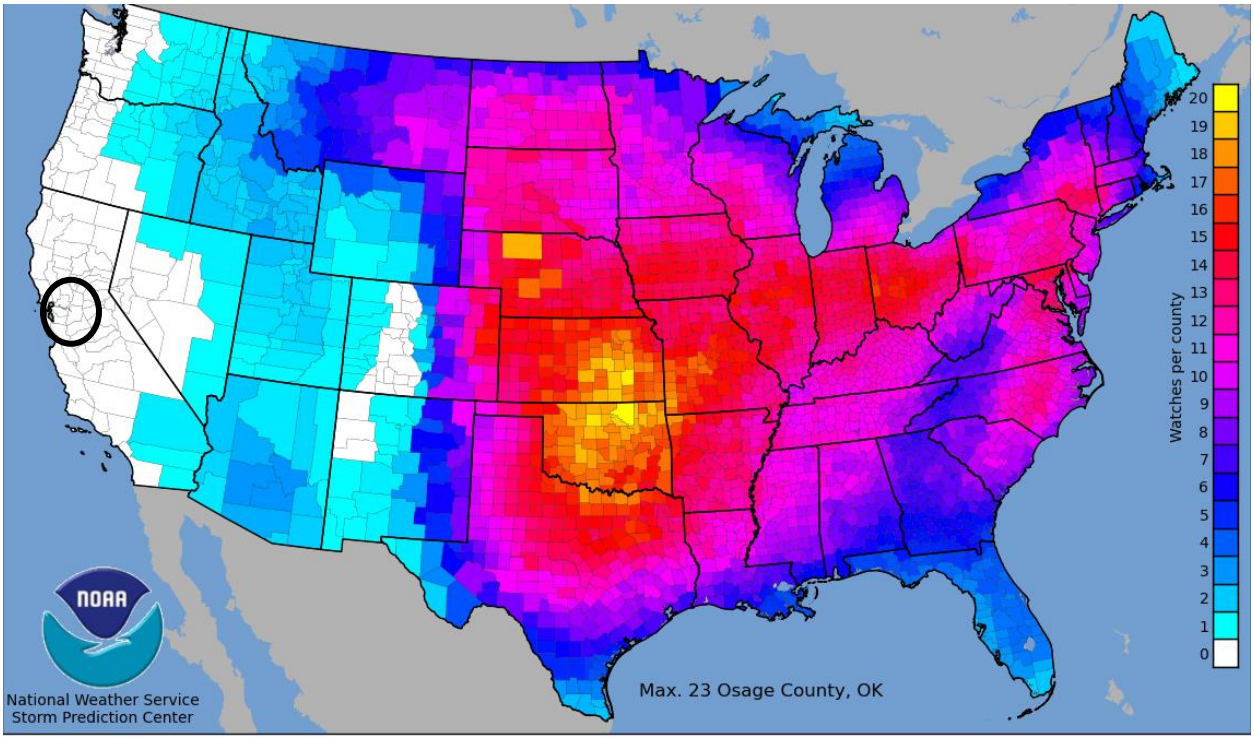
Figure 4-26 Sacramento County—Daily Average and Extreme Precipitation



Source: Western Regional Climate Center, www.wrcc.dri.edu/

The NOAA Storm Prediction Center tracks thunderstorm watches on a county basis. Figure 4-27 shows thunderstorm watches in Sacramento County and the United States for a 20-year period between 1993 and 2012, the most recent map available.

Figure 4-27 Sacramento County – Average Thunderstorm Watches per Year (1993 to 2012)



Source: NOAA Storm Prediction Center, map retrieved 9/23/2020

Hail

Hail can occur throughout the Sacramento County Planning Area during storm events, though it is rare. Hail is formed when water droplets freeze and thaw as they are thrown high into the upper atmosphere by the violent internal forces of thunderstorms. Hail is sometimes associated with severe storms within the Sacramento County Planning Area. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 miles per hour (mph). Severe hailstorms can be quite destructive, causing damage to roofs, buildings, automobiles, vegetation, and crops.

The National Weather Service classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4-26 indicates the hailstone measurements utilized by the National Weather Service.

Table 4-26 Hailstone Measurements

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball

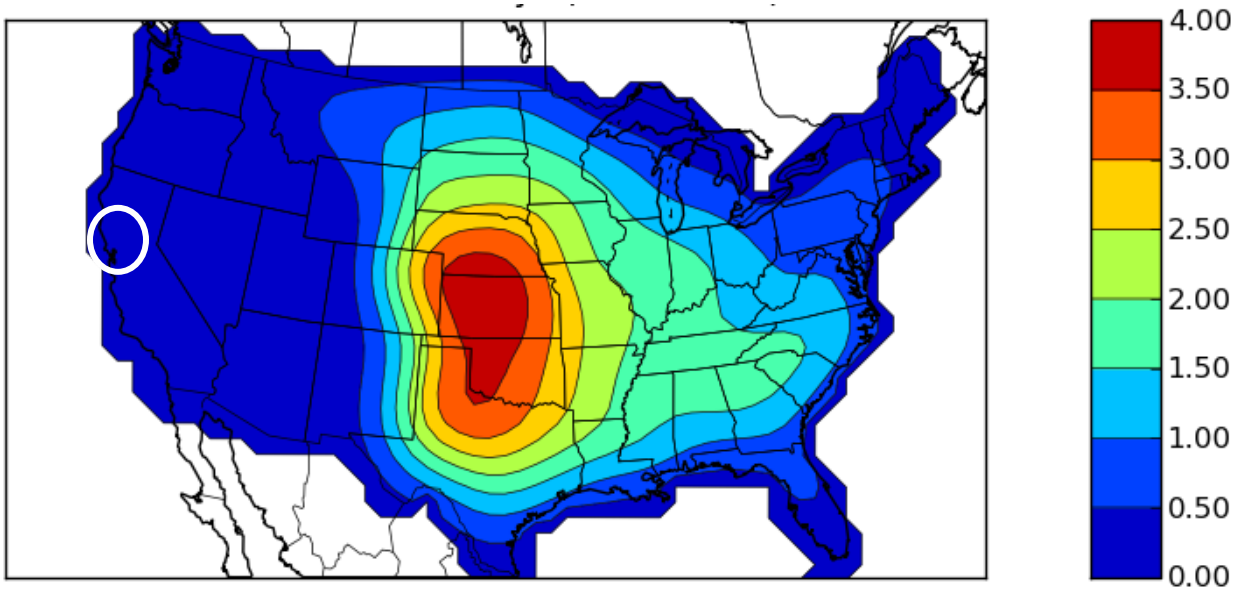
Average Diameter	Corresponding Household Object
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf-Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

Location and Extent

While rare, hail events can occur in any location of the County. All portions of the County are at risk to hail. There is no scale in which to measure hail, other than hail stone size as detailed above. The speed of onset of hail can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of thunderstorms that can cause hail in California is often short, ranging from minutes to hours. Hail events last shorter than the duration of the total thunderstorm. The National Weather Service tracks hail events. Figure 4-28 shows the average days each year where hail of greater than 1" in diameter occurred during a 20-year period from 1990 to 2009. The most recent map available.

Figure 4-28 Sacramento County – Average Hail Days per Year (1990 to 2009)



Source: National Weather Service, map retrieved 9/23/2020

Lightning

Lightning can occur throughout the County both during and outside of storm events. Lightning is defined by the NWS as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be struck directly, which may result in an explosion, burn, or total destruction. Or, damage may be indirect, when the current passes through or near an object, which generally results in less damage.

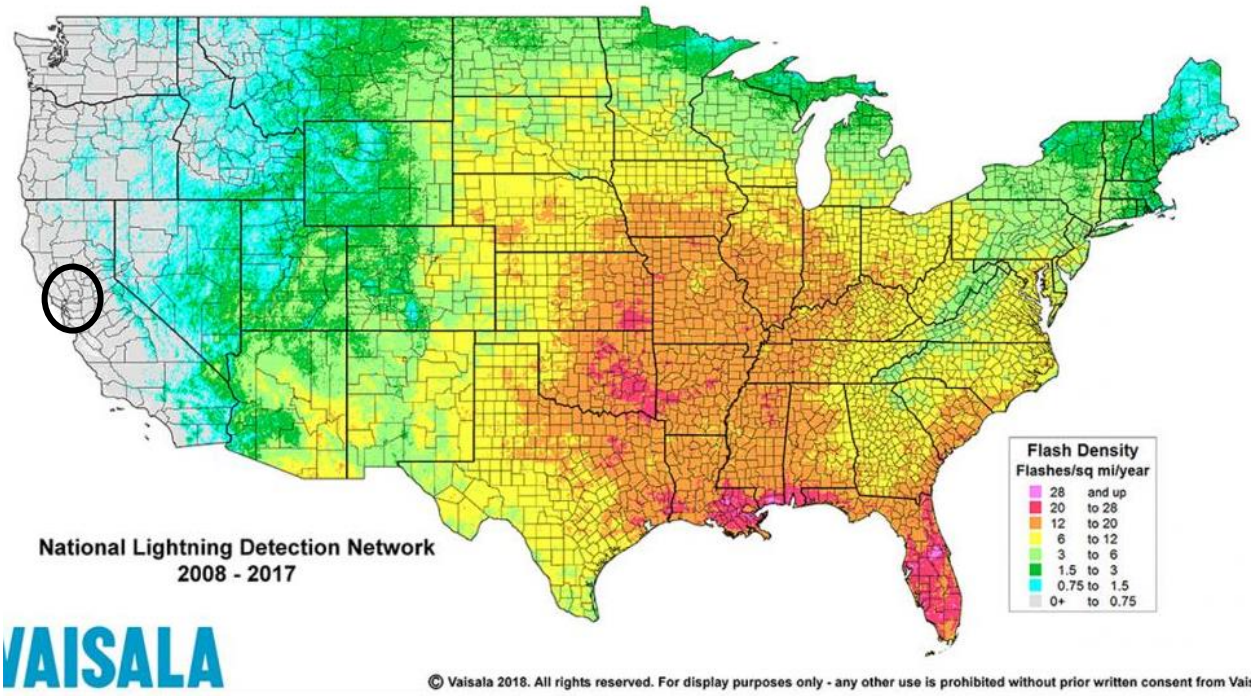
Intra-cloud lightning is the most common type of discharge. This occurs between oppositely charged centers within the same cloud. Usually it takes place inside the cloud and looks from the outside of the cloud like a diffuse brightening that flickers. However, the flash may exit the boundary of the cloud, and a bright channel, similar to a cloud-to-ground flash, can be visible for many miles.

Cloud-to-ground lightning is the most damaging and dangerous type of lightning, though it is also less common. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, a large minority of flashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm in areas that most people do not consider to be a threat. Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage.

Location and Extent

Lightning events can occur in any location of the County and are often associated with thunderstorms. All portions of the County are at risk to lightning. Lightning in the County can occur both during and outside of thunderstorms; the latter often referred to as dry lightning events. The speed of onset of thunderstorms that can cause lightning can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of thunderstorms in California is often short, ranging from minutes to hours. Thunderstorms and lightning are rare in the County. Vaisala maintains the National Lightning Detection Network. It tracks cloud to ground lightning incidences in the United States. Figure 4-29 shows lightning incidences in the County and the rest of the United States from 2008 to 2017, the most recent map date available.

Figure 4-29 Sacramento County – Lightning Incidence Map 2008 to 2017



Source: Vaisala National Lightning Detection Network, map retrieved 8/14/2020

Past Occurrences

Disaster Declaration History

A search of FEMA and Cal OES disaster declarations turned up multiple events. Heavy rains and storms have caused flooding in the County. Events where flooding resulted in a state or federal disaster declaration are shown in Table 4-27.

Table 4-27 Sacramento County – Disaster Declarations from Heavy Rain and Storms (and Floods) 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: FEMA, Cal OES

NCDC Events

The NCDC data recorded 38 hail, heavy rain, and lightning incidents for Sacramento County since 1950. A summary of these events is shown in Table 4-28. Additional events of heavy rain and storms are also

discussed in the NCDC table in the flood profile in Section 4.3.10. Specific events in the NCDC database showing damages, deaths, or injuries are detailed below the table.

*Table 4-28 NCDC Hail, Heavy Rain, and Lightning Events in Sacramento County 1950–5/31/2020**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Hail	9	0	0	0	0	$111,030	$0
Heavy Rain	28	0	0	1	0	$365,000	$50,000
Lightning	1	0	0	0	0	$150,000	$0
Total	**38**	**0**	**0**	**1**	**0**	**$626,030**	**$50,000**

Source: NCDC

*Note: Losses reflect totals for all impacted areas, some of which fell outside of Sacramento County

- **March 24, 1994** – A strong upper low pressure system and cold front moved over the area, where rainfall amounts of 0.75 to 1.33 inches were common. Numerous reports of street flooding were reported.
- **January 22, 2000** – In about a 48-hour span, downtown Sacramento more than doubled its seasonal precipitation climbing from 3.91 inches to 8.21 inches. Officially for the event, downtown Sacramento received 4.30 inches. On the 24th, Sacramento easily established a new daily precipitation record with 3.11 inches. The previous record for the date was 1.76 inches. Saturated grounds along with breezy conditions were responsible for a tree's collapse which critically injured a Sacramento resident. The same uprooted tree damaged two passenger vehicles and a residence. SMUD reported that the extreme weather caused 1,871 customers to lose power. Over $15,000 in property damage was attributed to this storm.
- **February 11, 2000** – Heavy rain inundated a sewage pump along Greenback Lane in Folsom. This caused water and raw sewage to sweep downhill and into an impoundment on the American River. Over $100,000 in property damage was attributed to this storm.
- **October 9, 2000** – Lightning struck a television antenna, setting the roof ablaze in the City of Elk Grove. Over $150,000 was attributed to this lightning strike.
- **May 9, 2005** – Hail struck 10 miles north of the City of Sacramento. Hail accumulation on Highway 99 resulted in several accidents. Over $10,000 was attributed to this hailstorm.
- **April 2, 2006** – Prolonged heavy precipitation with high snow levels resulted in excessive runoff into area river basins. Hardest hit was the San Joaquin River system and the Delta region. Many area reservoirs had minimal flood storage space as per seasonal norms and the large inflows had to be balanced very carefully with downstream releases to protect the fragile San Joaquin levee system. While the bulk of the flooding affected agricultural and rural properties, some local areas adjacent to waterways experienced flooding of homes and many roads were impassable. However, through the efforts of advance flood-fight measures, careful monitoring of levees, and critical water management coordination among federal, state, and local agencies, the system performed as designed and more serious flooding was averted. Over $250,000 in property damage and $50,000 in crop damage were attributed to this storm.
- **February 26, 2018** – Large amounts of small hail blanketed downtown and northern Sacramento, Natomas, and adjacent portions of I5, causing major traffic problems during the afternoon commute. Hail fell 2 to 4 inches deep in portions of north Sacramento and Natomas. Snowplows were required to

remove hail in some areas. Some damage was done to awnings and parking lot covers. The California State Library roof suffered damage and leaked, with hundreds of rare books soaked with water. $100,000 in damages were reported.

- **December 16, 2018 –** Downtown Sacramento set a daily record for rainfall, 1.17 inches of rain, breaking the old record of 0.95 inches set in 2002.
- **March 20**, **2019** – There were multiple reports by the public of pea to nickel sized accumulating hail.

Hazard Mitigation Planning Committee Events

The HMPC noted that the all-time record for rainfall during any 24-hour period in Sacramento is 7.24 inches on April 19-20, 1880. Streets were described as "having the appearance of miniature rivers." The rainstorm was also reported (colorfully) in such terms as "steady and business-like", "a perfect torrent", and "more like a cataract than an April shower."

The record maximum one-hour rainfall is 1.65 inches, which fell during the evening of April 7, 1935. Thunderstorms in the area were responsible for the downpour with considerable street flooding reported. (Note: Hourly rainfall records are only available after 1903).

January 1862, with 15.04 inches, is the wettest month on record. This took place before official government observations began. Precipitation records at that time were kept by two physicians, Dr. F.M. Hatch, a retired Army Surgeon, and his associate, Dr. T.M. Logan. Their records are believed to be reliable.

The most rainfall ever recorded in one season in Sacramento is 37.62 inches, set during the 1982-83 rainy season, under the influence of a strong El Niño. This followed the wet season of 1981-82 (32.65 inches), making it the wettest two-year period on record in Sacramento. The most recent El Niño outbreak to saturate the Sacramento area was the 1997-98 water year, which received a whopping 32.25 inches of precipitation. Since rainfall records began in 1849-50, only eight other water years have received more.

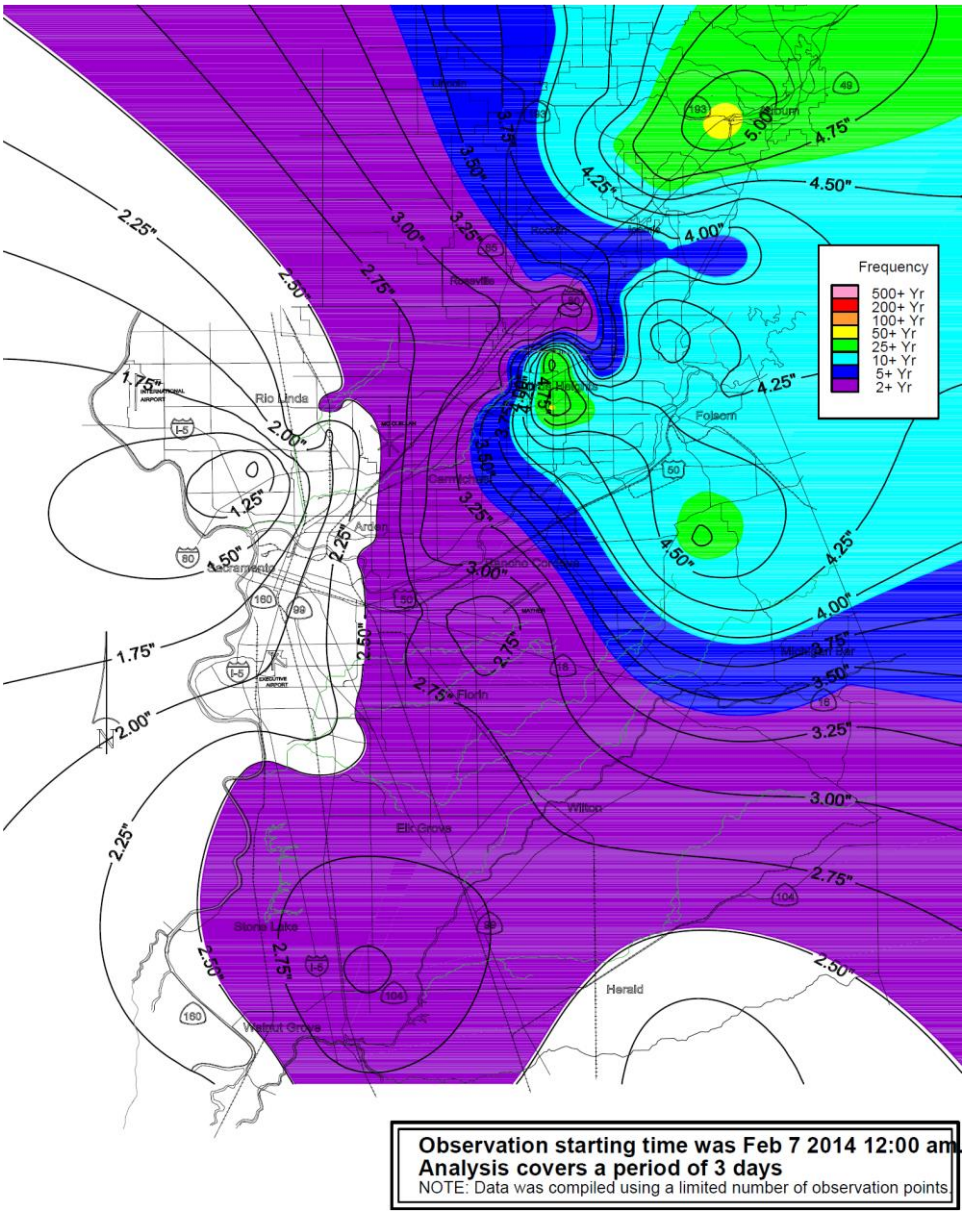
The HMPC also provided storm reports from 2011 to 2015. Reports are triggered for the following reasons: 1) 75 drainage complaints Countywide, or 25 complaints in any one County Supervisor's District; 2) any structure flooding; and 3) coverage on the news about impending storms or during the storm. Information from those reports is included below.

- **March 2011** – Rain fell continually throughout the week, but the significant storm event began on the 24th. Rainfall totals only reached approximately 1" to 1.5" countywide on the 24th, but fell with high intensities at times on saturated watersheds which exacerbated impacts on stream levels. High winds helped dislodge debris to clog drain inlets. There were a total of 90 service request calls between 11 am on the 24th to 11 am on the 25th. Most calls were for plugged storm drains. There was one report of a flooded structure, but that was not confirmed.
- **December 2, 2012** – A series of consecutive heavy rainfall events caused creeks and streams to rise rapidly due to ground saturation. Reports of a trailer park flooded on Sunday due to rising creek levels along Arcade Creek. Winding Way (road) was reported as flooded in low lying areas as well. Damages included:
  - ✓ 12 homes (6 - homes confirmed, 6 - homes high probability)
  - ✓ 15 garages (8 - garages confirmed, 5 - garages high probability)
  - ✓ 4 duplexes (eight residences)

- ✓ 29 apartments (2 within Auburn Villa MHP)
- ✓ 4 mobile/manufactured homes within Auburn Villa MHP
- ✓ 16 RVs within Auburn Villa MHP
- ✓ 30 vehicles

- **May 5-6, 2013** – Redevelopment of thunderstorms that were producing torrential rainfall over the urban areas of Sacramento caused several instances of roadway flooding across the area. Law enforcement reported roadway flooding at Exposition Blvd and Heritage Lane with a vehicle stuck in the roadway, two vehicles stuck in water near Arden and Hwy 160, roadway flooding near Watt Ave and Marconi Ave, as well as roadway flooding at H Street and 37th Street.
- **February 7-9, 2014** – A large storm occurred in the County. Rainfall totals of up to 3.5" occurred. Upstream of Folsom Dam, 5" fell in the City of Auburn in Placer County. Storm totals and an estimate frequency interval for the storm are shown on Figure 4-30. 73 calls were handled by the County for service requests.

Figure 4-30 February 7-9h 2014 Storm Rainfall Totals and Storm Interval



Source: Sacramento County Department of Water Resources 2014 Storm Report

- **February 5 to 9, 2015** – Countywide rainfall totaled approximately 1 inch to 3 inches and the rainfall intensity was equivalent to the 3-year storm event or less. The Department of Water Resources received 47 drainage service requests. The majority of calls were for localized street flooding and plugged drain inlets. No structure flooding was reported at this time. Three self-service sandbag sites were opened for the storm event; however no sandbags were distributed. Arcade Creek hit monitor stage at Winding Way near the American River College, Cosumnes River hit monitor stage at Michigan Bar (stages in the river are still raising but are not expected to reach flood stage), and the Natomas East Main Drain Canal hit monitor stage at pump station D15. Deer Creek hit flood stage at Scott Road.
- **December 21 and 22, 2015** – Countywide rainfall totaled approximately 0.1 inch to 0.95 inches, and the rainfall intensity was less than a 2-yr event. The Department of Water Resources received 12

drainage service requests. No structure flooding was reported at this time. Cosumnes River hit monitor stage at Michigan Bar and is receding. The Natomas East Main Drain Canal hit monitor stage at pump station D15. Deer Creek hit monitor stage at Scott Road.

- **October 14 to 16, 2016** – 3-day rainfall depth countywide was 0.7" to 4.1". There was a 3-hour intense downpour on 10/16/2016 at about 11:00AM. The 3-hour downpour caused the greatest recurrence intervals. The recurrence interval in most places was a 5-year or less event. In a few locations, the recurrence interval ranged from a 9.6 to 48.3-year event. The most intense areas were near the American River corridor. Arcade Creek at ARC hit flood stage. There were 94 service requests calls consisting mostly of plugged inlets and street flooding. There was one report of residential flood damage.
- **December 15, 2016** – The event was an approximately 12-hour event that took place during the latter half of the day. Peak 12-hour rainfall countywide was 0.7" to 2.4". Peak 6-hour rainfall countywide was 0.6" to 2.1". The 6-hour duration caused the greatest recurrence intervals. Most locations reflected recurrence intervals between a 2-year and 10-year event, with some locations experiencing a greater recurrence interval. Recurrence interval for the peak 6-hour duration was 0.3 to 35.8 years. The lower South Sacramento Streams Group area saw the highest recurrence intervals of 8.2 - 35.8 year, followed by the D-05 watershed with recurrence intervals of 7.4 - 14.4 year. Arcade Creek at ARC hit flood stage.
- **January 2017 sequence of storms**; 1/2/2017 - 1/12/2017 – A series of rainfall events occurred in early January 2017. Average rainfall countywide for the 10-day period was approximately 4.7". Based on rainfall, the overall recurrence interval within the County for the 10-day period was about a 2-year event. For shorter durations (less than 24-hrs.), average recurrence intervals were in the 5-year to 9-year range. However, rainfall and snow melt outside of the County in the Cosumnes River watershed caused the Cosumnes River at Michigan Bar to exceed monitor stage on January 4th, followed by flood stage twice (January 9th and 10th respectively) during the 10-day period. Peak flow at Michigan Bar on January 11th was 31,600-cfs, which correlates to an approximate 9-year event. Impacted areas included the North Delta, Point Pleasant, Wilton, and Dry Creek. Locations that exceeded flood stage included Cosumnes River at Michigan Bar, Mokelumne River at Benson's Ferry, Lambert Road at Snodgrass Slough, and Dry Creek at Elkhorn Blvd. Lambert Road was over-topped, causing flooding in the Point Pleasant area. RD 800 flood fought a boil near Wilton Road. Service requests exceeded 360 during the sequence of storms. Structure flooding damage in the North Delta and Dry Creek areas was estimated at approximately $300,000.
- **February 2017 sequence of storms**; 2/2/2017 - 2/11/2017 – A series of rainfall events occurred in early February 2017. Average rainfall countywide for the 10-day period was approximately 4.5". Based on rainfall, the overall recurrence interval within the County for the 10-day period was about a 2-year event. For shorter durations (less than 2-day), average recurrence intervals were in the 3-year to 11-year range. However, rainfall outside of the County in the Cosumnes River watershed caused the Cosumnes River at Michigan Bar to approach or exceed flood stage three times during the event, on February 7th, 8th, and 10th. Michigan Bar had a peak flow on Feb. 10th of 49,700-cfs which correlates to an approximate 25-year event. Similar to the January event, impacted areas were in the North Delta, Point Pleasant, and Dry Creek. Locations that exceeded flood stage included Cosumnes River at Michigan Bar, Mokelumne River at Benson's Ferry, and Lambert Road at Snodgrass Slough. Dry Creek at Elkhorn exceeded monitor stage twice during the event. Lambert Road was over-topped. Structure flooding damage in the North Delta and Dry Creek areas was estimated at approximately $270,000.
- **January 8 and 9, 2018** – The event was greater than a 2-year event, with many locations in the 10-year to 25-year range. Urban watersheds received 2 to 4 inches of rain, equating to annual recurrence of 20 to 80 years. Peak 24-hour rainfall countywide was 2.0" to 3.8". The 24-hour duration caused the

greatest recurrence intervals. Recurrence interval for the peak 24-hour duration was 1.7 to 47.4 years. Shorter durations saw recurrence intervals generally less than a 10-year event. Locations with greater recurrence intervals included Arcade Creek, the D-05 watershed, and the lower portion of the South Sacramento Streams Group watershed. Arcade Creek at ARC hit flood stage.

- **December 16, 2018** – Downtown Sacramento set a daily record for rainfall, 1.17 inches of rain, breaking the old record of 0.95 inches set in 2002.
- **February 25 to 27, 2019** – The event was forecast to be an intense event but rainfall ended up being more gradual. Total 2-day rainfall countywide was 0.4" to 4.4". The 2-day duration caused the greatest recurrence intervals. Recurrence interval for the peak 2-day duration was 0.2 to 17.3 years. Areas within the urban part of the county saw the greatest recurrence intervals, above 5-years. Areas in the south and southeast part of the county saw recurrence intervals below 5-year. Arcade Creek at ARC hit flood stage. Dry Creek at Elkhorn hit flood stage.
- **April 4 to 5, 2020** – The event was a 2-year event or less for most locations, with a few isolated locations with higher intensity. Total 2-day rainfall countywide was 0.8" - 3.0". Peak 24-hour rainfall countywide was 0.7" to 2.9". The 2-hour duration caused the greatest recurrence intervals, while the 6-hour duration gave the greatest recurrence intervals of the longer durations. Recurrence interval for the peak 6-hour duration was 0.3 to 13.9 years. Recurrence interval for the peak 2-hour duration was 0.4 to 44.3 years. Locations with greater recurrence intervals included Arcade Creek, the D-05 watershed, and part of the South Sacramento Streams Group watershed. Arcade Creek at ARC hit flood stage. Cosumnes River at Michigan Bar hit monitor stage. BOS District 3 saw the most service request calls with 93. Most calls were for street flooding and plugged Dis. There were a few reports of garage and home flooding.

Likelihood of Future Occurrence

Highly Likely – Based on NCDC data and HMPC input, 38 heavy rain and storm incidents over a 71-year period (1950-2020) equates to a severe storm event every 1.8 years. As noted, this database likely does not capture all heavy rain, hail, and lightning events. Severe weather is a well-documented seasonal occurrence that will continue to occur often in the Sacramento County Planning Area.

Climate Change and Heavy Rains and Storms

Climate change and its effect on heavy rain and storms near the County has been discussed by three sources:

- CAS – 2014
- 2017 Sacramento County Climate Action Plan (CAP)/2021 Draft Climate Action Plan Update
- Cal-Adapt

Climate Adaptation Strategy

According to the CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. It is unlikely that hail will become more common in the County. The amount of lightning is not projected to change.

2017 Sacramento County Climate Action Plan (CAP)/2021 Draft Climate Action Plan Update

According to the 2017 and 2021 Draft CAP, which utilized Cal Adapt to model potential climate change impacts to Sacramento County, historic precipitation patterns could be altered. The 2017 Cap noted that depending on the location, precipitation events may increase or decrease in intensity and frequency. However, while the projections in California show little change in total annual precipitation, even modest changes could significantly affect California ecosystems that are conditioned to historical precipitation timing, intensities, and amounts. Also noted, reduced precipitation could lead to higher risk of drought and increased precipitation could cause flooding and soil erosion. Based on the Cal-Adapt model, the historical annual average rate of precipitation in Sacramento County is 18 inches. Under the high emission scenario, overall precipitation in Sacramento County is expected to decline over the next century, with annual averages decreasing more substantially under the high emissions scenario. Further, changes in weather patterns resulting from increases in global average temperature could result in a decrease in total amount of precipitation falling as snow. Based on historical data and modeling, under both low- and high-emissions scenarios, CA DWR projects that the Sierra Nevada snowpack will decrease by 25-40 percent from its historic April 1st average of 28 inches of water content by 2050 and 48 to 65 percent by 2100, respectively.

The 2021 Draft CAP noted that although annual precipitation figures in the Sacramento Valley region are expected to increase only slightly, climate change is likely to increase the intensity of extreme storms. Dry years are likely to become even drier, while wet years will become even wetter in the next several decades. Most critically, future wet seasons will have more precipitation as rain than snow, due to higher temperatures. The Northern Sierras, a primary water source for the Sacramento Valley, are expected to have almost no annual snowpack by the end of this century under the scenarios modeled for the paper. This shift will affect the timing of streamflow into the Sacramento Valley from spring to winter (Houlton and Lund 2018).

Cal Adapt

Cal-Adapt noted that, on average, the projections show little change in total annual precipitation in California. Furthermore, among several models, precipitation projections do not show a consistent trend during the next century. The Mediterranean seasonal precipitation pattern is expected to continue, with most precipitation falling during winter from North Pacific storms. One of the four climate models projects slightly wetter winters, and another projects slightly drier winters with a 10 to 20 percent decrease in total annual precipitation. However, even modest changes would have a significant impact because California ecosystems are conditioned to historical precipitation levels and water resources are nearly fully utilized.

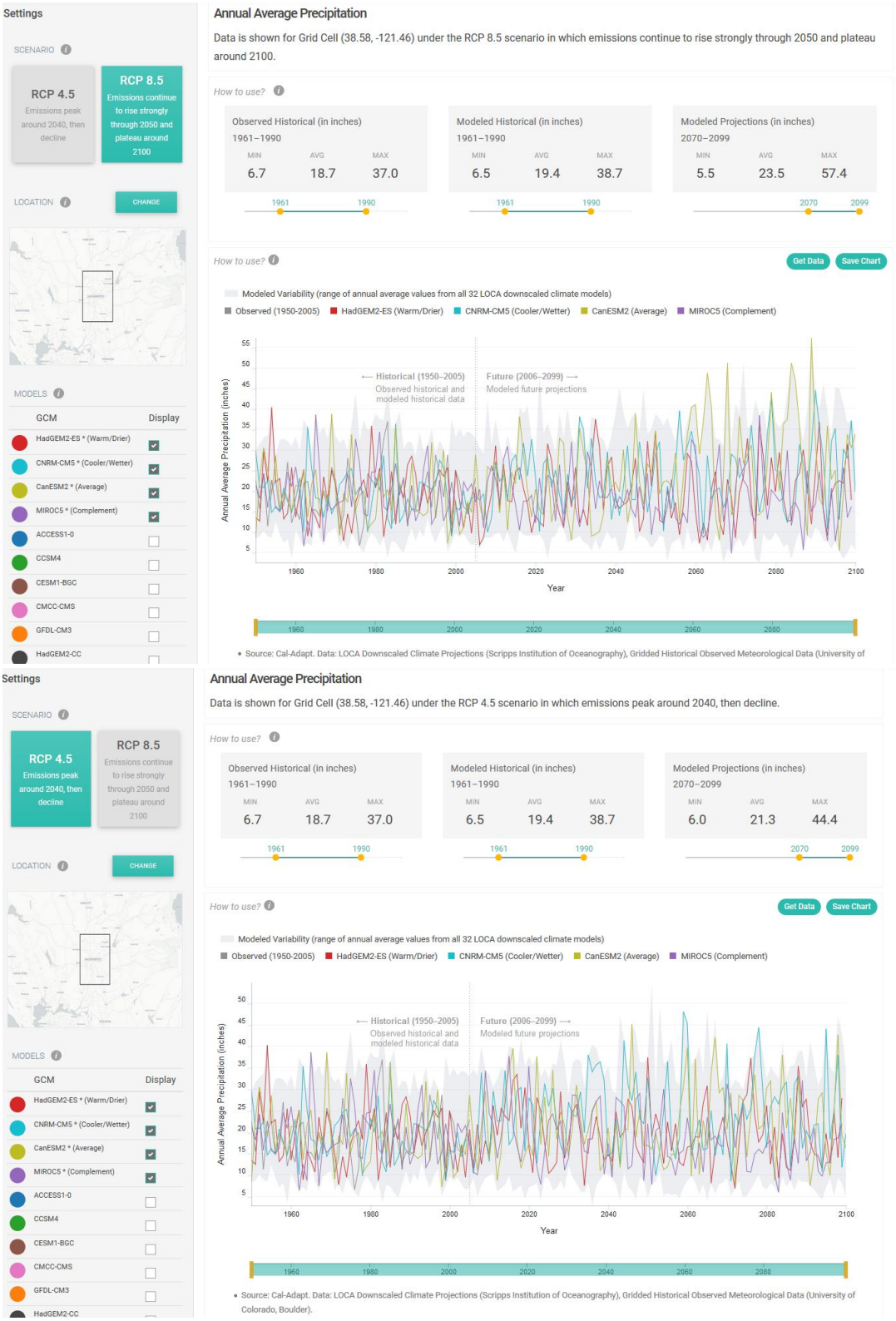
These projections also differ depending on the time of year and the type of measurement (highs vs. lows), all of which have different potential effects to the state's ecosystem health, agricultural production, water use and availability, and energy demand. Future precipitation estimates from Cal-Adapt for the Sacramento County Planning (using the quad that contains the City of Sacramento) are shown in Figure 4-31.. It shows the following:

- The upper chart shows annual averages of observed and projected precipitation values for the selected area on map under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100. The gray line (1950 – 2005) is observed data. The colored lines (2006 – 2100)

are projections from 10 LOCA downscaled climate models selected for California. The light gray band in the background shows the least and highest annual average values from all 32 LOCA downscaled climate models.

- The lower chart shows annual averages of observed and projected Precipitation values for the selected area on map under the RCP 4.5 scenario in which emissions peak around 2040, then decline. The gray line (1950 – 2005) is observed data. The colored lines (2006 – 2100) are projections from 10 LOCA downscaled climate models selected for California. The light gray band in the background shows the least and highest annual average values from all 32 LOCA downscaled climate models.

Figure 4-31 Sacramento County – Future Precipitation Estimates: High and Low Emission Scenarios



Source: Cal-Adapt – Precipitation: Decadal Averages Map 11/15/2020

Vulnerability Assessment

Vulnerability—Medium

According to historical hazard data, severe weather from heavy rain and storms is an annual occurrence in Sacramento County. Impacts can be felt by both the population of the County as well as the structures that have been built in the County. Many of the impacts from heavy rains and storms are discussed in other sections of this Plan (Section 4.3.7 Dam Failure, Section 4.3.10 Flood, Section 4.3.12 Localized Flood, Section 4.3.13 Landslide, and Section 4.3.13 Levee Failure).

Impacts

Impacts from heavy rains and storms include damages to property and infrastructure. This includes downed trees, damaged utility structures and infrastructures; road damages and blockages; hail damage to crops, buildings, and automobiles, and lightning damages to homes, critical infrastructure, and people. During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. However, actual damage associated with the primary effects of severe weather have been somewhat limited. It is the secondary hazards caused by severe weather, such as floods and agricultural losses that have had the greatest impact on the County. The risk and vulnerability associated with these secondary hazards are discussed in other sections of this plan (Section 4.3.10 Flood: 1%/0.2% Annual Chance, Section 4.3.12 Flood: Localized Stormwater, Section 4.3.7 Dam Failure, and Section 4.3.13 Levee Failure).

Future Development

Homes built in the County are built to existing building codes that generally withstand heavy rains and storms. New critical facilities such as communications towers and others should be built to withstand lightning, hail and thunderstorm winds. Backup power sources for all critical facilities should be incorporated into all new facilities. Properly located, designed, and constructed, future losses to new development should be minimal.

4.3.5. Severe Weather: High Winds and Tornadoes

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

This section includes a description and location and extent discussion for both high winds and tornadoes, respectively.

High Winds

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. These winds may occur as part of a seasonal climate pattern or in relation to other severe weather events such as thunderstorms.

Location and Extent

The entire Sacramento County Planning Area is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical measure that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort wind force scale. Figure 4-32 shows the Beaufort wind scale.

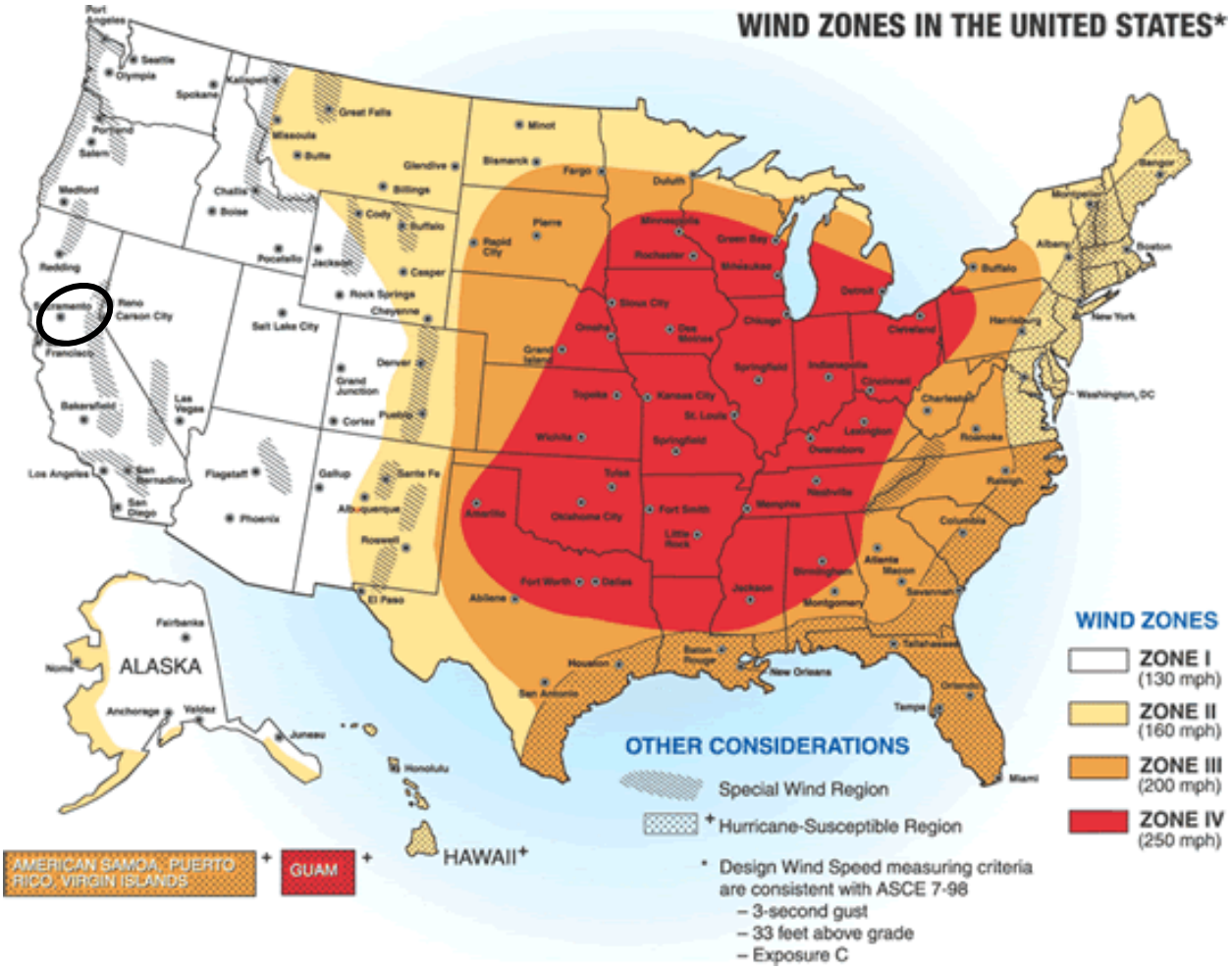
Figure 4-32 Beaufort Wind Scale

Beaufort Number	Wind Speed (miles/hour)	Wind Speed (km/hour)	Wind Speed (knots)	Description	Wind Effects on Land
0	< 1	< 1	< 1	Calm	Calm. Smoke rises vertically.
1	1-3	1-5	1-3	Light Air	Wind motion visible in smoke.
2	4-7	6-11	4-6	Light Breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	12-19	7-12	Gentle Breeze	Leaves and smaller twigs in constant motion.
4	13-18	20-28	11-16	Moderate Breeze	Dust and loose paper are raised. Small branches begin to move.
5	19-24	29-38	17-21	Fresh Breeze	Small trees begin to sway.
6	25-31	39-49	22-27	Strong Breeze	Large branches are in motion. Whistling is heard in overhead wires. Umbrella use is difficult.
7	32-38	50-61	28-33	Near Gale	Whole trees in motion. Some difficulty experienced walking into the wind.
8	39-46	62-74	34-40	Gale	Twigs and small branches break from trees. Cars veer on road.
9	47-54	75-88	41-47	Strong Gale	Larger branches break from trees. Light structural damage.
10	55-63	89-102	48-55	Storm	Trees broken and uprooted. Considerable structural damage.
11	64-72	103-117	56-63	Violent Storm	Widespread damage to structures and vegetation.
12	> 73	> 117	> 64	Hurricane	Considerable and widespread damage to structures and vegetation. Violence.

Source: National Weather Service

Figure 4-33 depicts wind zones for the United States. The map denotes that Sacramento County falls into Zone I, which is characterized by high winds of up to 130 mph.

Figure 4-33 Wind Zones in the United States

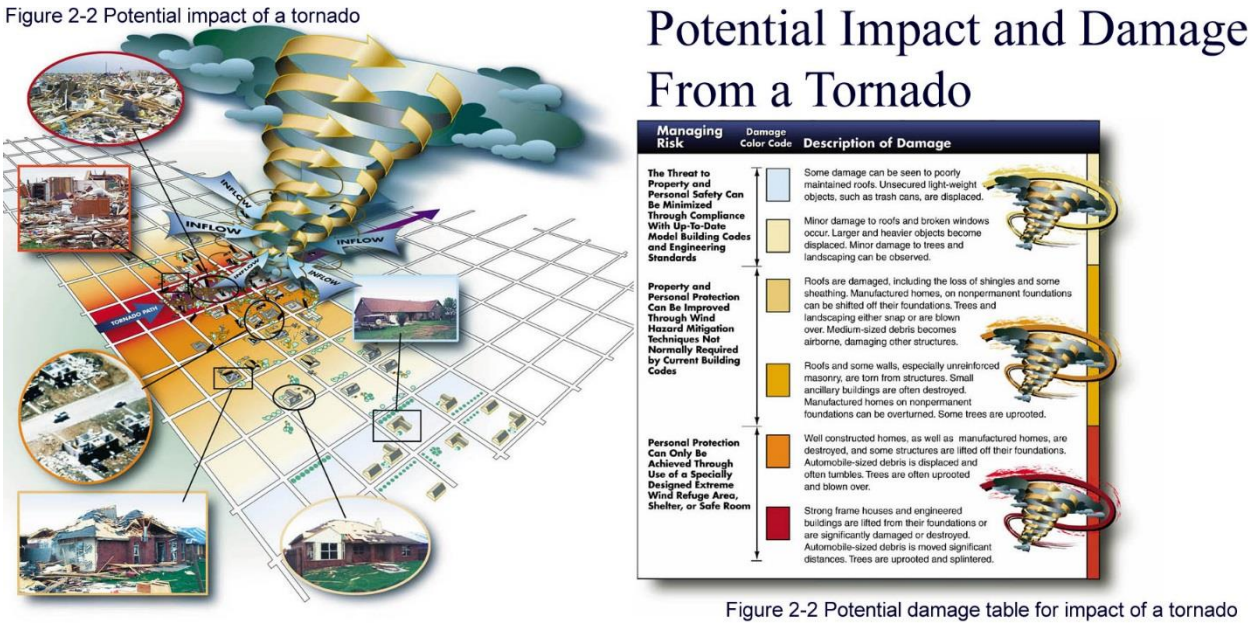


Source: FEMA

Tornadoes

Tornadoes and funnel clouds, while rare, can also occur during these types of severe storms. Tornadoes are another severe weather hazard that, though rare, can affect anywhere within the Sacramento County Planning Area, primarily during the rainy season in the late fall and early spring. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential across a path only 300 yards wide or less as 300-mile-wide hurricanes. Figure 4-34 illustrates the potential impact and damage from a tornado.

Figure 4-34 Potential Impact and Damage from a Tornado



Source: FEMA: Building Performance Assessment: Oklahoma and Kansas Tornadoes

Location and Extent

Tornadoes, while rare, can occur in any location of the County. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. Table 4-29 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at different levels of intensity. Table 4-30 shows the wind speeds associated with the Enhanced Fujita Scale ratings.

Table 4-29 Original Fujita Scale

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown, and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/f-scale.html

Table 4-30 Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF0	65-85
EF1	86-110
EF2	111-135
EF3	136-165
EF4	166-200
EF5	Over 200

Source: National Oceanic and Atmospheric Administration Storm Prediction Center, www.spc.noaa.gov/faq/tornado/ef-scale.html

It is difficult to predict a tornado or the conditions that preclude a tornado far in advance. Tornadoes can strike quickly with very little warning. In California it is rare for tornadoes to exceed EF3 magnitude. Most tornadoes that touch down are not long lived.

Past Occurrences

Disaster Declaration History

There have been no past federal or state disaster declarations due to high winds or tornadoes, according to Table 4-4.

NCDC Events

The NCDC data recorded 95 high wind incidents for Sacramento County since 1955. A summary of these events is shown in Table 4-31. Some of the tornado events in this database included touchdown points and tracks. These, where available, were mapped in GIS. These mapped tornado tracks are shown on Figure 4-35. More detail on these events can be found below the table and figure. Due to the high number of high wind events, only those events that were identified as causing damages in the County were included.

*Table 4-31 NCDC High Wind and Tornado Events in Sacramento County 1955-5/31/2020**

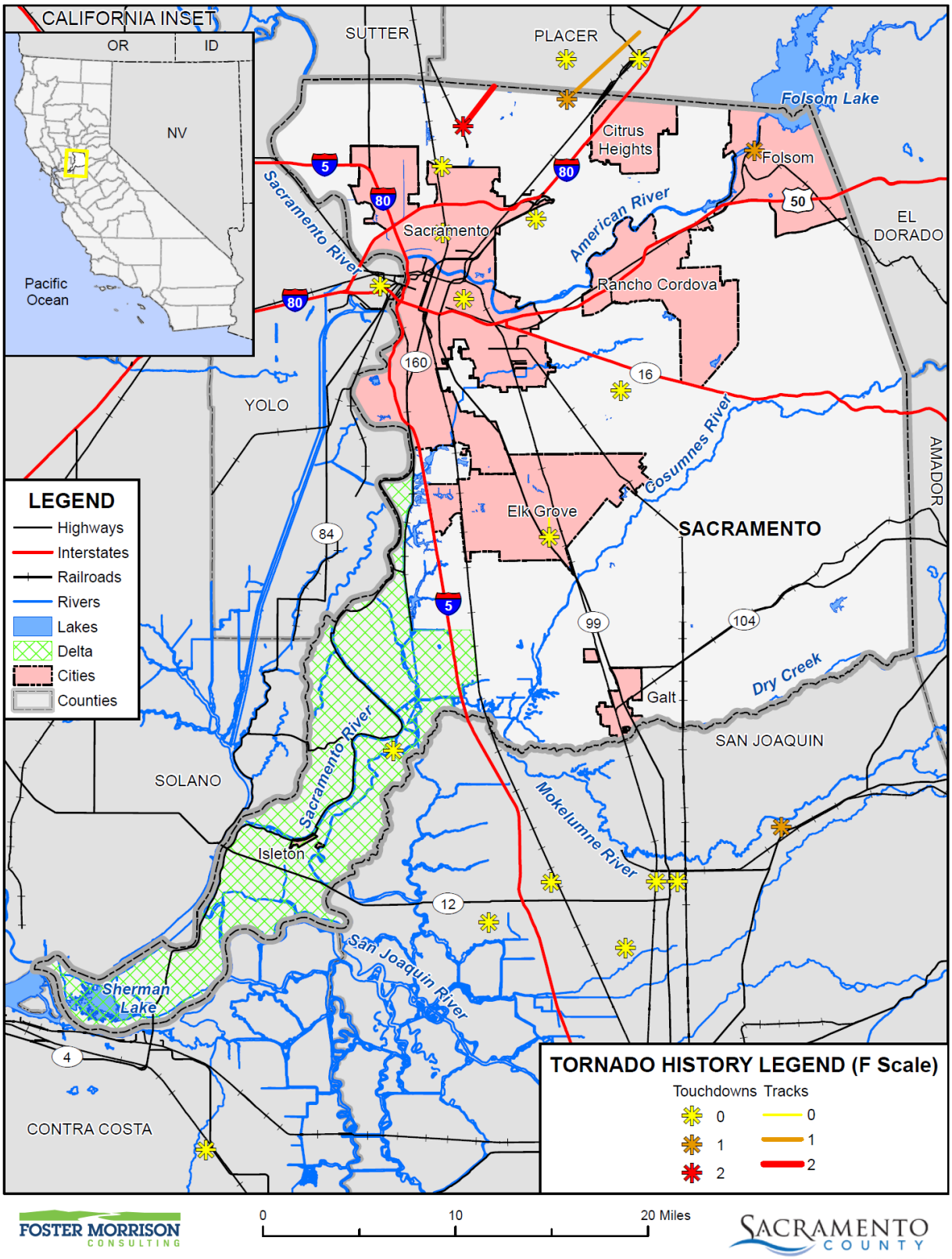
Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Funnel Cloud	7	0	0	0	0	$0	$0
High Wind	40	1	0	0	0	$8,957,000	$39,000

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Strong Wind	26	0	2	2	1	$3,651,000	$0
Thunderstorm Winds	9	0	0	0	0	$50,000	$0
Tornado	13	0	0	0	0	$1,480,000	$0
Total	**95**	**1**	**2**	**2**	**1**	**$14,138,000**	**$39,000**

Source: NCDC

*Note: Losses reflect totals for all impacted areas, some of which fell outside of Sacramento County

Figure 4-35 Sacramento County – NCDC Tornado Events and Tracks



Data Source: NOAA Storm Prediction Center, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

- **February 7, 1978** – An F2 tornado was reported in Sacramento County. The tornado was 20 yards wide and was on the ground for approximately 1.9 miles. No deaths, no injuries, and $250,000 in damages were attributed to this tornado.
- **March 22, 1983** – An F1 tornado was reported in Sacramento County. The tornado was 50 yards wide and was on the ground for approximately 1 mile. No deaths, no injuries, and $250,000 in damages were attributed to this tornado.
- **April 9, 1988** – An F1 tornado was reported in Sacramento County. The tornado was 30 yards wide and was on the ground for approximately 1 mile. No deaths, no injuries, and $500,000 in damages were attributed to this tornado.
- **February 7, 1998** – Strong winds blew for a second day in a row in the Sacramento and Northern San Joaquin Valleys. The winds were strong enough to push a floating restaurant upstream on the swollen Sacramento River near Sacramento. Power outages left 60,000 customers in Sacramento and 15,000 Solano County customers in the dark for hours. 118 city trees were damaged in Sacramento. In total, $300,000 in property damage was attributed to this windstorm. No injuries or deaths were recorded.
- **April 24, 1998** – A weak tornado (F0) touched down near a large mall in the Sacramento metro area, severely damaging a tree and damaging two cars. No deaths, no injuries, and $10,000 in damages were attributed to this tornado.
- **November 7, 1998** – Post-frontal winds exceeding 50 mph downed over 400 power lines and trees. Over 125,000 SMUD and PG&E customers temporarily lost power with 90,000 of them in Sacramento County. In addition, $700,000 of damages were reported. No injuries or deaths were recorded.
- **April 3, 1999** – Pre-frontal winds of 40 mph disrupted electrical service for 3,500 PG&E customers. In addition, $59,000 of damages were reported. $20,000 of it was property damage, while $39,000 of crop damage was recorded. No injuries or deaths were recorded.
- **June 17, 2000 –** Sustained winds of 30-40 mph blew through the Carquinez Strait during the afternoon and early evening hours. A motorcyclist traveling on I-680 in nearby Solano County was pushed off the highway near Marshview Road by a stronger gust at approximately 5:25 pm and died of his injuries.
- **October 24, 2000 –** Strong north winds exceeded 40 mph across the interior valley and foothills. More than 20,000 Sacramento Metropolitan Utility District (SMUD) and Pacific Gas & Electric (PG&E) customers were temporarily without power. The winds uprooted trees damaging several homes and vehicles. $40,000 in property damage was attributed to this windstorm. No injuries or deaths were recorded.
- **February 21, 2005** – On 21 February 2005 Presidents' Day, three tornadoes and several funnel clouds (see Figure 4-36) occurred in the Sacramento valley, including two weak (F0) tornadoes in the Sacramento, CA metropolitan area. The Southport, CA and Natomas, CA tornadoes caused nearly $1 million of damage to residential and commercial property. Amazingly, there were no fatalities or serious injuries despite the number of flying debris, air-borne projectiles, toppled trees, and an over-turned semi-trailer truck.

Figure 4-36 Images from the President's Day Tornado Outbreak in Sacramento County

Source: Sacramento Bee

- **April 8, 2005** – An F0 made two brief touchdowns in Sacramento County, one 8 miles north of the City of Sacramento and another near the Sacramento Metro Airport. The brief touchdown north of the City caused damage to a church roof, residential property fences, and to tree branches. The brief touchdown near the airport was in an open field and caused no damages. In all, no deaths, no injuries, and $25,000 in damages were attributed to this tornado.
- **February 25, 2007** – Clearing skies over an unstable airmass left in the wake of a very cold winter storm provided an environment favorable for weak convective activity. A very weak tornado (EF0) skimmed a residential area just south of downtown Elk Grove shortly after noon. Damage was minimal but consistent in a narrow one mile path. Most of the damage was to small tree branches but also included two power lines tipped, a rooftop solar heating unit damaged, and there was minor damage to fence panels at two locations. No structural damage was noted. No deaths or injuries were attributed to this tornado.
- **January 4, 2008** – A 71 mph gust was measured 4 miles west northwest of Elk Grove. A 69 mph wind gust was measured at Sacramento Executive Airport and a 66 mph wind gust was measured at Sacramento International Airport. The State Legislature building had several windows broken and proceedings were forced to be suspended. Many trees were reported down, including an 80 foot oak tree near the intersection of Elm and Hazel in Sacramento. PG&E reported many power poles down throughout the area and thousands of residents and businesses were without power for up to seven days. Several big rigs were reported down by the California Highway Patrol (CHP), including one on I-5 south of River Rd. in Woodland, and another on I-80 east of State Route 113. $7.4 million in property damages were recorded, though not all of them occurred in Sacramento County. No injuries or deaths were recorded.
- **February 25, 2011** – An EF0 tornado touched down at the Mather Field Industrial Park, immediately north of Mather Field. The maximum wind speed of the tornado was estimated at 75 mph with a damage path of one third of a mile. The damage path was in a northeast direction. No injuries nor fatalities have been reported. Damage was to a few trees including a large evergreen tree, broken road signs, and broken windows to multiple cars.
- **October 27, 2013** – Strong onshore winds brought down large trees for the Southern Sacramento Valley. Sacramento Executive AP peaked at 41mph, Sacramento International AP peaked at 46mph, and Vacaville/Nut Tree peaked at 36mph. Broadcast media reported several large trees down in Sacramento which hit houses, powerlines, and cars. A tree fell on a home near Sac State that caused significant roof damage. $50,000 in property damage was attributed to this windstorm. No injuries or deaths were recorded.
- **December 11, 2014** – Law enforcement, media, and the public reported numerous trees and large branches downed by winds in Sacramento and adjacent suburbs, such as Rosemont, Carmichael, and

Florin. These caused local power outages to spread across the area. There was a 38 mph gust measured at 7 am at Sacramento Executive Airport, a 40 mph gust at Sacramento International Airport. $500,000 in property damage was attributed to this windstorm. No injuries or deaths were recorded.

- **December 30, 2014 –** Multiple fallen trees caused damage to homes in the Motherlode foothills and in the Sacramento metro area. Trees were reported falling on homes and business in Sacramento, Elk Grove, and Folsom. Fallen trees and branches also caused power outages, with 344,000 customers across northern California impacted. $1,600,000 in property damage was attributed to this windstorm, though not all in Sacramento County. No injuries or deaths were recorded.
- **October 22, 2015** – A tornado touched down in the City of Elk Grove. Supercells developed behind the cold front along a north-south boundary in the middle of the Central Valley, where both instability and shear were large. Reports of tornado damage were at approximately 3:45pm (PST) near Waterman and Grand Line Roads. The estimated damage path length was about a mile with wind speeds estimated at 90-100mph. A sturdy metal roof was bent back, tree trunks that were several feet in diameter were snapped. Dozens of houses were mildly damaged.
- **January 19, 2016** – A large tree fell blocking the courtyard of the Capitol Towers apartments in downtown Sacramento. $40,000 in damages.
- **January 11, 2017** – An NWS survey determined an EF0 tornado touched down in the southern Natomas area of Sacramento- South Natomas Tornado. The path length was 3/8 of a mile. Several trees and fences were downed. Two metal awnings were twisted and torn down. Numerous trees were stripped of limbs and deposited in the roadway. $25,000 in damages were reported. No injuries or deaths were reported.
- **February 17, 2017** – Wind brought down trees and tree branches, knocking down power lines and causing outages. There was a 44 mph wind gust reported at Sacramento Executive Airport, with strong winds through the morning and afternoon. $100,000 in damages was reported.
- **December 16, 2017** – Winds brought down trees and branches causing power outages. Nearly 13,000 customers were without power in the Sacramento area, about 5,000 in Davis. $100,000 in damages were reported.
- **December 26, 2018** – At least one funnel cloud was reported near Sacramento International Airport. No touchdown or damage was observed.
- **January 7, 2019** – A wind gust to 60 mph was measured at McClellan Airfield. Numerous trees were reported down in the area. $100,000
- **February 27, 2019** – CHP reported numerous trees down across the area due to strong winds and wet ground, causing road blockages and power outages. A gust to 49 mph was measured at Sacramento International Airport. Examples include downed power lines in roadway which were reported near Pleasant Grove Rd. A tree was down across roadway 4 NW Latrobe. A pole was down across lanes at Best Ranch Rd 2 ESE Yolo. A downed tree was near Loop Rd/Krosens Rd. 1 WNW Loma Rica. A light pole was down in the roadway 3 NNE Laguna. A downed tree blocked all lanes of Auburn Folsom Road at King Road 3 S Newcastle. $1,000,000 in damages were reported.
- **May 18, 2020** –. A member of the public reported a brief tornado near Ione from 12:21 pm to 12:26pm on May 18, 2020. Location and timing are approximate. No damages, injuries, or deaths were reported.

Hazard Mitigation Planning Committee Events

The Planning Team for the County noted the following events since 2011:

- **October 22nd @ 3:45 2012 –** A tornado occurred in Elk Grove, which caused winds of 90-100 mph.

- **April 8th and 9th 2013** – A strong trough that had brought rain and snow to interior northern California, had moved eastward of the area on Monday, April 8th. This brought strong, gusty northerly winds in its wake across the area, mainly the Central Valley, ridge tops, and wind prone mountain canyons. The strongest periods of winds were on Monday, April 8th from late morning into mid-afternoon. Breezy conditions occurred again on Tuesday, April 9th, though winds were not quite as strong. Sustained winds on Monday reached 25-35 mph with gusts as high as around 50 mph. Sustained winds on Tuesday were 20-30 mph with gusts as high as around 40 mph. Over 20,000 people were reported to have lost power due to falling trees and wind (though not all in Sacramento County).
- **Oct 3rd & 27th 2013** – High winds occurred. Gusts of 35 – 50 mph.
- **March 29, 2014** – A Pacific front moved through interior Northern California March 28-30th which brought rain and heavy snow to the area. A supercell strengthened in the Central Sacramento Valley that afternoon that eventually produced an EF0 tornado near Nord, CA that evening.
- **Dec 11th**, 2014 **–** Heavy rainfall & winds of about 50-60 mph.
- **Dec 30th**, 2014 **–** High winds occurred, causing a power outage to about 344,000 people.
- **December 2015 –** there was a tornado that formed over Folsom Lake and impacted El Dorado County
- **January 19th**, **2016 –** Part of a tree fell onto Saverien Drive, blocking the right turn lane. This was a result of rainfall and 40 mph winds.

Likelihood of Future Occurrence

Highly Likely/Occasional – Based on NCDC data and HMPC input, 329 wind incidents over a 66-year period (1955-2020) equates to a severe wind event every year. High winds are a well-documented seasonal occurrence that will continue to occur annually in the Sacramento County Planning Area. Tornadoes tend to be rare in the County, and warrant a likelihood of future occurrence rating of occasional.

Climate Change and High Winds

According to the CAS, while average annual rainfall may increase or decrease slightly, the intensity of individual thunderstorm events is likely to increase during the 21st century. This may bring stronger thunderstorm winds. The CAS does not discuss non-thunderstorm winds.

Vulnerability Assessment

Vulnerability—Medium

Sacramento County is subject to potentially destructive straight-line winds and tornadoes. High winds are common throughout the area and can happen during most times of the entire year and outside of a severe storm event. Tornadoes are rare. Straight line and tornadoes winds are primarily a public safety and economic concern. Structures, agriculture (crops and livestock), and the citizens of the County are at risk to high winds and tornadoes.

Impacts

High winds, often accompanying severe storms and thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss.

Straight-line winds may also exacerbate existing weather conditions by increasing the effect on temperature and decreasing visibility due to the movement of particulate matters through the air, as in dust and snowstorms. The winds may also exacerbate fire conditions by drying out the ground cover, propelling embers around the region, and increasing fire severity. These winds may damage crops, push automobiles off roads, damage roofs and structures, and cause secondary damage due to flying debris.

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, the majority of injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response.

Impacts from straight line winds and tornadoes include:

- Increased wildfire risk
- Increased chance of PSPS event
- Erosion (soil loss)
- Dry land farming seed loss
- Windblown weeds
- Downed trees
- Downed crops and ag damage
- Power line impacts and economic losses from power outages
- Occasional building damage, primarily to roofs

Campers, mobile homes, barns, and sheds and their occupants are particularly vulnerable as windstorm events in the region can be sufficient in magnitude to overturn these lighter structures. Livestock that may be contained in these structures may be injured or killed, causing economic harm to the rancher who owns both the structure and the livestock. Overhead power lines are vulnerable and account for the majority of historical damages. State highways can be vulnerable to high winds and dust storms, where high profile vehicles may be overturned by winds and lowered visibility can lead to multi-car accidents.

Future Development

Future development projects should consider windstorm and tornado hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Utilities at risk to high winds should be undergrounded as new facilities are improved or added. Development trends in the County are not expected to increase vulnerability to this hazard.

4.3.6. Climate Change

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

Climate change is the distinct change in measures of weather patterns over a long period of time, ranging from decades to millions of years. More specifically, it may be a change in average weather conditions such as temperature, rainfall, snow, ocean and atmospheric circulation, or in the distribution of weather around the average. While the Earth's climate has cycled over its 4.5-billion-year age, these natural cycles have taken place gradually over millennia, and the Holocene, the most recent epoch in which human civilization developed, has been characterized by a highly stable climate – until recently.

This LHMP Update is concerned with human-induced climate change that has been rapidly warming the Earth at rates unprecedented in the last 1,000 years. Since industrialization began in the 19th century, the burning of fossil fuels (coal, oil, and natural gas) at escalating quantities has released vast amounts of carbon dioxide and other greenhouse gases responsible for trapping heat in the atmosphere, increasing the average temperature of the Earth. Secondary impacts include changes in precipitation patterns, the global water cycle, melting glaciers and ice caps, and rising sea levels. According to the Intergovernmental Panel on Climate Change (IPCC), climate change will "increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems" if unchecked.

Through changes to oceanic and atmospheric circulation cycles and increasing heat, climate change affects weather systems around the world. Climate change increases the likelihood and exacerbates the severity of extreme weather – more frequent or intense storms, floods, droughts, and heat waves. Consequences for human society include loss of life and injury, damaged infrastructure, long-term health effects, loss of agricultural crops, disrupted transport and freight, and more. Climate change is not a discrete event but a long-term hazard, the effects of which communities are already experiencing.

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

In Sacramento County, the HMPC noted that each year it seems to get a bit warmer. California's Adaptation Planning Guide (APG): Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. California's Adaptation Planning Guide: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the Northern Central Valley Region characterized as an agricultural, inland region with over 3.7 million people, with substantial cities, the largest being the state capitol, Sacramento. Agriculture is the predominant economic activity. The agricultural operations in this region include rice, dairy, and nut trees (almond and walnut). The region's agricultural activity is one of the most productive

in the nation. Table 4-32 provides a summary of Cal-Adapt Climate Projections for the North Central Valley Region.

Table 4-32 North Central Valley Region and Sacramento County – Cal Adapt Climate Projections

Effect	Ranges
Temperature Change, 1990-2100	January increase in average temperature of 4°F to 6°F and between 8°F and 12°F by 2100. July increase in average temperature of 6°F to 7°F in 2050 and 12°F to 15°F by 2100. (Modeled average temperatures; high emissions scenario)
Precipitation	Annual precipitation is projected to decline by approximately one to two inches by 2050 and three to six inches by 2100. (Community Climate System Model Version 3 (CCSM3) climate model; high carbon emissions scenario)
Heat wave	Heat wave is defined as five days over 102°F to 105°F, except in the mountainous areas to the east. Two to three more heat waves per year are expected by 2050 with five to eight more by 2100.
Wildfire	By 2085, the north and eastern portions of the region will experience an increase in wildfire risk, more than 4 times current levels in some areas. (Geophysical Fluid Dynamics Laboratory (GFDL) climate model; high carbon emissions scenario)

Source: Cal-Adapt

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the County. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

During the creation of the 2017 Sacramento County Climate Action Plan (CAP), an analysis scale to measure the extent and impacts of climate change was assembled. For the purposes of this analysis, risk was determined by a combination of the estimated certainty of the science projecting the climate change impact and the certainty of the sector sensitivity. Certainty rankings were based on percent probability of global models created by the IPCC (CNRA 2012a: 29). The timeframe in which the impact is most likely to occur (based on risk) can be categorized as:

- Current: Impacts currently or imminently occurring (2016-2020)
- Near-term: 2020-2040
- Mid-term: 2040-2070
- Long-term: 2070-2100

Risk certainty has been provided based on the certainty of exposures estimated in Figure 4-46 below. Onset designations have also been assigned.

Table 4-33 Risk and Onset for Sacramento County Climate Change Impacts

Impact	Risk Certainty Rating	Onset Timeframe
Increased Temperature	High	Current

Impact	Risk Certainty Rating	Onset Timeframe
Increased Frequency of Extreme Heat Days	High	Near-term
Increased Frequency in Heat Waves	High	Near-term
Sea-Level Rise	High	Long-term
Changes to Precipitation Patterns	Medium	Current
Increased Wildfire Risk	Medium	Mid-term
Increased Flooding	High	Current

Source: 2017 Sacramento County CAP

Past Occurrences

Disaster Declaration History

Climate change has never been directly linked to any declared disasters, as shown in Table 4-4.

NCDC Events

The NCDC does not track climate change events.

Hazard Mitigation Planning Committee Events

HMPC members noted that the strength of storms does seem to be increasing and the temperatures seem to be getting hotter. The HMPC also noted that the winter rains of 2017 and 2019 were more intense.

On December 17, 2020, the Sacramento County Board of Supervisors has adopted a resolution declaring a climate emergency and identifying the County's efforts to mobilize and contribute towards a safe climate. The resolution declared climate change an emergency requiring urgent action to achieve carbon neutrality by 2030. The resolution also states the County will establish, within 60 days of approval, a permanent Climate Emergency Mobilization Task Force. The task force will be composed of climate experts, including representatives of the scientific and academic communities, to oversee the development and implementation of a climate emergency response plan.

Likelihood of Future Occurrence

Likely – Climate change is virtually certain to continue without immediate and effective global action. According to NASA, 2017 and 2019 were two of the hottest years on record. Without significant global action to reduce greenhouse gas (GHG) emissions, the IPCC concludes in its Fifth Assessment Synthesis Report (2014) that average global temperatures are likely to exceed 1.5°C by the end of the 21st century, with consequences for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea level rise and storm surges.

Climate Scenarios

The United Nations IPCC developed several GHG emissions scenarios based on differing sets of assumptions about future economic growth, population growth, fossil fuel use, and other factors. The emissions scenarios range from "business-as-usual" (i.e., minimal change in the current emissions trends) to more progressive (i.e., international leaders implement aggressive emissions reductions policies). Each of these scenarios leads to a corresponding GHG concentration, which is then used in climate models to examine how the climate may react to varying levels of GHGs. Climate researchers use many global climate models to assess the potential changes in climate due to increased GHGs.

Key Uncertainties Associated with Climate Projections

Climate projections and impacts, like other types of research about future conditions, are characterized by uncertainty. Climate projection uncertainties include but are not limited to:

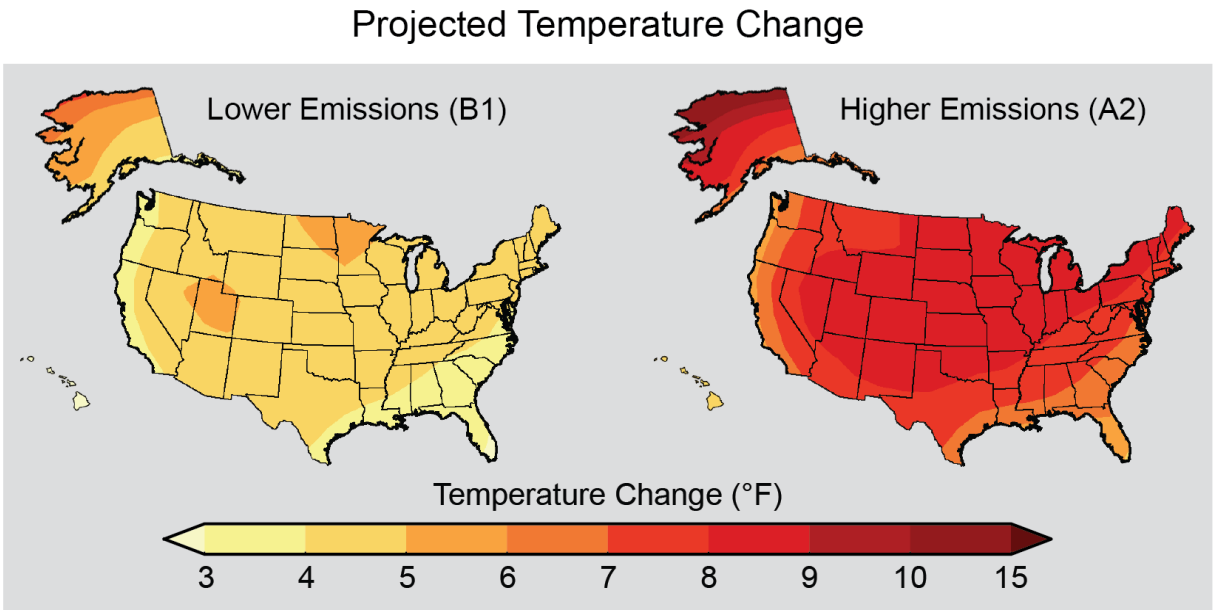
- Levels of future greenhouse gas concentrations and other radiatively important gases and aerosols,
- Sensitivity of the climate system to greenhouse gas concentrations and other radiatively important gases and aerosols,
- Inherent climate variability, and
- Changes in local physical processes (such as afternoon sea breezes) that are not captured by global climate models.

Even though precise quantitative climate projections at the local scale are characterized by uncertainties, the information provided can help identify the potential risks associated with climate variability/climate change and support long term mitigation and adaptation planning.

National Climate Center Scenarios

Maps show projected change in average surface air temperature in the later part of this century (2071-2099) relative to the later part of the last century (1970-1999) under a scenario that assumes substantial reductions in heat trapping gases and a higher emissions scenario that assumes continued increases in global emissions. These are shown in Figure 4-37.

Figure 4-37 Projected Temperature Change – Lower and Higher Emissions Scenario



Source: National Climate Assessment

2014 Climate Adaptation Scenarios

According to the California Natural Resource Agency (CNRA), climate change is already affecting California and is projected to continue to do so well into the foreseeable future. Current and projected changes include increased temperatures, sea level rise, a reduced winter snowpack altered precipitation patterns, and more frequent storm events. Over the long term, reducing greenhouse gases can help make these changes less severe, but the changes cannot be avoided entirely. Unavoidable climate impacts can result in a variety of secondary consequences including detrimental impacts on human health and safety, economic continuity, ecosystem integrity and provision of basic services.

The CNRA's 2014 CAS delineated how climate change may impact and exacerbate natural hazards in the future, including wildfires, extreme heat, floods, and drought:

- Climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in Sacramento County and the rest of California, which are likely to increase the risk of mortality and morbidity due to heat-related illness and exacerbation of existing chronic health conditions. Those most at risk and vulnerable to climate-related illness are the elderly, individuals with chronic conditions such as heart and lung disease, diabetes, and mental illnesses, infants, the socially or economically disadvantaged, and those who work outdoors.
- Higher temperatures will melt the Sierra snowpack earlier and drive the snowline higher, resulting in less snowpack to supply water to California users.
- Droughts are likely to become more frequent and persistent in the 21st century.
- Intense rainfall events, periodically ones with larger than historical runoff, will continue to affect California with more frequent and/or more extensive flooding.

- Storms and snowmelt may coincide and produce higher winter runoff from the landward side, while accelerating sea-level rise will produce higher storm surges during coastal storms. Together, these related to saltwater intrusion.
- Warmer weather, reduced snowpack, and earlier snowmelt can be expected to increase wildfire through fuel hazards and ignition risks. These changes can also increase plant moisture stress and insect populations, both of which affect forest health and reduce forest resilience to wildfires. An increase in wildfire intensity and extent will increase public safety risks, property damage, fire suppression and emergency response costs to government, watershed and water quality impacts, vegetation conversions and habitat fragmentation.

2017 Sacramento County CAP/2021 Draft Climate Action Plan Update

The Sacramento County CAP contained information on multiple hazards (such as extreme temperatures, droughts, wildfires, etc.) that are exacerbated by climate change issues. Those are discussed in their respective hazard profiles in each section of this Plan Update.

Vulnerability Assessment

Vulnerability—Medium

Climate change is the distinct change in measures of weather patterns over a long period of time, ranging from decades to millions of years. More specifically, it may be a change in average weather conditions such as temperature, rainfall, snow, ocean and atmospheric circulation, or in the distribution of weather around the average.

Sacramento County Climate Change Impacts

This section sources multiple documents that focus on Sacramento County's climate change vulnerability:

- California Adaptation Planning Guide
- 2017 Sacramento County CAP/2021 Draft Climate Action Plan Update
- Proceedings of the National Academy of Sciences

California Adaptation Planning Guide

The APG prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. The APG: Defining Local and Regional Impacts focuses on understanding the ways in which climate change can affect a community. According to this APG, climate change impacts (temperature, precipitation, sea level rise, ocean acidification, and wind) affect a wide range of community structures, functions and populations. These impacts further defined by regional and local characteristics are discussed by secondary impacts and seven sectors found in local communities: Public Health, Socioeconomic, and equity impacts; Ocean and Coastal Resources; Water Management; Forest and Rangeland; Biodiversity and Habitat; Agriculture; and Infrastructure.

The APG: Understanding Regional Characteristics identified the following impacts specific to the North Central Valley region in which the Sacramento County Planning Area is part of:

- Temperature increases – particularly nighttime temperature
- Reduced precipitation
- Flooding – increase flows, snowmelt, levee failure in the Delta
- Reduced agricultural productivity (e.g., nut trees, dairy)
- Reduced water supply
- Wildfire in the Sierra foothills
- Public health and heat
- Reduced tourism

California's Adaptation Guide: Understanding Regional Characteristics provides input on adaptation considerations for the Northern Central Valley Region. As detailed in this guide, climate change has the potential to disrupt many features that characterize the region, including ecosystems health, snowpack, and the tourist economy. Specific regional impacts include the following:

Flooding. The eastern part of the Northern Central Valley contains the foothills of the Sierra Nevada mountain range. The mountainous areas of the state are projected to have less precipitation falling as snow and to be subject to rapid melt events. This will result in extreme, high-flow events and flooding in the Central Valley. Communities should evaluate local floodplains and recognize areas where a small increase in flood height would inundate large areas and potentially threaten structures, infrastructure, agricultural fields, and/or public safety. As the rivers of the region flow toward San Francisco Bay, the land decreases in elevation and is protected by levees, many of which are vulnerable, particularly to seismic events.

Agriculture. The Northern Central Valley is one of the largest agricultural producing regions, not only in California, but in the United States. Between climate change impacts on water availability and seasonal temperature regimes, the health of livestock, and productivity of trees and crops are likely to be affected. Agriculture in this region is varied, with rice, nuts (almonds, walnuts, pistachios), and dairy being three of the most predominant products. Others include pears, cattle, wine grapes, chicken, sweet potatoes, and plums. Each crop is likely to react slightly differently to alteration in seasonal temperature regimes and water availability. Rice is projected to experience a moderate loss in productivity (less than 10%). In the case of nut trees, it is the reduction in nighttime cooling that may have the most impact. Jurisdictions reliant on almonds, walnuts, pistachios, or other nuts should specifically evaluate projected changes in daily low temperatures and/or loss of nighttime chill hours. It is difficult to specifically project the production impact on crops because this relates to many factors in addition to temperature and precipitation, including pest regimes, availability of imported or groundwater irrigation water, and management practices. As with crops, climate change impacts on dairy cows can occur and depend on a variety of factors.

The impact of climate change on agricultural productivity has the potential to alter a community's economic continuity, including its employment base.

Public Health, Socioeconomic, and Equity Impact. Increased temperatures and more frequent heat waves are expected in the region. Impervious surfaces are increasing in the Central Valley, increasing the potential impacts of heat islands. Farm employment or lodging and food services are among the top five employment sectors in several of the counties in this region. Agricultural workers and employees in the

tourist industry are more susceptible to heat events. Regardless of their occupation, the poor are less likely to have the adaptive capacity to prevent and address impacts for reasons stated above.

Water Supply. Shorter rainfall events and rapid snowmelt will reduce the region's water supply by making water more difficult to capture in reservoirs or retain for groundwater recharge. Recreation and tourism in the region are also likely to suffer due to lower water levels in waterways and reservoirs and declining snowpack. Agriculture will also be impacted due to reduced or altered precipitation. Water supply (for irrigation) can alleviate some of the other climate stresses (altered temperature or precipitation) or, in the case of reduced water supply, exacerbate them. The challenge of climate change is that water supply is projected to be reduced and water that is available will be more costly for users. Employees of water-reliant industries such as agriculture may become more economically vulnerable because of unstable working conditions.

Fire. Fire risk is projected to increase in the foothills lining the eastern edge of the region. The areas northeast of Sacramento, due to population density and fire risk, are projected to have large property loss. Jurisdictions should pay careful attention to the wildland-urban interface and enforcement of mitigation measures such as residential vegetation and setbacks.

2017 Sacramento County CAP/2021 Draft Climate Action Plan Update

According to the Climate Change Vulnerability Assessment for the Sacramento County Climate Adaptation Plan (CAP), climate change is already affecting and will continue to alter the physical environment throughout the Central Valley and Sacramento County; however, specific implications of climate change effects vary with differing physical, social, and economic characteristics within the County.

This section presents a vulnerability assessment for the County, focusing on direct and indirect climate change effects. The direct, or primary, effects analyzed for the County include changes in average temperature and annual precipitation amounts. Secondary effects, which can occur because of individual changes or a combination of changes in the primary effects, are also assessed. These include extreme heat, wildfire, drought, flooding, and sea-level rise.

Methodology

The vulnerability assessment follows the process outlined in Phase 2 of the APG and is composed of the following four steps:

- **Exposure**: The first step in the vulnerability assessment is to identify what climate change effects Sacramento County will experience in the future. To assess potential effects from climate change the APG 2.0 recommended Cal-Adapt tool is used. Results are based on two Representative Concentration Pathways (RCPs), 4.5 which represents a medium emissions scenario and 8.5 which represents a high emissions scenario. Because the efficacy of future global GHG reduction strategies is unknown, a discussion of both emissions scenarios, and their associated impacts, is included in this vulnerability assessment (Bedsworth et al. 2018).
- **Sensitivity and Potential Impacts**: This step identifies and assesses how population groups, community functions, and physical assets may be affected by localized climate change effects.

There are two Primary Effect changes listed in the 2021 CAP:

- Increased Temperatures
- Changes in Precipitation Patterns

Results – Increased Temperatures

According to Cal-Adapt, the historic (1961-1990) annual average maximum temperature for the County was 74 degrees Fahrenheit (°F), and the historic annual average minimum temperature was 48.4 °F. As shown in Table 4-34 and Figure 4-38 and Figure 4-39, both are projected to increase by mid-century (2035-2064) and further increase by late century (2070-2099) under the medium and high emissions scenarios.

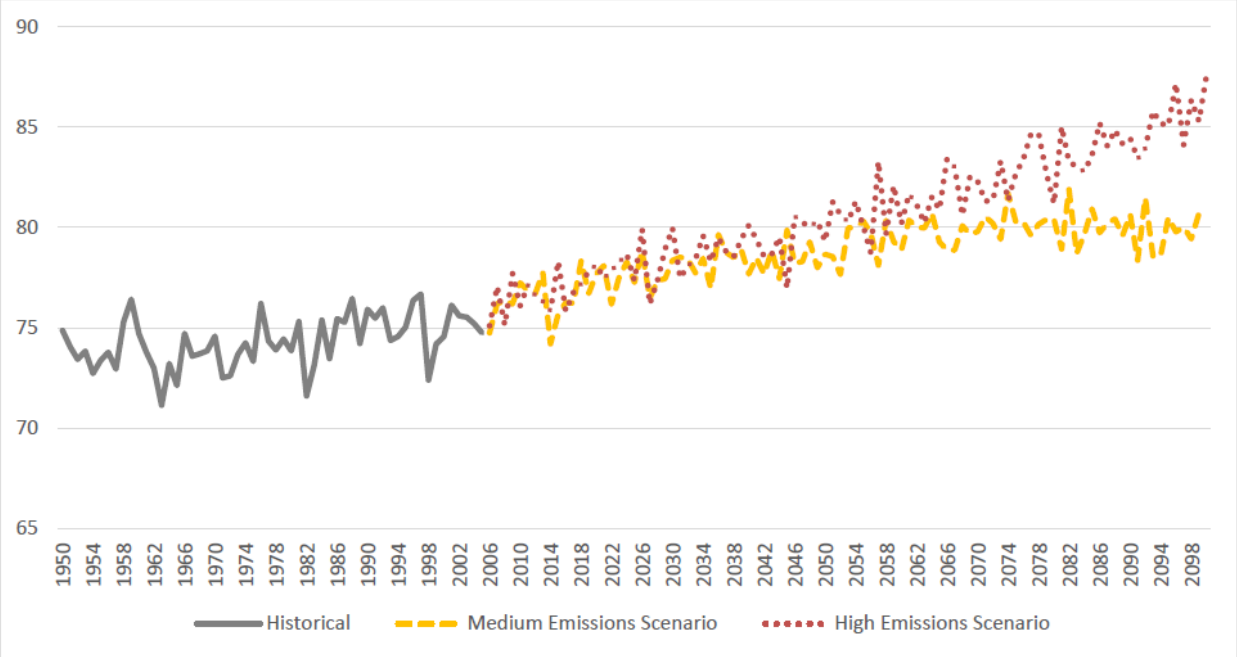
Table 4-34 Changes in Annual Average Temperature in Sacramento County

Annual Average Temperature (°F)	Historic Annual Average Temperature (1961-1990)	Medium Emissions Scenario (RCP 4.5)		High Emissions Scenario (RCP 8.5)	
		Mid-Century (2035-2064)	Late Century (2070-2099)	Mid-Century (2035-2064)	Late Century (2070-2099)
Maximum Temperature	74.0	78.3	79.8	79.4	82.7
Minimum Temperature	48.4	52.2	53.4	53.2	56.8

Notes: °F = degrees Fahrenheit, RCP = Representative Concentration Pathway

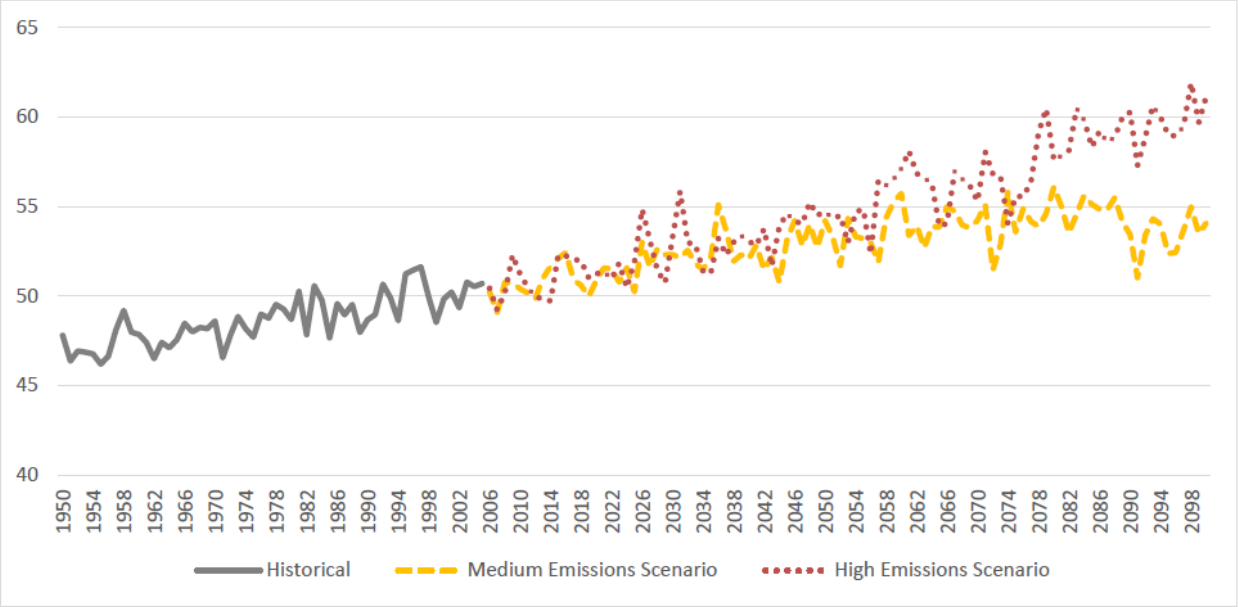
Source: 2021 Draft Sacramento County CAP

Figure 4-38 Historical and Projected Annual Average Maximum Temperature in Sacramento County



Source: 2021 Draft Sacramento County CAP

Figure 4-39 Historical and Projected Annual Average Minimum Temperature in Sacramento County



Source: 2021 Draft Sacramento County CAP

Increased temperature in unincorporated county will influence secondary climate effects including extreme heat events, wildfires, and drought. These are discussed in Section 4.3.3, 4.3.18, and 4.3.8 respectively.

Results – Changes in Precipitation Patters

According to California's Fourth Climate Change Assessment Sacramento Valley Region report, precipitation patterns in California oscillate between extremely dry and wet periods. Although annual precipitation figures in the Sacramento Valley region are expected to increase only slightly, climate change is likely to increase the intensity of extreme storms. Dry years are likely to become even drier, while wet years will become even wetter in the next several decades. Most critically, future wet seasons will have more precipitation as rain than snow, due to higher temperatures. The Northern Sierras, a primary water source for the Sacramento Valley, are expected to have almost no annual snowpack by the end of this century under the scenarios modeled for the paper. This shift will affect the timing of streamflow into the Sacramento Valley from spring to winter (Houlton and Lund 2018).

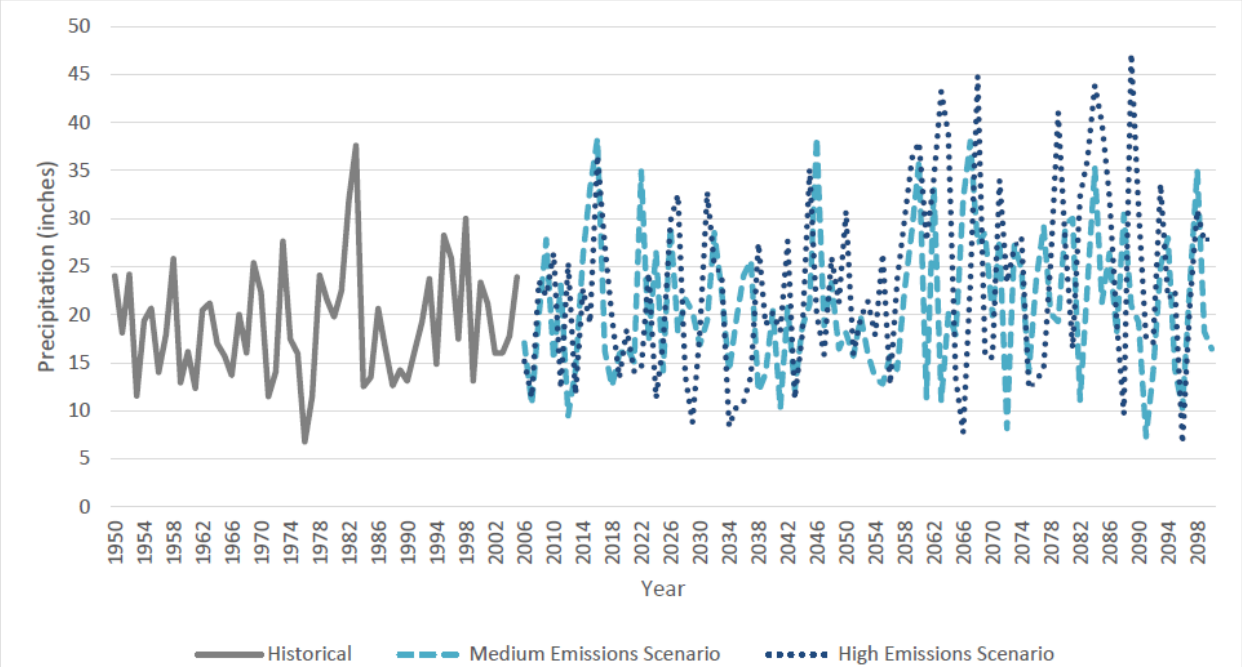
According to Cal-Adapt, the historic annual average precipitation in the County has been 18.3 inches. As shown in Table 4-35 and Figure 4-40, the total annual precipitation in the County is projected to increase slightly by mid-century and late century under the medium and high emissions scenarios.

Table 4-35 Changes in Annual Average Precipitation in Sacramento County

Annual Average Precipitation	Historic Annual Average Precipitation (1961-1990)	Medium Emissions Scenario (RCP 4.5)		High Emissions Scenario (RCP 8.5)	
		Mid-Century (2035-2064)	Late Century (2070-2099)	Mid-Century (2035-2064)	Late Century (2070-2099)
Annual Average Precipitation (in)	18.3	20.3	20.3	20.5	22.1

Notes: in = inches, RCP = Representative Concentration Pathway
Source: 2021 Sacramento County CAP

Figure 4-40 Historical and Projected Precipitation in Sacramento County



Source: 2021 Sacramento County CAP

Changes in precipitation patterns will affect secondary climate effects including extreme heat, wildfires, drought, flooding. These are discussed in Section 4.3.3, 4.3.18, 4.3.8, and 4.3.11, respectively.

Proceedings of the National Academy of Sciences (2014)

In addition to the APG, a report from the Proceedings of the National Academy of Sciences (PNAS) states that some of the recent fire impacts may have been attributed to climate change. The PNAS report posits that climate influences wildfire potential primarily by modulating fuel abundance in fuel-limited environments, and by modulating fuel aridity in flammability-limited environments. Increased forest fire activity across the western United States in recent decades has contributed to widespread forest mortality, carbon emissions, periods of degraded air quality, and substantial fire suppression expenditures. Those most vulnerable to high levels of ozone and particulate matter include people who work or spend a lot of time outdoors, such as residents of this region who are employees of the tourist industry. Households eligible for energy utility financial assistance programs are an indicator of potential impacts. These

households may be more at risk of not using cooling appliances, such as air conditioning, due to associated energy costs.

Future Development

Sacramento County in general could see population fluctuations as a result of climate impacts relative to those experienced in other regions, and these fluctuations could be expected to impact demand for housing and other development. For example, sea level rise may disrupt economic activity and housing in coastal communities, resulting in migration to inland urban areas. Other interior western states may experience an exodus of population due to challenges in adapting to heat even more extreme than that which is projected to occur here. While there are currently no formal studies of specific migration patterns expected to impact the Sacramento County region, climate-induced migration was recognized within the UNFCCC Conference of Parties Paris Agreement of 2015 and is expected to be the focus of future studies.

Climate change, coupled with shifting demographics and market conditions, could impact both the location of desired developments and the nature of development. Demand may increase for smaller dwellings that are less resource intensive, more energy efficient, easier to maintain and can be more readily adapted or even moved in response to changing conditions. Compact, mixed-use and infill developments that can help residents avoid long commutes and vulnerabilities associated with the transportation system will likely continue to grow in popularity. The value of open space and pressure to preserve it will likely increase, due in part to its restorative, recreational, environmental and habitat benefits but also for its ability to sequester carbon, help mitigate the accumulation of greenhouse gas in the atmosphere and slow down the global warming trend. Higher flood risks, especially if coupled with increased federal flood insurance rates, may decrease market demand for housing and other types of development in floodplains, while increased risk of wildfires may do the same for new developments in the urban-wildland interface. Flood risks may also inspire new development and building codes that elevate structures while maintaining streetscapes and neighborhood characteristics.

Climate change will stress water resources. Water is an issue in every region, but the nature of the potential impacts varies. Drought, related to reduced precipitation, increased evaporation, and increased water loss from plants, is an important issue in many U.S. regions, especially in the West. Floods, water quality problems, and impacts on aquatic ecosystems and species are likely to be amplified by climate change. Declines in mountain snowpack are important in Sacramento County the Sierra Nevada Mountains and across the state, where snowpack provides vital natural water storage and supply. The ability to secure and provide water for new development requires on-going monitoring and assurances. It is recommended that the ability to provide a reliable water supply from the appropriate water purveyor, continue to be in the conditions for project approval, and such assurances shall be verified and in place prior to issuing building permits.

Similarly, protecting and enhancing water supply will also need to be addressed. California's Sustainable Groundwater Management Act (SGMA) will contribute to addressing groundwater and aquifer recharge needs. Good groundwater management will provide a buffer against drought and climate change, and contribute to reliable water supplies regardless of weather patterns. California depends on groundwater for a major portion of its annual water supply, and sustainable groundwater management is essential to a reliable and resilient water system. Protection of critical recharge areas should be addressed across the

County in the respective Groundwater Management Plans. Further, these plans should include provisions that guide development or curtail development in areas that would harm or compromise recharge areas.

Climate change will affect transportation. The transportation network is vital to the County and the region's economy, safety, and quality of life. While it is widely recognized that emissions from transportation have impacts on climate change, climate will also likely have significant impacts on transportation infrastructure and operations Examples of specific types of impacts include softening of asphalt roads and warping of railroad rails; damage to roads; flooding of roadways, rail routes, and airports from extreme events; and interruptions to flight plans due to severe weather. Climate change impacts considered in the plan include extreme temperatures; increased precipitation, runoff and flooding; increased wildfires; and landslides. Although landslides are not a direct result of climate change, these events are expected to increase in frequency due to increased rainfall, runoff, and wildfire. These events have the potential to cause injuries or fatalities, environmental damage, property damage, infrastructure damage, and interruption of operations. During flood events, these trails serve as secondary transportation facilities when roadways are blocked or otherwise impassible. During Hurricane Sandy, bicycles were one of the primary modes used to deliver food and water to residents stranded in their homes due to flood. Including dual or multi-purpose facilities and amenities as part of all new development provides not just desirable community amenities but critical infrastructure for climate resiliency.

Climate change will affect land uses and planning. Climate change coupled with shifting demographics and market conditions, could impact both the location of desired developments and the nature of development. Demand may increase for smaller dwellings that are less resource intensive, more energy efficient, easier to maintain and can be more readily adapted or even moved in response to changing conditions. Compact, mixed-use and infill developments that can help residents avoid long commutes and vulnerabilities associated with the transportation system will likely continue to grow in popularity. The value of open space, urban greening, green infrastructure, tree canopy expansion and pressure to preserve it will likely increase, due in part to its restorative, recreational, environmental, and habitat, and physical and mental health benefits but also for its ability to sequester carbon and cool the surrounding environment.

Climate change will affect Utilities. California is already experiencing impacts from climate change such as an increased number of wildfires, sea level rise and severe drought. Utility efforts to deal with these impacts range from emergency and risk management protocols to new standards for infrastructure design and new resource management techniques. Utilities are just beginning to build additional resilience and redundancy into their infrastructure investments from a climate adaptation perspective, but have been doing so from an overall safety and reliability perspective for decades. Significant efforts are also being made in those areas that overlap with climate change mitigation such as diversification of resources, specifically the addition of more renewables to the portfolio mix, as well as implementation of demand response efforts to curb peak demand. Efforts are also under way to upgrade the distribution grid infrastructure, which should add significant resilience to the grid as well. Next, they will issue a guidance document that expands upon the vulnerability assessments phase and includes plans for resilience solutions including cost/benefit analysis methodologies. The outcomes of this work will help to inform next steps on how infrastructure, the grid and other related operations will be modified to address climate change. New development will have to adapt and incorporate these new approaches as they evolve. Existing and new development will be affected from impacts that includes not only diminished capacity from all of the utility assets from generation to transmission and distribution, but also the cost consequences resulting from prevention,

replacement, outage, and energy loss. These have the potential for greatly impacting not just residential development but commercial and industrial and all utility users.

4.3.7. Dam Failure

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failures can also result from any one or a combination of the following causes:

- Earthquake;
- Inadequate spillway capacity resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage, or piping or rodent activity;
- Improper design;
- Improper maintenance;
- Negligent operation; and/or
- Failure of upstream dams on the same waterway.

In general, there are three types of dams: concrete arch or hydraulic fill, earth and rockfill, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously; the flood wave builds up rapidly to a peak then gradually declines. An earth-rockfill dam fails gradually due to erosion of the breach; a flood wave will build gradually to a peak and then decline until the reservoir is empty. And a concrete gravity dam can fail instantaneously or gradually with a corresponding buildup and decline of the flood wave.

Dams and reservoirs have been built throughout California to supply water for agriculture and domestic use, to allow for flood control, as a source of hydroelectric power, and to serve as recreational facilities. The storage capacities of these reservoirs range from a few thousand acre feet to five million acre-feet. The water from these reservoirs eventually makes its way to the Pacific Ocean by way of several river systems.

The California Department of Water Resources (CA DWR) Division of Safety of Dams (DSOD) has jurisdiction over impoundments that meet certain capacity and height criteria. Embankments that are less than six feet high and impoundments that can store less than 15 acre-feet are non-jurisdictional. Additionally, dams that are less than 25 feet high can impound up to 50 acre-feet without being

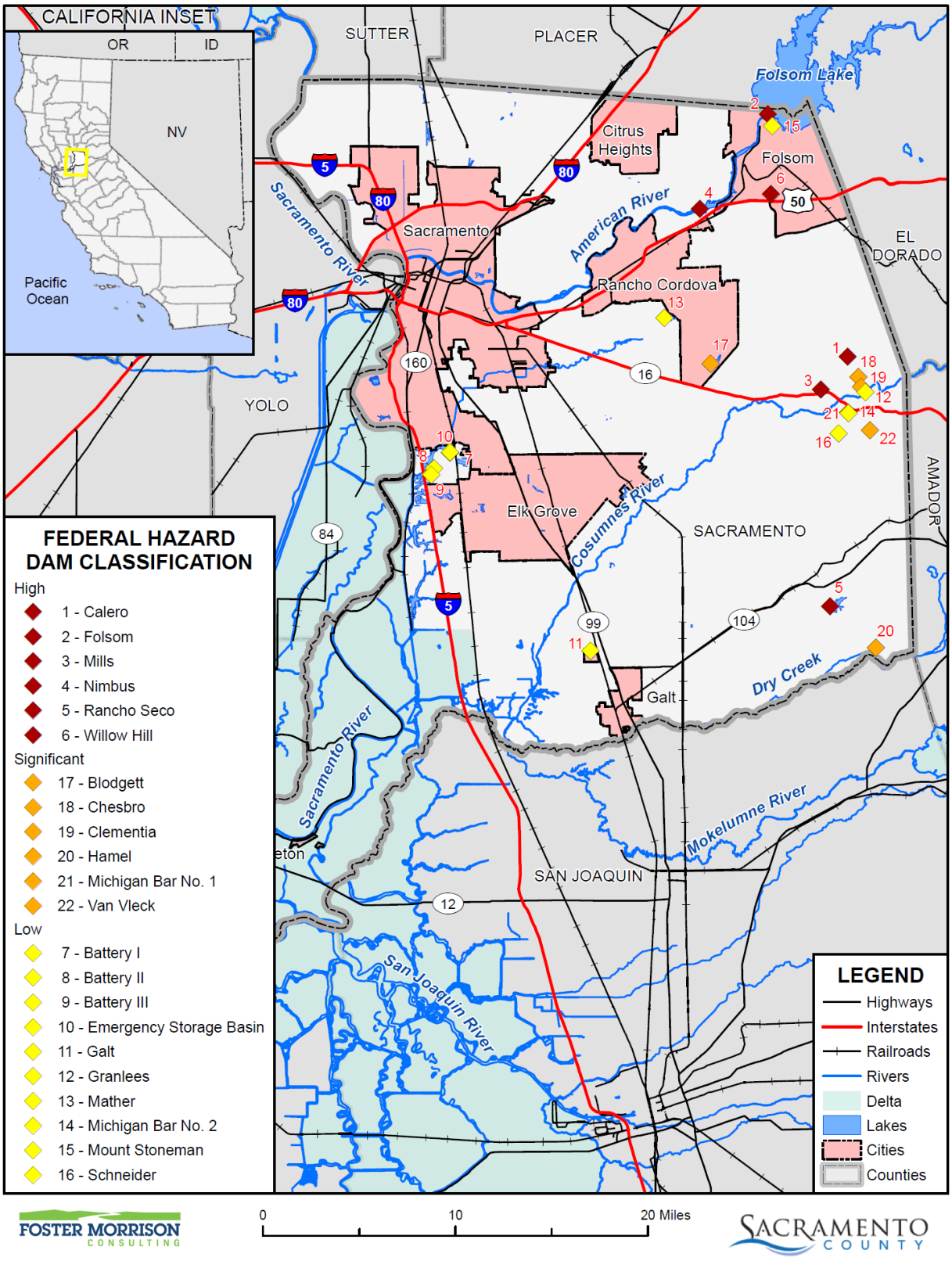
jurisdictional. CA DWR, DOSD assigns hazard ratings to large dams within the State. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property:

- **Extremely High Hazard** – Expected to cause considerable loss of human life or would result in an inundation area with a population of 1,000 or more
- **High Hazard** – Expected to cause loss of at least one human life.
- **Significant Hazard** – No probable loss of human life but can cause economic loss, environmental damage, impacts to critical facilities, or other significant impacts.
- **Low Hazard** – No probable loss of human life and low economic and environmental losses. Losses are expected to be principally limited to the owner's property.

Location and Extent

According to data provided by Sacramento County, CA DWR, and Cal OES, there are 27 dams in Sacramento County that were constructed for flood control, storage, treatment impoundments, electrical generation, and recreational purposes that fall under the jurisdiction of the DSOD (jurisdictional dams described above). Of the 27 dams, 11 are rated as High Hazard, 6 as Significant Hazard, and 10 as Low Hazard. Figure 4-41 identifies the dams located in the Sacramento County Planning Area and those outside the County that threaten the County. Table 4-36 gives information on each of the dams in the County that fall under DSOD jurisdiction. There are also 25 dams outside the County that have mapped inundation areas inside the County. These are shown on Figure 4-42. Table 4-37 details the 25 dams outside of Sacramento County that could affect areas inside Sacramento County.

Figure 4-41 Sacramento County Dam Inventory



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Table 4-36 Sacramento County – Inventory of Dams under DSOD Jurisdiction

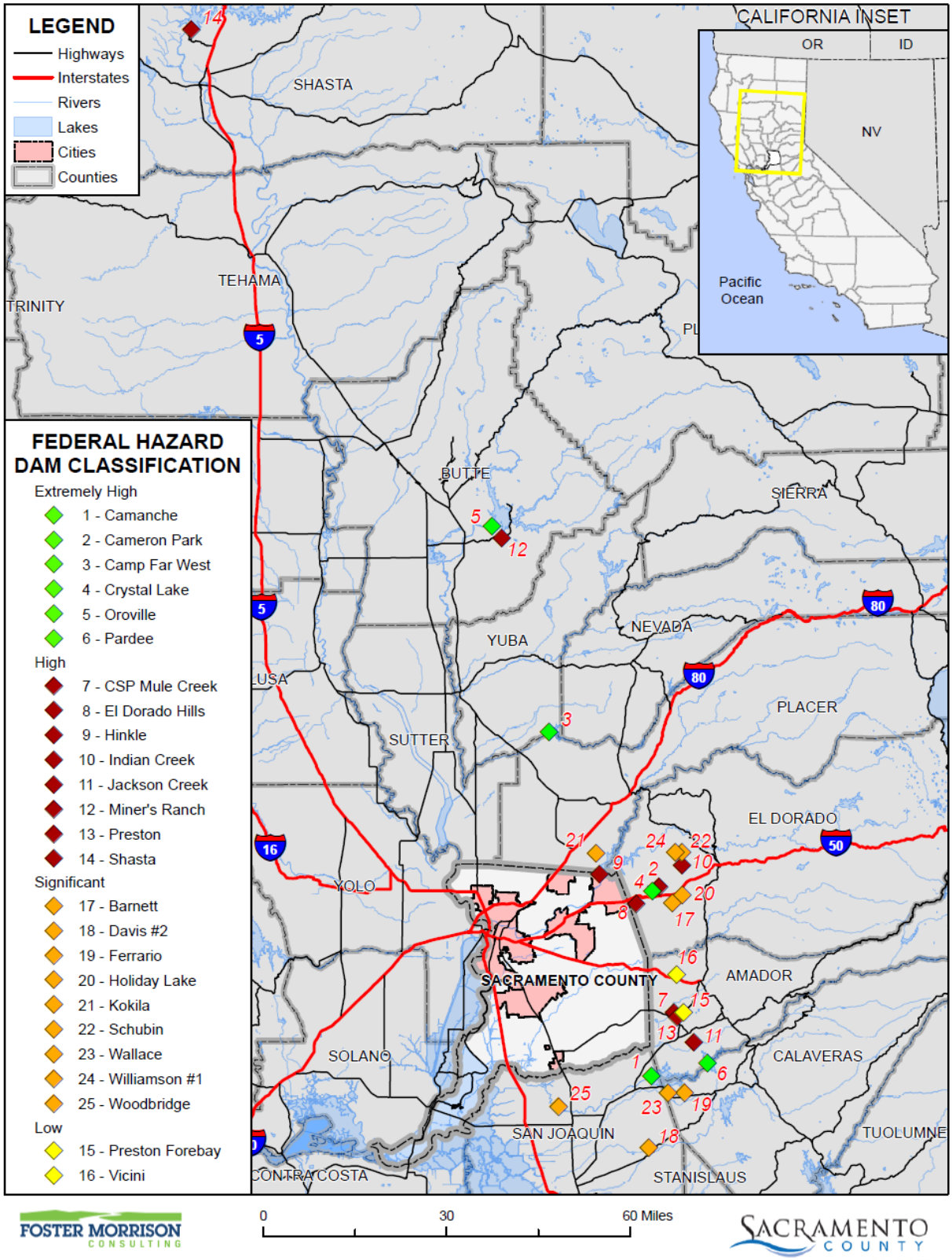
Name	Significance	Owner	River	Nearest City/ Distance (mi)	Mapped	Structural Height (ft)	Maximum Storage (acre-ft)
Battery I	Low	Sacramento Regional County Sanitation District	Unnamed	N/A	Y	N/A	N/A
Battery II	Low	Sacramento Regional County Sanitation District	Unnamed	N/A	Y	15	315
Battery III	Low	Sacramento Regional County Sanitation District	Unnamed	N/A	Y	12	847
Blodgett	Significant	Private	Laguna Creek	Mather AFB 2 miles	Y	24	599
Calero	High	Private	Crevis Creek	Rancho Murieta 3 miles	Y	55	3,375
Chesbro	Significant	Private	Consumnes River	Rancho Murieta 2 miles	Y	79	1,500
Clementia	Significant	Private	Tributary of Consumnes River	Rancho Murieta 0 miles	Y	33	1,510
Emergency Storage Basin	Low	Sacramento Regional County Sanitation District	Laguna Creek	N/A	Y	13	629
Folsom	High	Department of Interior	American River	Folsom 1 mile	Y	340	1,120,000
Folsom Mormon Island Auxiliary Dam	High	Department of Interior	Blue Ravine	Folsom 2 miles	N	110	1,120,000
Folsom Dike 7	High	Department of Interior	Green Valley	Folsom 1 mile	N	25	1,120,000
Folsom Dike 8	High	Department of Interior	Green Valley	Folsom 1 mile	N	15	1,120,000
Folsom Left Wing	High	Department of Interior	American River	Folsom 1 mile	N	145	1,120,000

Name	Significance	Owner	River	Nearest City/ Distance (mi)	Mapped	Structural Height (ft)	Maximum Storage (acre-ft)
Folsom Right Wing	High	Department of Interior	American River	Folsom 1 mile	N	145	1,120,000
Galt	Low	City of Galt	Consumnes River	Rancho Murieta 2 miles	Y	16	155
Granlees	Low	Consumnes Irrigation Association	Tributary of Dry Creek	N/A	Y	17	75
Hamel	Significant	Private	Morrison Creek	N/A	Y	26	350
Mather	Low	USAF	Tributary of Consumnes River	Rancho Murieta 2 miles	Y	N/A	N/A
Michigan Bar No. 1	Significant	Private	Tributary of Consumnes River	Rancho Murieta 2 miles	Y	17	897
Michigan Bar No. 2	Low	Private	Consumnes River	Rancho Murieta 1 mile	Y	36	56
Mills	High	Private	Consumnes River	Rancho Murieta 2 miles	Y	23	315
Mount Stoneman	Low	Folsom Prison	Tributary of American River	Folsom 2 miles	Y	73	40
Nimbus	High	Department of Interior	American River	Fair Oaks 3 miles	Y	87	8,800
Rancho Seco	High	Sacramento Municipal Utilities	Hadselville Creek	Clay 4 miles	Y	58	4,350
Schneider	Low	Private	Tributary of Arkansas Creek	Rancho Murieta 4 miles	Y	22	226
Van Vleck	Significant	Private	Arkansas Creek	Rancho Murieta 7 miles	Y	30	2,600
Willow Hill	High	City of Folsom	American River	Folsom 3 miles	Y	24	175

Source: Cal OES and the National Performance of Dams Program

*One Acre Foot=326,000 gallons

Figure 4-42 Sacramento County – Dams Inventory Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Table 4-37 Dams of Concern Outside Sacramento County

Dam Name Dam ID County	Hazard Class	Owner	Dam Height	Storage (acre-feet)*	Stream	Nearest Community/Distance
Oroville CA00035 Butte	High	California Department of Water Resources	770	3,540,000	Feather River	Oroville 3 miles
Miner's Ranch CA00275 Butte	High	Oroville Wyandotte Irrigation District	90	815	Kelly Ridge Canal	Kelly Ridge 1 mile
Camanche Main CA00 73 San Joaquin	High	East Bay Municipal Utility District	171	431,000	Mokelumne River	Clements 4 miles
Shasta CA10186 Shasta	High	Department of the Interior	602	4,661,860	Sacramento River	Redding 9 miles
Pardee CA00164 Border of Calaveras and Amador Counties	High	East Bay Municipal Utility District	350	198,000	Mokelumne River	Jackson 8 miles
CSP Mule Creek CA01195 Amador	High	State Department of Corrections	51	630	Offstream	Ione 2 miles
Jackson Creek CA00867 Amador	High	Jackson Valley Irrigation District	168	24,000	Jackson Creek	Buena Vista 1 mile
Camp Far West CA00227 Yuba	High	South Sutter Water District	185	104,000	Bear River	Sheridan 5 miles
Preston CA00012 Amador	Significant	Amador Reg. Sanit. Authority	40	37	Tributary of Mule Creek	Ione 1 mile
Preston Forebay CA00006 Amador	Significant	Amador Reg. Sanit. Authority	40	37	Offstream	Ione 2 miles
Wallace CA01314 Calaveras	Significant	Private	19	700	Tributary of Bear Creek	Wallace 0 miles
Ferrario CA00626 Calaveras	Significant	Private	25	384	Tributary of Bear Creek	Wallace 4 miles

Dam Name Dam ID County	Hazard Class	Owner	Dam Height	Storage (acre-feet)*	Stream	Nearest Community/Distance
Cameron Park CA01199 El Dorado	Significant	Cameron Park Community Services District	29	880	Deer Creek	Cameron Park 1 mile
Barnett CA00998 El Dorado	Significant	Private	18	187	Barnett Creek	Shingle Springs 2 miles
Williamson #1 CA00608 El Dorado	Significant	Private	42	260	Tributary of Weber Creek	Shingle Springs 6 miles
Holiday Lake CA00910 El Dorado	Significant	Holiday Lake Community Service District	39	220	Sawmill Creek	Frenchtown 2 miles
Crystal Lake CA01282 El Dorado	Significant	Private	32	296	Tributary of Deer Creek	Shingle Springs 4 miles
Schubin CA01045 El Dorado	Significant	Private	55	315	Tributary of Webber Creek	Shingle Springs 7 miles
Indian Creek CA00997 El Dorado	Significant	Private	36	757	Indian Creek	Rescue 4 miles
Hinkle CA01192 Placer	Significant	San Juan Suburban Water District	20	200	Tributary of American River	Orangevale 2 miles
Kokila CA00544 Placer	Significant	Pacific Gas and Electric	42.5	1,520	Tributary of South Yuba River	Washington 25 miles
Vicini CA01093 Amador	Significant	Private	19	290	Tributary of Willow Creek	Indian Hill 8 miles
Woodbridge CA00285 San Joaquin	Significant	Woodbridge Irrigation District	35	5,064	Mokelumne River	Woodbridge 0 miles
Davis #2 CA00656 San Joaquin	Significant	Private	26	2,220	Tributary of Calaveras River	Linden 4 miles

Source: Cal OES and the National Performance of Dams Program

*One Acre Foot=326,000 gallons

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, dam failure would most probably happen in consequence of the natural disaster triggering the event. However, DOSD assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail: Low, Significant, High, and Extremely High, as detailed above. There is no scale with which to measure dam

failure. While a dam may fill slowly with runoff from winter storms, a dam break can have a very quick speed of onset. The duration of dam failure is not long – only as long as it takes to empty the reservoir of water the dam held back. Dam inundation flood geographic extents are discussed in Table 4-47 (for extremely high hazard dams) and Table 4-48 (for high hazard dams) in the flooded acres analysis in the vulnerability assessment of this section.

Past Occurrences

Disaster Declaration History

There have been no disasters declaration related to dam failure in Sacramento County, as shown in Table 4-4.

NCDC Events

There have been no NCDC dam failure events in Sacramento County.

Hazard Mitigation Planning Committee Events

A search of the National Performance of Dams database data shows two dam failure incidents for Sacramento County since 1994, both related to the Folsom Dam. However, these incidents were not actually dam failures, were quite limited in scope, and since the incidents occurred, improvements to the Folsom Dam system have been made and are continuing. These two events are further described below:

July 17, 1995 – At the Folsom Dam, a spillway gate (gate #3 – see Figure 4-43) of Folsom Dam failed, increasing flows into the American River significantly. The spillway was repaired and the U.S. Bureau of Reclamation carried out an investigation of the water flow patterns around the spillway using numerical modeling. No flooding occurred as a result of the partial failure, but due to the location of the dam in proximity to the City of Folsom, possible flooding was a major concern.

Figure 4-43 July 17, 1995 Folsom Dam Incident

Source: US Bureau of Reclamation

May 15, 1997 – Cavitation damage to river outlet works occurred at Folsom Dam. Damage was discovered just downstream of gate #3. The damage consisted of a hole in the floor of the conduit measuring approximately 42 feet long, 15 feet wide, and 6 feet deep. Subsequent inspections of the other conduits revealed similar damage downstream of gate #4. Also, the beginning of cavitation damage was found downstream of gate #2. Minor damage was found in the other five conduits. No flooding was associated with this damage.

2017 Oroville Spillway Incident – February On Feb. 7, the California Department of Water Resources temporarily suspended flows from the Oroville Dam spillway to investigate concrete erosion on the bottom half of the spillway. On Feb. 8, to help determine an appropriate level of flow down the damaged spillway at Oroville Dam, the California Department of Water Resources released up to 20,000 cubic feet per second (cfs), then ramped down the flows to assess any further damage to the eroded spillway. On Feb. 9, the California Department of Water Resources personnel and a host of collaborating agencies continued to monitor Lake Oroville spillway flows through the night. As expected, the overnight flow rate of 20,000 cubic feet per second (cfs) caused additional lower spillway erosion. Spillway flow was stopped again for a few hours to allow engineers to evaluate the integrity of the structure. On Feb. 11, a relatively light flow of water that began washing into Lake Oroville's emergency spillway was expected to continue flowing for the next few days. The lake exceeded the elevation of 901 feet above sea level shortly after 8 a.m., at which point water slowly began to flow over the concrete weir of the auxiliary spillway, down a hillside, and into the Feather River. On Feb. 12, the Lake Oroville Dam emergency spillway structure suffered potentially

catastrophic damage as a result of erosion secondary to water flow. The California Department of Water Resources increased exhaust water flow from the Gated Spillway to 100,000 cubic feet per second in an attempt to decrease Lake Oroville water levels. In response, the California Governor's Office of Emergency Services activated the State Operations Center in Sacramento in support of the Oroville Dam emergency spillway incident. Immediate evacuations were ordered for counties and cities near Lake Oroville, and Governor Brown issued state of emergency to help mobilize disaster response resources and support the local evacuations. In Sacramento County, the County prepared for high water levels and the possible collapse of the dam. There was worry about levee erosions from high water flows. Ultimately, the dam held and no damages occurred in the County.

Likelihood of Future Occurrence

Occasional—No dam failure events have occurred in the County, but the County was affected by the Oroville Spillway incident. Thus, based on historical data and input from the HMPC, it is occasional that major dam failure event will occur in Sacramento County.

Climate Change and Dam Failure

Increases in both precipitation and heat causing snow melt in areas upstream of dams could increase the potential for dam failure and uncontrolled releases in Sacramento County.

The 2021 Draft Sacramento CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events, such as sustained periods of heavy precipitation, increased rainfall intensity during precipitation events, and increased risk of rain-on-snow events. Further, more winter-time precipitation that falls as rain instead of snow, and higher temperatures that will cause earlier snowmelt, which could produce substantial surface water flows over a short period of time and may potentially affect dams and spillways and overwhelm levee systems designed for historical precipitation patterns.

Vulnerability Assessment

Vulnerability—High

Dam failure flooding can occur as the result of partial or complete collapse of an impoundment. Dam failures often result from prolonged rainfall and flooding. The primary danger associated with dam failure is the high velocity flooding of those properties downstream of the dam. A dam failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to dam failures is confined to the areas subject to inundation downstream of the facility. Secondary losses would include loss of the multi-use functions of the facility and associated revenues that accompany those functions. Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding.

Impacts

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require

evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Electric generating facilities and transmission lines could also be damaged and affect life support systems in communities outside the immediate hazard area. Associated water supply, water quality and health concerns could also be an issue. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

Based on the risk assessment, it is apparent that a major dam failure could have a devastating impact on the Planning Area. Dam failure flooding presents a threat to life and property, including buildings, their contents, and their use. Large flood events can affect crops and livestock as well as lifeline critical utilities (e.g., water, sewerage, and power), transportation, jobs, tourism, the environment, and the local and regional economies.

Mapped Dams of Concern

As detailed in Table 4-36, the County is vulnerable to the multiple dams. The following dams have mapped inundation areas that intersect the County:

Dams Inside the County

- Calero
- Folsom
- Rancho Seco
- Willow Hill

Dams Outside the County

- Cameron Park
- Camp Far West
- El Dorado Hills
- Hinkle
- Jackson Creek
- Oroville
- Shasta

Folsom Dam 235,000 cfs Scenario

The County provided the mapping of a Folsom Dam 235,000 cfs Scenario. This is considered a "super release" scenario. This scenario has the dam holding (and not failing) by releasing a theoretical maximum of 235,000 cubic feet per second of water. This release would be done under extreme circumstances to relieve the dam of an enlarged reservoir of water occurring simultaneously with additional inflows from upstream. This release would inundate areas below Folsom Dam, and would only be undertaken to save the dam from failure.

Values at Risk

Dam inundation areas were available for multiple dams, as obtained from CA DWR, DSOD were used as the basis of this dam inundation analysis. Dams were grouped by location (inside or outside the County) and hazard rating in order to perform analysis. The depth of flooding due to the failure of these dams is unknown.

Methodology and Results

The same methodology was used for the dams inside and outside the County. Sacramento County's 2020 Parcel/Assessor Data, obtained from Sacramento County, were used for the County inventory of parcels and values. GIS was used to for analysis on the parcel layer. The dam inundation areas, obtained from DSOD, were then overlaid on the parcel layer. The dam inundation areas, obtained from DSOD, were then overlaid on the polygon parcel layer unlike the assets at risk analysis which was performed by centroid analysis. For the purposes of this analysis, if the dam inundation layer intersected any part of the polygon parcel, the entire parcel was considered to be in the dam inundation area. The parcels were segregated and analyzed in this fashion for the entirety of Sacramento County. Once completed, the parcel boundary layer was joined to the centroid layer and values were transferred based on the identification number in the Assessors database and the GIS parcel layer.

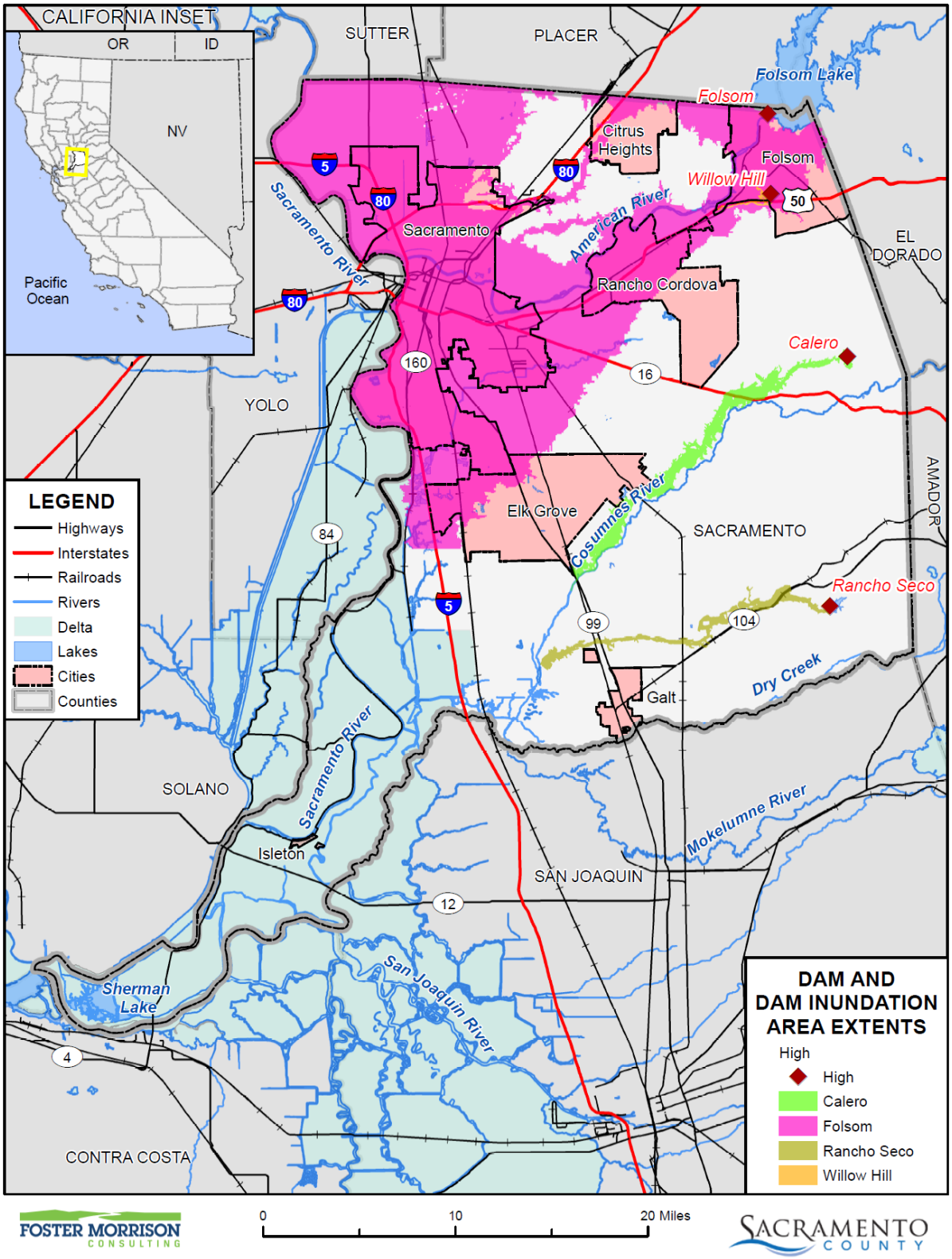
Also, it is important to keep in mind that these assessed values may be well below the actual market value of improved parcels located within the dam inundation areas due primarily to Proposition 13 and to a lesser extent properties falling under the Williamson Act.

Dams Inside the County

Dam analysis was performed for the mapped high hazard dams in the County with available inundation data. Figure 4-44 shows the dam inundation areas of these dams inside the County. The depth of flooding due to the failure of a dam is unknown. Table 4-38 the total parcel counts, improved parcel counts, their improved structure and land values in each dam inundation areas. Table 4-39 breaks down Table 4-38 to show the jurisdictions affected by each dam inundation area. Table 4-40 details the property uses in the unincorporated County in each dam inundation area. Property uses affected by each dam inundation area in the incorporated communities in the County are detailed in their respective annexes to this Plan Update.

It is important to note that there are no extremely high hazard dams located inside Sacramento County. Therefore, no analysis is performed on these dams.

Figure 4-44 Sacramento County –Dam Inundation Areas from Dams Inside County



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 2/2021.

Table 4-38 Sacramento County Planning Area – Summary Count and Value of Parcels in the High Hazard Dam Inundation Areas

Dam Inundation Areas	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Calero	186	121	$77,487,364	$89,943,593	$85,593,089	$253,024,050
Folsom	310,069	286,482	$53,080,410,667	$111,779,756,530	$70,029,815,914	$234,889,983,292
Rancho Seco	151	78	$36,677,678	$38,207,607	$37,089,274	$111,974,559
Willow Hill	42	19	$46,124,255	$446,593,668	$416,826,784	$909,544,707

Source: Sacramento County 2020 Parcel/Assessor's Data, Cal OES, DSOD

Table 4-39 Sacramento County Planning Area – Count and Value of Parcels in the High Hazard Dam Inundation Areas of Dams Inside the County

Dam Inundation/ Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Calero Dam Inundation Area						
Elk Grove	16	13	$2,869,457	$5,415,691	$2,707,844	$10,992,995
Unincorporated Sacramento County	170	108	$74,617,907	$84,527,902	$82,885,245	$242,031,055
Folsom Dam Inundation Area						
Citrus Heights	8,555	8,246	$12,255,404,308	$13,678,780,639	$6,880,277,314	$32,814,462,221
Elk Grove	18,141	17,172	$1,807,628,600	$5,172,659,324	$2,912,714,908	$9,893,002,716
Folsom	22,290	20,638	$3,870,588,630	$9,452,361,980	$5,863,790,696	$19,186,741,224
Rancho Cordova	18,469	17,609	$3,973,310,963	$6,896,716,789	$4,927,028,278	$15,797,055,987
City of Sacramento	156,848	143,642	$19,302,703,646	$51,321,198,849	$33,664,345,577	$104,288,248,771
Unincorporated Sacramento County	85,766	79,175	$11,870,774,520	$25,258,038,949	$15,781,659,141	$52,910,472,373
Rancho Seco Dam Inundation Area						
Galt	1	0	$0	$0	$0	$0
Unincorporated Sacramento County	150	78	$36,677,678	$38,207,607	$37,089,274	$111,974,559
Willow Hill Dam Inundation Area						
Folsom	36	19	$45,935,048	$446,593,668	$416,826,784	$909,355,500
Unincorporated Sacramento County	6	0	$189,207	$0	$0	$189,207

Source: Sacramento County 2020 Parcel/Assessor's Data, Cal OES, DSOD

Table 4-40 Unincorporated Sacramento County – Count and Value of Parcels in the High Hazard Dam Inundation Areas of Dams Inside the County by Property Use

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Calero Dam Inundation Area						
Agricultural	123	90	$70,030,633	$80,320,269	$80,320,269	$230,671,171
Care / Health	1	0	$164	$0	$0	$164
Miscellaneous	8	0	$11,352	$0	$0	$11,352
Public / Utilities	3	0	$0	$0	$0	$0
Recreational	1	1	$504,672	$336,440	$336,440	$1,177,552
Residential	17	15	$2,245,516	$3,285,311	$1,642,654	$7,173,482
Retail / Commercial	2	2	$69,212	$585,882	$585,882	$1,240,976
Vacant	15	0	$1,756,358	$0	$0	$1,756,358
Unincorporated Sacramento County	**170**	**108**	**$74,617,907**	**$84,527,902**	**$82,885,245**	**$242,031,055**
Folsom Dam Inundation Area						
Agricultural	227	56	$94,041,389	$12,202,315	$12,202,315	$118,446,019
Care / Health	103	97	$66,307,595	$233,055,928	$233,055,928	$532,419,451
Church / Welfare	246	216	$83,107,816	$381,139,882	$381,139,882	$845,387,580
Industrial	1,088	870	$533,006,127	$1,586,271,028	$2,379,406,549	$4,498,683,694
Miscellaneous	1,885	16	$9,210,021	$664,951	$664,951	$10,539,923
Office	744	662	$349,890,757	$1,075,111,141	$1,075,111,141	$2,500,113,039
Public / Utilities	391	0	$131	$0	$0	$131
Recreational	100	56	$34,222,157	$61,232,163	$61,232,163	$156,686,483
Residential	76,840	75,939	$9,416,527,232	$20,503,678,639	$10,251,839,253	$40,172,044,897
Retail / Commercial	1,206	1,117	$733,273,970	$1,387,006,959	$1,387,006,959	$3,507,287,888
Unknown	5	4	$40,717	$299,068	$0	$339,785
Vacant	2,931	142	$551,146,608	$17,376,875	$0	$568,523,483
Unincorporated Sacramento County Total	**85,766**	**79,175**	**$11,870,774,520**	**$25,258,038,949**	**$15,781,659,141**	**$52,910,472,373**
Rancho Seco Dam Inundation Area						
Agricultural	87	63	$34,027,330	$35,978,223	$35,978,223	$105,983,776
Industrial	2	0	$0	$0	$0	$0
Miscellaneous	22	0	$1,395	$0	$0	$1,395

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Public / Utilities	4	0	$0	$0	$0	$0
Residential	14	14	$1,972,943	$2,222,098	$1,111,051	$5,306,092
Vacant	21	1	$676,010	$7,286	$0	$683,296
Unincorporated Sacramento County Total	**150**	**78**	**$36,677,678**	**$38,207,607**	**$37,089,274**	**$111,974,559**
Willow Hill Dam Inundation Area						
Miscellaneous	2	0	$5,518	$0	$0	$5,518
Public / Utilities	1	0	$0	$0	$0	$0
Vacant	3	0	$183,689	$0	$0	$183,689
Unincorporated Sacramento County Total	**6**	**0**	**$189,207**	**$0**	**$0**	**$189,207**

Source: Sacramento County 2020 Parcel/Assessor's Data, Cal OES, DSOD

In addition to the Cal OES and DSOD provided inundation areas, Sacramento County noted a study done regarding a Folsom Dam super release. Using a 235,000 cfs release scenario, maps were created to show an expected inundation area under that scenario. This can be seen in Figure 4-45. Using the same methodology as above, tabular analysis was created. A summary table of values at risk in the Sacramento County Planning Area in the Folsom Dam 235,000 cfs scenario can be seen in Table 4-41. Table 4-42 breaks Table 4-41 to show the values at risk in each jurisdiction. Table 4-43 shows the values at risk in the unincorporated County from the Folsom Dam 235,000 cfs release. The County noted that the area labeled Folsom 235,000 cfs Release Riverine Inundation is the American River corridor and the backwater of the Natomas East Main Drainage Channel (aka Steelhead Creek) to the flood control pump station.

Figure 4-45 Sacramento County – Folsom Dam 235,000 cfs Scenario Inundation Areas

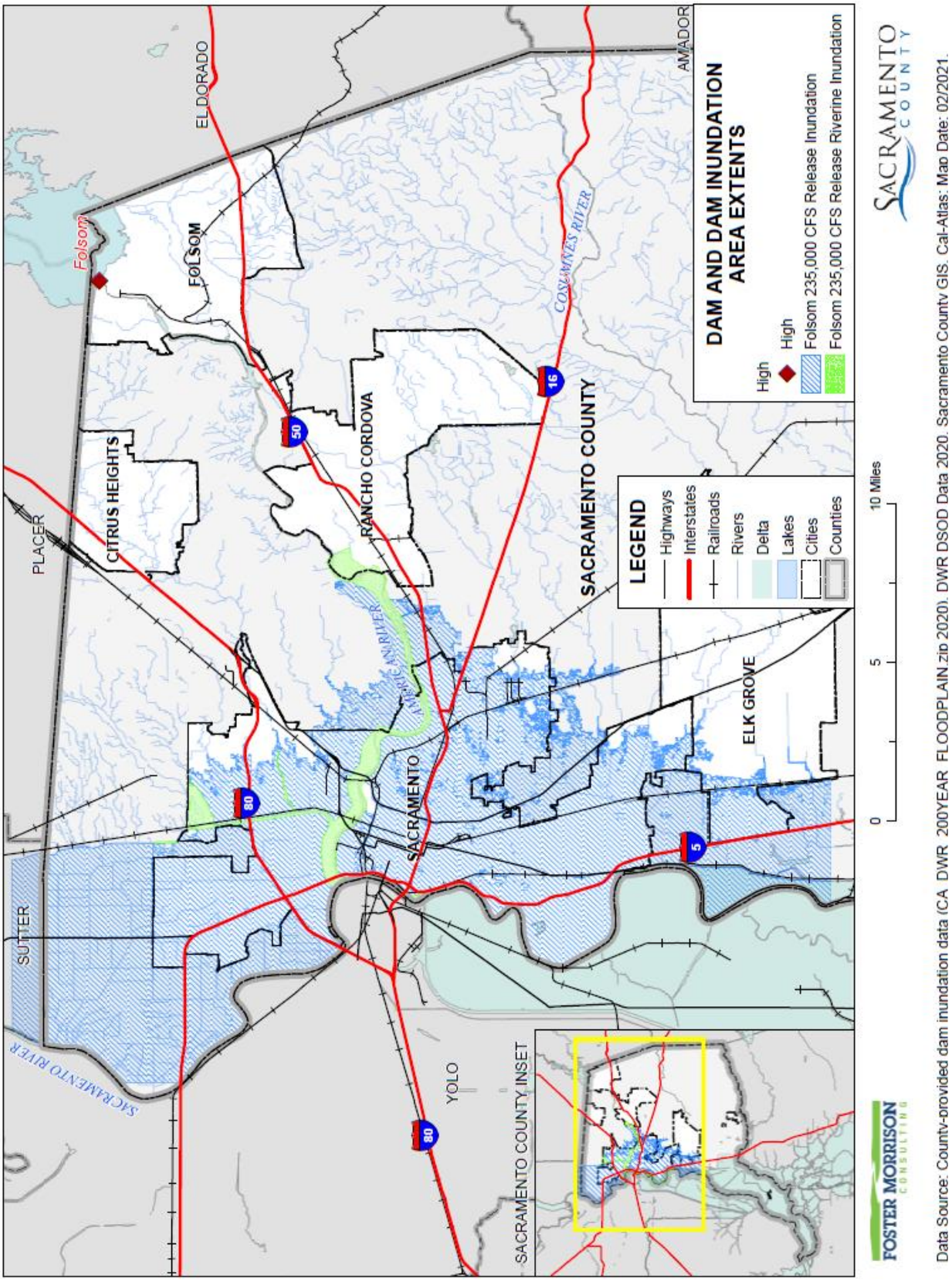


Table 4-41 Sacramento County Planning Area – Summary of Parcels and Values in Folsom Dam 235,000 cfs Scenario

Dam Inundation Areas	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Folsom 235,000 CFS Release	187,228	171,865	$23,366,779,385	$60,380,930,368	$39,487,017,929	$123,234,728,193

Source: Sacramento County 2020 Parcel/Assessor's Data, CA DWR

Table 4-42 Sacramento County Planning Area – Count and Value of Parcels in Folsom Dam 235,000 cfs Scenario by Jurisdiction

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Elk Grove	9,814	9,277	$1,076,336,037	$3,151,585,836	$1,798,131,188	$6,026,052,974
Rancho Cordova	40	24	$5,871,864	$12,428,695	$6,214,348	$24,514,907
City of Sacramento	149,885	137,271	$18,549,178,060	$49,163,674,037	$31,945,584,881	$99,658,437,646
Unincorporated Sacramento County	27,489	25,293	$3,735,393,424	$8,053,241,800	$5,737,087,512	$17,525,722,666

Source: Sacramento County 2020 Parcel/Assessor's Data, CA DWR

Table 4-43 Unincorporated Sacramento County – Count and Value of Parcels in Folsom Dam 235,000 cfs Scenario by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	217	56	$100,071,498	$18,921,962	$18,921,962	$137,915,422
Care / Health	34	31	$23,873,064	$184,953,311	$184,953,311	$393,779,686
Church / Welfare	96	87	$28,566,484	$123,724,535	$123,724,535	$276,015,554
Industrial	401	371	$250,753,869	$917,950,259	$1,376,925,392	$2,545,629,523
Miscellaneous	671	12	$5,923,419	$572,961	$572,961	$7,069,341
Office	340	299	$200,658,030	$553,755,429	$553,755,429	$1,308,168,888
Public / Utilities	171	0	$45	$0	$0	$45
Recreational	54	23	$10,025,825	$8,209,991	$8,209,991	$26,445,807
Residential	24,019	23,817	$2,523,254,098	$5,545,133,462	$2,772,566,770	$10,840,954,257
Retail / Commercial	609	561	$344,599,527	$697,457,161	$697,457,161	$1,739,513,849
Vacant	877	36	$247,667,565	$2,562,729	$0	$250,230,294

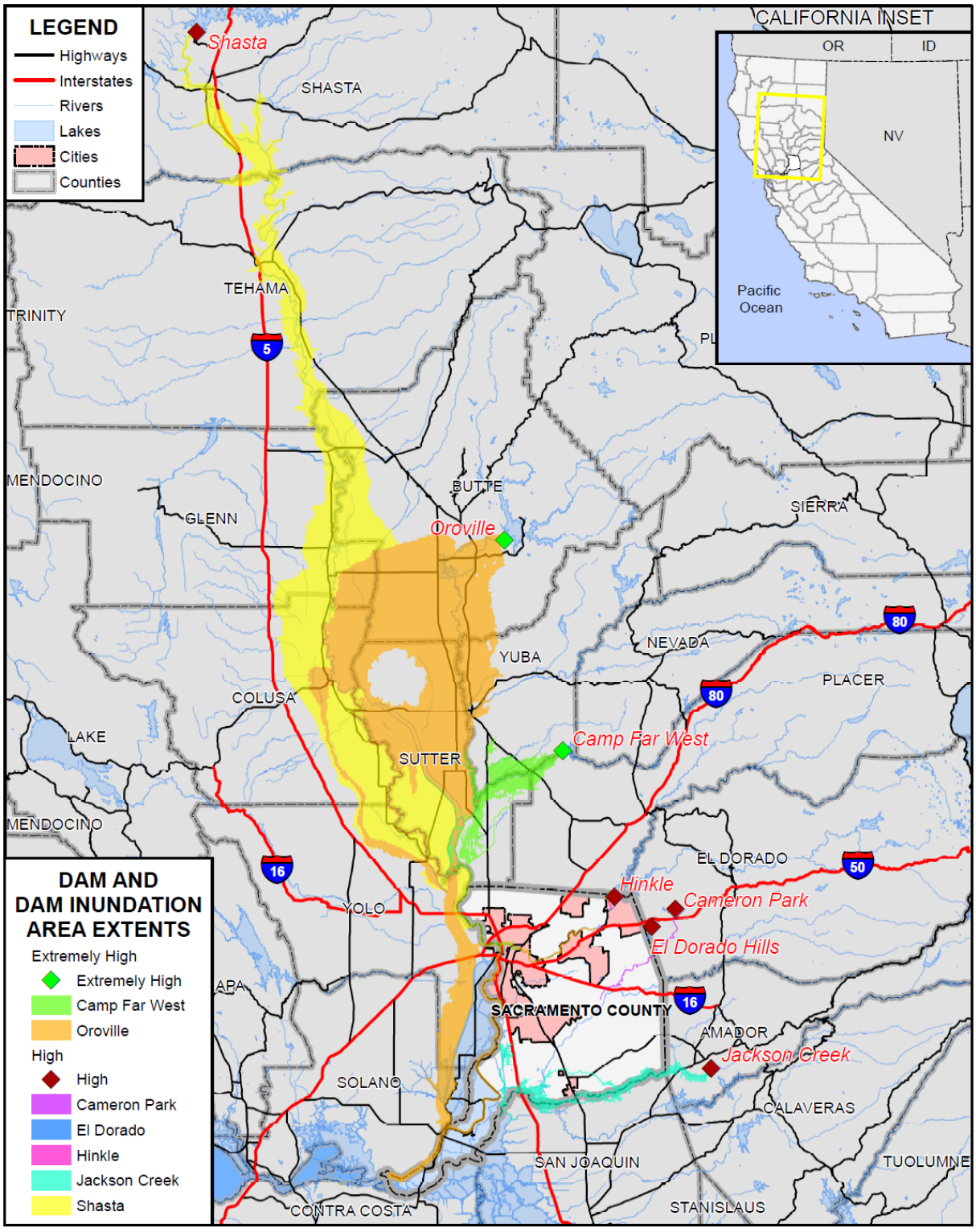
Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unincorporated Sacramento County Total	**27,489**	**25,293**	**$3,735,393,424**	**$8,053,241,800**	**$5,737,087,512**	**$17,525,722,666**

Source: Sacramento County 2020 Parcel/Assessor's Data, CA DWR

Dams Outside the County

Dam analysis was performed for the mapped extremely high and extremely high hazard dams outside the County with inundation areas inside the County. Figure 4-46 shows the dam inundation areas of these dams of concern for the County. Table 4-44 the total parcel counts, improved parcel counts, their improved structure and land values in each high hazard dam inundation areas. Table 4-45 breaks down Table 4-44 to show the which jurisdictions are affected by each dam inundation area. Table 4-46 details the property uses in the unincorporated County in each dam inundation area. Property uses affected by each dam inundation area in the incorporated communities in the County are detailed in their respective annexes to this Plan Update.

Figure 4-46 Sacramento County –Dam Inundation Areas from Dams Outside County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Table 4-44 Sacramento County Planning Area– Summary Count and Value of Parcels in the Dam Inundation Areas from Dams Outside the County

Dam Inundation Areas	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Extremely High Hazard Dams						
Camp Far West	414	190	$64,583,854	$104,745,932	$60,238,929	$229,568,707
Oroville	3,179	2,141	$526,316,249	$1,156,028,355	$766,016,092	$2,448,360,716
High Hazard Dams						
Cameron Park	133	55	$82,693,121	$9,057,582	$9,057,582	$100,808,285
El Dorado	12	12	$1,114,668	$216,108	$216,108	$1,546,884
Hinkle	179	159	$192,807,585	$208,536,005	$109,171,285	$510,514,874
Jackson Creek	345	161	$81,249,563	$82,788,464	$78,557,106	$242,595,133
Shasta	220	76	$24,219,642	$35,768,653	$18,041,883	$78,030,179

Source: Sacramento County 2020 Parcel/Assessor's Data, Cal OES, DSOD

Table 4-45 Sacramento County Planning Area – Count and Value of Parcels in the Dam Inundation Areas of Dams Outside the County

Dam Inundation/ Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Camp Far West (Extremely High Hazard Dam)						
City of Sacramento	113	20	$9,035,924	$25,269,061	$20,399,528	$54,704,513
Unincorporated Sacramento County	301	170	$55,547,930	$79,476,871	$39,839,401	$174,864,194
Oroville Dam (Extremely High Hazard Dam)						
Isleton	111	83	$5,547,065	$10,955,235	$7,102,979	$23,605,281
Rancho Cordova	79	36	$4,225,670	$10,953,529	$5,476,761	$20,655,962
City of Sacramento	1,246	864	$246,504,620	$675,337,203	$460,240,301	$1,382,082,142
Unincorporated Sacramento County	1,743	1,158	$270,038,894	$458,782,388	$293,196,051	$1,022,017,331
Cameron Park Dam (High Hazard Dam)						
Unincorporated Sacramento County	133	55	$82,693,121	$9,057,582	$9,057,582	$100,808,285

Dam Inundation/ Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
El Dorado Dam (High Hazard Dam)						
Unincorporated Sacramento County	12	12	$1,114,668	$216,108	$216,108	$1,546,884
Hinkle Dam (High Hazard Dam)						
Folsom	179	159	$192,807,585	$208,536,005	$109,171,285	$510,514,874
Jackson Creek Dam (High Hazard Dam)						
Galt	19	5	$6,672,896	$1,895,709	$1,176,520	$9,745,125
Unincorporated Sacramento County	326	156	$74,576,667	$80,892,755	$77,380,586	$232,850,008
Shasta Dam (High Hazard Dam)						
Unincorporated Sacramento County	220	76	$24,219,642	$35,768,653	$18,041,883	$78,030,179

Source: Sacramento County 2020 Parcel/Assessor's Data, Cal OES, DSOD

Table 4-46 Unincorporated Sacramento County – Count and Value of Parcels in the Dam Inundation Areas of Dams Outside the County by Property Use

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Camp Far West Dam (Extremely High Hazard Dam)						
Agricultural	2	0	$20	$0	$0	$20
Miscellaneous	10	0	$5,894	$0	$0	$5,894
Public / Utilities	68	0	$18	$0	$0	$18
Recreational	4	1	$280,231	$212,967	$212,967	$706,165
Residential	172	167	$45,701,407	$79,252,857	$39,626,434	$164,580,690
Unknown	1	0	$5,576	$0	$0	$5,576
Vacant	44	2	$9,554,784	$11,047	$0	$9,565,831
Unincorporated Sacramento County Total	**301**	**170**	**$55,547,930**	**$79,476,871**	**$39,839,401**	**$174,864,194**
Oroville Dam (Extremely High Hazard Dam)						
Agricultural	237	184	$52,227,644	$74,072,612	$74,072,612	$200,372,868
Church / Welfare	3	2	$114,491	$8,642,469	$8,642,469	$17,399,429
Industrial	19	9	$1,485,480	$3,217,306	$4,825,958	$9,528,745
Miscellaneous	234	1	$425,998	$5,740	$5,740	$437,478
Office	10	8	$3,566,252	$9,165,507	$9,165,507	$21,897,266

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Public / Utilities	96	0	$9	$0	$0	$9
Recreational	47	29	$23,818,018	$26,725,908	$26,725,908	$77,269,834
Residential	919	890	$168,053,864	$332,590,151	$166,295,077	$666,939,089
Retail / Commercial	25	23	$2,089,416	$3,462,780	$3,462,780	$9,014,976
Unknown	1	0	$5,576	$0	$0	$5,576
Vacant	152	12	$18,252,146	$899,915	$0	$19,152,061
Unincorporated Sacramento County Total	**1,743**	**1,158**	**$270,038,894**	**$458,782,388**	**$293,196,051**	**$1,022,017,331**
Cameron Park Dam (High Hazard Dam)						
Agricultural	112	52	$70,383,526	$8,469,486	$8,469,486	$87,322,498
Industrial	2	0	$2,402,082	$0	$0	$2,402,082
Retail / Commercial	3	3	$131,728	$588,096	$588,096	$1,307,920
Vacant	16	0	$9,775,785	$0	$0	$9,775,785
Unincorporated Sacramento County Total	**133**	**55**	**$82,693,121**	**$9,057,582**	**$9,057,582**	**$100,808,285**
El Dorado Dam (High Hazard Dam)						
Agricultural	12	12	$1,114,668	$216,108	$216,108	$1,546,884
Unincorporated Sacramento County Total	**12**	**12**	**$1,114,668**	**$216,108**	**$216,108**	**$1,546,884**
Jackson Creek Dam (High Hazard Dam)						
Agricultural	180	120	$66,810,403	$73,937,915	$73,937,915	$214,686,233
Miscellaneous	53	0	$13,114	$0	$0	$13,114
Public / Utilities	12	0	$10	$0	$0	$10
Recreational	3	2	$418,688	$76,097	$76,097	$570,882
Residential	28	27	$4,795,052	$6,577,059	$3,288,528	$14,660,639
Retail / Commercial	1	1	$78,046	$78,046	$78,046	$234,138
Vacant	49	6	$2,461,354	$223,638	$0	$2,684,992
Unincorporated Sacramento County Total	**326**	**156**	**$74,576,667**	**$80,892,755**	**$77,380,586**	**$232,850,008**
Shasta Dam (High Hazard Dam)						
Agricultural	15	0	$77	$0	$0	$77
Miscellaneous	25	0	$6,704	$0	$0	$6,704

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Public / Utilities	73	0	$18	$0	$0	$18
Recreational	4	2	$550,453	$321,058	$321,058	$1,192,569
Residential	76	73	$20,607,081	$35,441,648	$17,720,825	$73,769,555
Vacant	27	1	$3,055,309	$5,947	$0	$3,061,256
Unincorporated Sacramento County Total	**220**	**76**	**$24,219,642**	**$35,768,653**	**$18,041,883**	**$78,030,179**

Source: Sacramento County 2020 Parcel/Assessor's Data, Cal OES, DSOD

Dam Inundation - Flooded Acres

In addition to the centroid analysis used to obtain numbers of parcels and values at risk to the dam failure hazard, parcel boundary analysis was performed to obtain total acres and flooded acres by dam inundation area. The following is an analysis of inundated or flooded acres associated with dam failures and inundation areas in the County.

Methodology

GIS was used to calculate acres flooded by each Cal OES dam inundation area. The parcel layer was intersected with the Cal OES and DWR DSOD dam inundation area data to obtain the acres inundated by dam. The Sacramento County parcel layer and inundation areas were intersected, and each segment divided by the intersection of inundation area and parcels was calculated for acres.

Limitations

One limitation created by this type of analysis is that with respect to the improved acres analysis, improvements are uniformly found throughout the parcel, while in reality, only portions of the parcel are improved, and improvements may or may not fall within the inundated portion of a parcel; thus, areas of improvements inundated, calculated through this method, may be higher or lower than those actually seen in a similar real-world event.

Analysis Results

The following tables represent a summary analysis of total acres for each dam inundation area in the Planning Area. Table 4-47 shows the flooded acres of the Sacramento County Planning Area in the inundation areas of each high hazard dam located inside the County. Table 4-48 shows the flooded acres of the Sacramento County Planning Area in the inundation areas of each extremely high and high hazard dam located outside the County.

Table 4-47 Sacramento County Planning Area – Flooded Acres from Dams Inside of the County

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
High Hazard Dams							
Calero	Elk Grove	20.11	0.00%	18.89	0.01%	1.22	0.00%
	Unincorporated Sacramento County	6,568.66	1.02%	5,498.48	1.52%	1,070.18	0.37%
Folsom	Citrus Heights	2,360.07	0.36%	2,053.12	0.57%	306.95	0.11%
	Elk Grove	6,834.83	1.06%	5,297.04	1.47%	1,537.79	0.54%
	Folsom	15,025.46	2.32%	9,759.53	2.70%	5,265.93	1.85%
	Rancho Cordova	10,507.97	1.62%	6,010.88	1.66%	4,497.09	1.58%
	City of Sacramento	72,486.45	11.21%	47,239.98	13.08%	25,246.47	8.85%
	Unincorporated Sacramento County	94,865.55	14.67%	48,367.38	13.39%	46,498.16	16.29%
Rancho Seco	Galt	1.50	0.00%	0.0	0.00%	1.50	0.00%
	Unincorporated Sacramento County	3,279.52	0.51%	2,430.82	0.67%	848.70	0.30%
Willow Hill	Folsom	84.84	0.01%	56.66	0.02%	28.19	0.01%
	Unincorporated Sacramento County	73.07	0.01%	0.0	0.00%	73.07	0.03%
Folsom Dam 235,000 cfs Scenario							
Folsom Dam 235,000 cfs scenario	Elk Grove	3,726.59	0.58%	2,923.81	0.81%	802.78	0.28%
	Rancho Cordova	429.60	0.07%	7.18	0.00%	422.42	0.15%
	City of Sacramento	66,339.94	10.26%	43,402.39	12.01%	22,937.55	8.04%
	Unincorporated Sacramento County	47,934.35	7.41%	19,276.52	5.34%	28,657.83	10.04%

Source: Cal OES, DSOD

Table 4-48 Sacramento County Planning Area – Flooded Acres from Dams Outside of the County

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Extremely High Hazard Dams							
Camp Far West	City of Sacramento	110.08	0.02%	5.86	0.00%	104.22	0.04%
	Unincorporated Sacramento County	24.13	0.00%	10.58	0.00%	13.55	0.00%
Oroville	Isleton	23.87	0.00%	12.61	0.00%	11.25	0.00%
	Rancho Cordova	477.28	0.07%	11.22	0.00%	466.06	0.16%
	City of Sacramento	1,727.40	0.27%	256.54	0.07%	1,470.86	0.52%
	Unincorporated Sacramento County	5,176.96	0.80%	3,119.38	0.86%	2,057.57	0.72%
High Hazard Dams							
Cameron Park	Unincorporated Sacramento County	451.49	0.07%	159.11	0.04%	292.38	0.10%
El Dorado	Unincorporated Sacramento County	10.39	0.00%	10.39	0.00%		
Hinkle	Folsom	102.20	0.02%	70.41	0.02%	31.79	0.01%
Jackson Creek	Galt	111.28	0.02%	12.53	0.00%	98.75	0.03%
	Unincorporated Sacramento County	11,704.20	1.81%	6,591.01	1.82%	5,113.20	1.79%
Shasta	Unincorporated Sacramento County	334.61	0.05%	74.72	0.02%	259.88	0.09%

Source: Cal OES, DSOD

Population at Risk

A separate analysis was performed to determine population in dam inundation areas for dams with available inundation maps. Using GIS, the dam inundation area dataset was overlayed on the improved residential parcel data. Those parcel centroids that intersect an inundation area were counted and multiplied by the Census Bureau average household size for Sacramento County. Table 4-49 shows the populations at risk to dam failure flooding dams inside the County. Table 4-50 shows the populations at risk to dam failure flooding for extremely high hazard dams outside the County, while Table 4-51 shows the population at risk

to dam failure for high hazard dams outside the County. Table 4-52 shows the populations at risk in the Folsom Dam 235,000 cfs Scenario.

Table 4-49 Sacramento County Planning Area – Residential Population at Risk in High Hazard Dam Inundation Areas Inside the County

Jurisdiction	Calero		Folsom		Rancho Seco		Willow Hill	
	Imp. Res. Parcels	Pop.	Imp. Res. Parcels	Pop.	Imp. Res. Parcels	Pop.	Imp. Res. Parcels	Pop.
Citrus Heights	0	0	6,807	17,290	0	0	0	0
Elk Grove	3	10	16,650	53,280	0	0	0	0
Folsom	0	0	19,525	51,351	0	0	1	3
Galt	0	0	0	0	0	0	0	0
Isleton	0	0	0	0	0	0	0	0
Rancho Cordova	0	0	15,558	33,294	0	0	0	0
City of Sacramento	0	0	134,294	357,222	0	0	0	0
Unincorporated Sacramento County	1	3	73,131	196,322	14	39	0	0
Total	**4**	**13**	**265,965**	**708,759**	**14**	**39**	**1**	**3**

Source: Cal OES Dam Inundation Data, DSOD, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Rancho Cordova (2.14): and unincorporated Sacramento County (2.76)

Table 4-50 Sacramento County Planning Area– Residential Population at Risk in Extremely High Hazard Dam Inundation Areas Outside the County

Jurisdiction	Camp Far West		Oroville	
	Imp. Res. Parcels	Pop.	Imp. Res. Parcels	Pop.
Citrus Heights	0	0	0	0
Elk Grove	0	0	0	0
Folsom	0	0	0	0
Galt	0	0	0	0
Isleton	0	0	51	138
Rancho Cordova	0	0	36	77
City of Sacramento	15	40	789	2,099
Unincorporated Sacramento County	167	461	890	2,456
Total	**182**	**501**	**1766**	**4,770**

Source: Cal OES Dam Inundation Data, DSOD, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Rancho Cordova (2.14): and unincorporated Sacramento County (2.76)

Table 4-51 Sacramento County Planning Area– Residential Population at Risk in High Hazard Dam Inundation Areas Outside the County

Jurisdiction	Cameron Park		El Dorado		Hinkle		Jackson Creek		Shasta	
	Imp. Res. Parcels	Pop.	Imp. Res. Parcels	Pop.	Imp. Res. Parcels	Pop.	Imp. Res. Parcels	Pop.	Imp. Res. Parcels	Pop.
Citrus Heights	0	0	0	0	0	0	0	0	0	0
Elk Grove	0	0	0	0	0	0	0	0	0	0
Folsom	0	0	0	0	154	405	0	0	0	0
Galt	0	0	0	0	0	0	3	9	0	0
Isleton	0	0	0	0	0	0	0	0	0	0
Rancho Cordova	0	0	0	0	0	0	0	0	0	0
City of Sacramento	0	0	0	0	0	0	0	0	0	0
Unincorporated Sacramento County	0	0	0	0	0	0	27	75	73	201
Total	**0**	**0**	**0**	**0**	**154**	**405**	**30**	**84**	**73**	**201**

Source: Cal OES Dam Inundation Data, DSOD, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Rancho Cordova (2.14): and unincorporated Sacramento County (2.76)

Table 4-52 Sacramento County Planning Area – Residential Population at Risk to Folsom Dam 235,000 cfs Scenario

Jurisdiction	Folsom Dam 235,000 cfs Scenario	
	Imp. Res. Parcels	Pop.
Citrus Heights	0	0
Elk Grove	7,752	24,806
Folsom	0	0
Galt	0	0
Isleton	0	0
Rancho Cordova	1	2
City of Sacramento	124,262	330,537
Unincorporated Sacramento County	20,552	56,724
Total	**152,567**	**412,069**

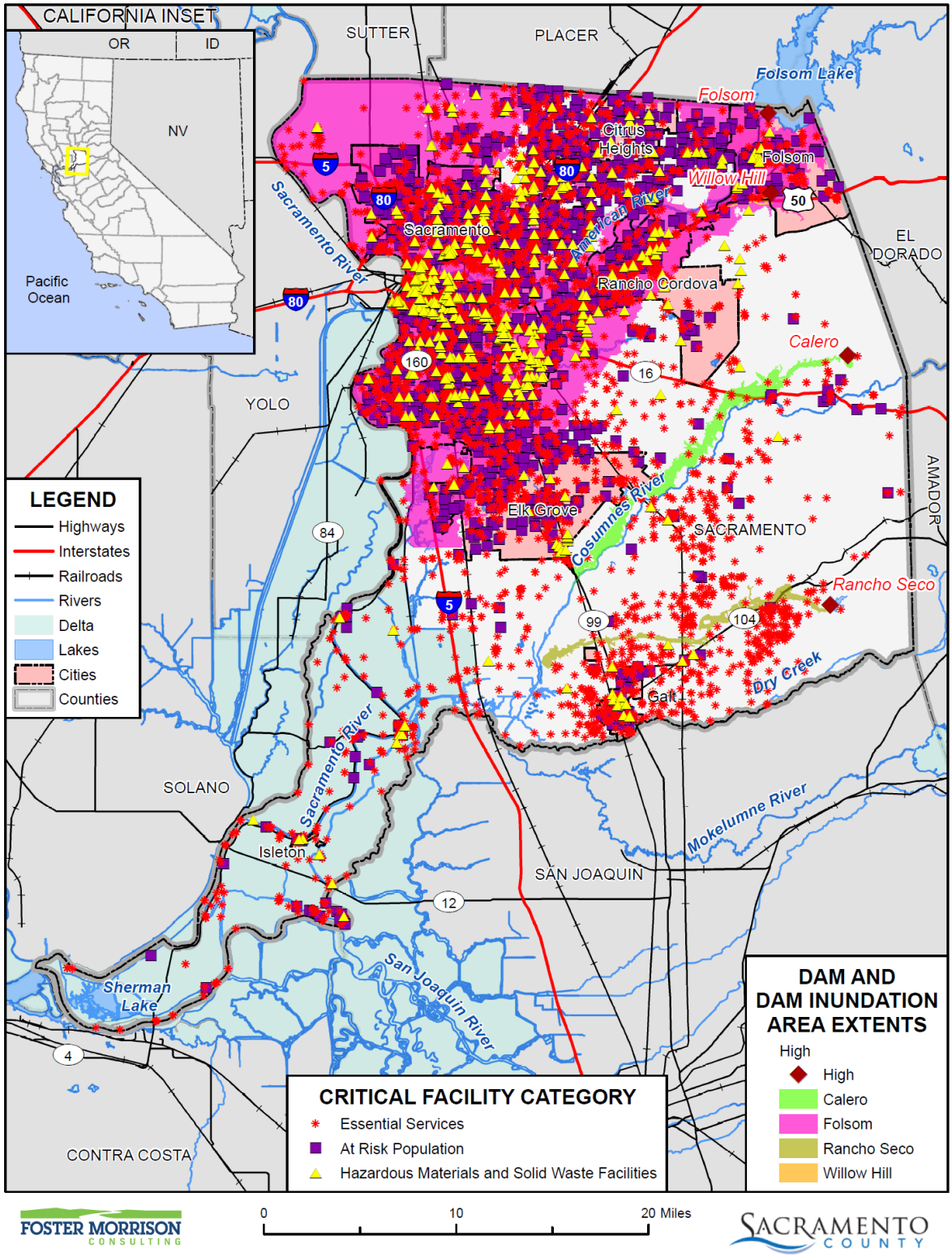
Source: Cal OES Dam Inundation Data, DSOD, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Rancho Cordova (2.14): and unincorporated Sacramento County (2.76)

Critical Facilities at Risk

A separate analysis was performed on the critical facility inventory in Sacramento County and all jurisdictions to determine critical facilities in the dam inundation areas from dams inside the County, outsid

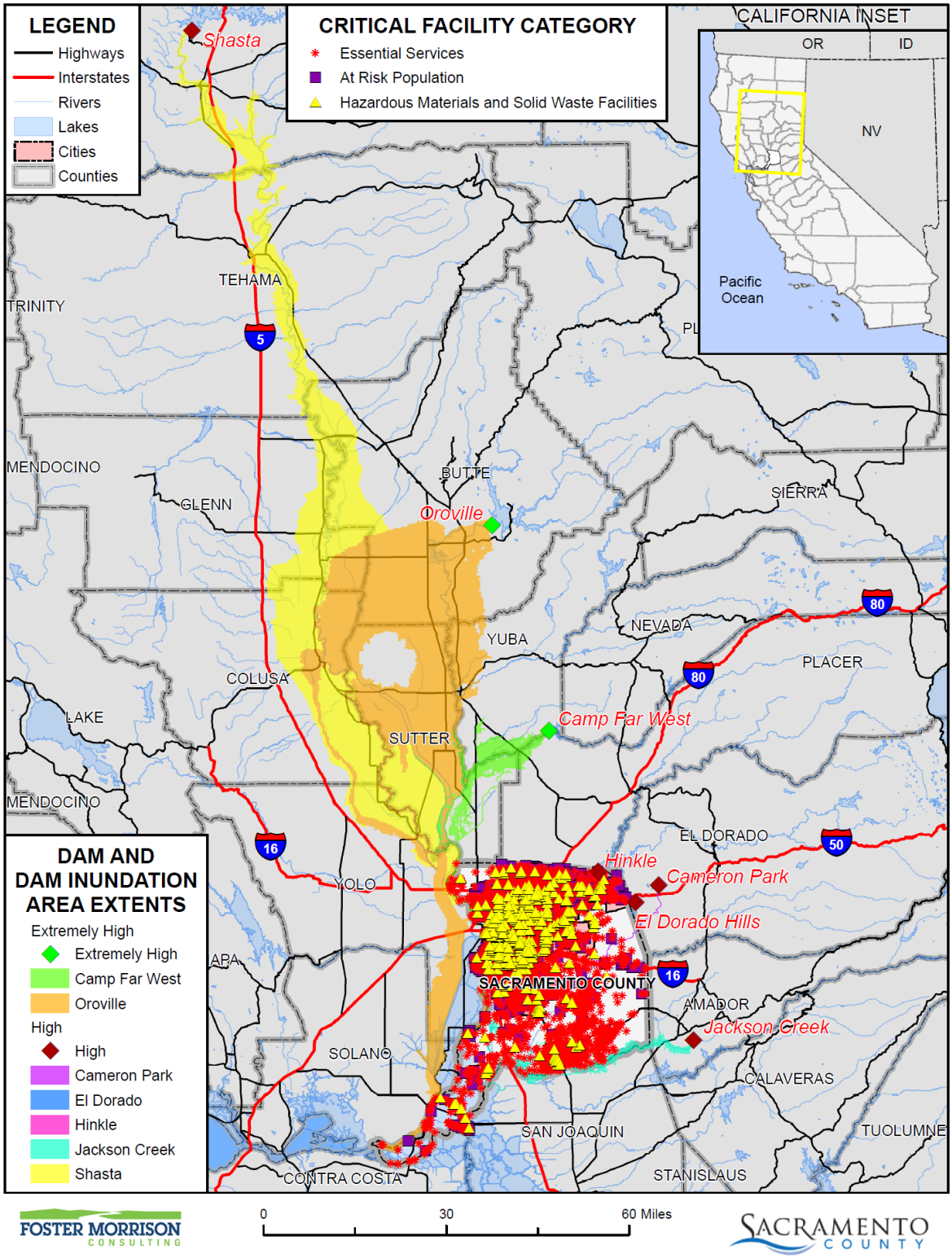
the County, and in the Folsom 235,000 cfs Scenario. Using GIS, the dam inundation areas were overlayed on the critical facility GIS layer. Figure 4-47 shows critical facilities inside dam inundation zones from dams inside the County. Figure 4-48 shows critical facilities inside dam inundation zones from dams outside the County. Figure 4-49 shows the critical facilities inside the Folsom Dam 235,000 cfs Scenario areas. Table 4-53 summarizes the critical facilities in the County by dam inundation area. Table 4-54 details critical facilities by facility type and count inside dam inundation areas for the unincorporated County. Details of critical facility definition, type, name and address by flood zone are listed in Appendix F.

Figure 4-47 Sacramento County Planning Area – Critical Facilities in Dam Inundation Areas from Dams Inside the County



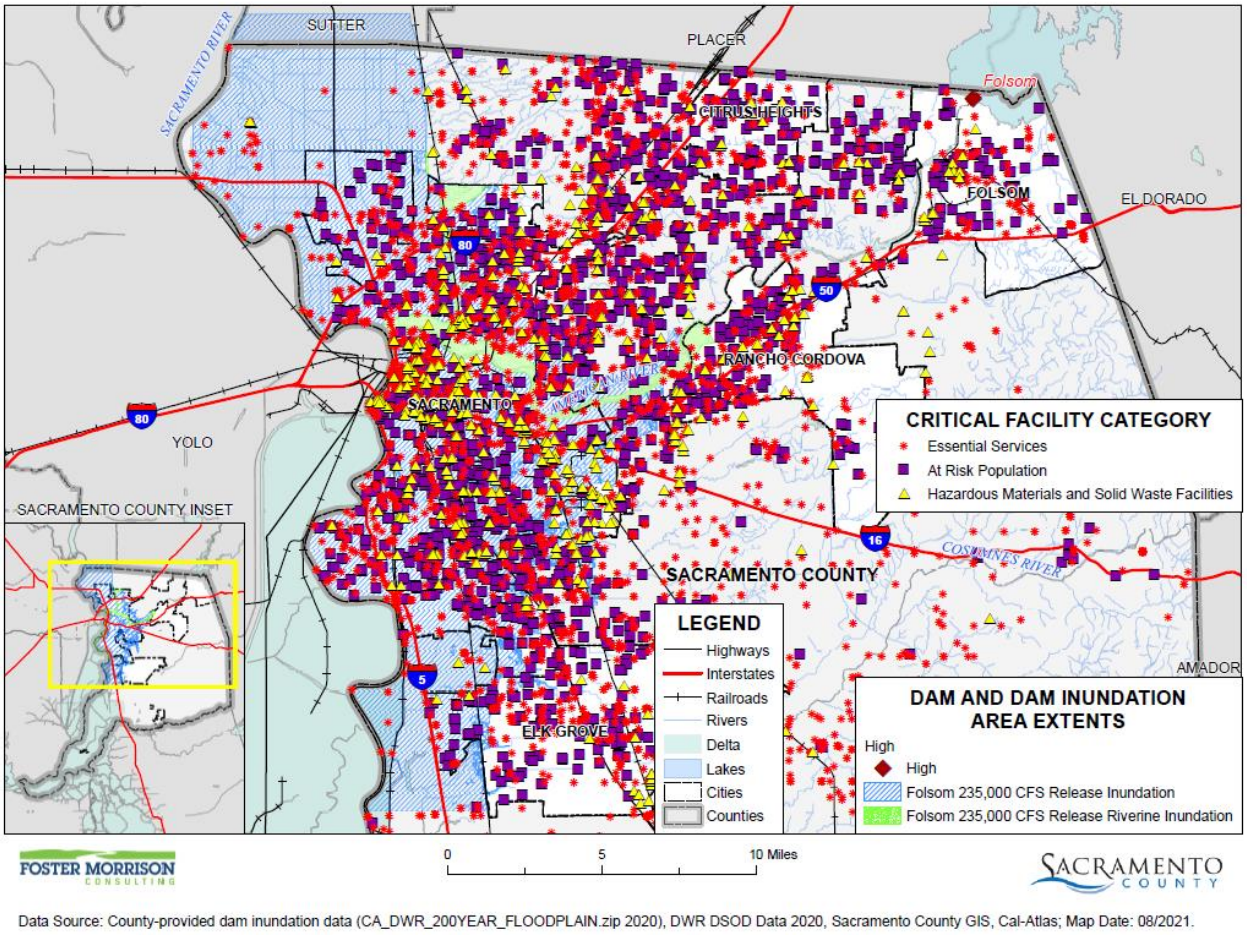
Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 8/2021.

Figure 4-48 Sacramento County Planning Area – Critical Facilities in Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 8/2021.

Figure 4-49 Sacramento County Planning Area – Critical Facilities in Folsom Dam 235,000 cfs Release Scenario



Data Source: County-provided dam inundation data (CA_DWR_200YEAR_FLOODPLAIN.zip 2020), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 4-53 Sacramento County Planning Area – Critical Facilities in Dam Inundation Areas Summary

Dam Inundation Areas/ Jurisdiction	Facility Count
Calero Dam (High Hazard Dam Inside the County)	
Unincorporated Sacramento County	7
Folsom Dam (High Hazard Dam Inside the County)	
Citrus Heights	45
City of Sacramento	2,337
Elk Grove	124
Folsom	203
Rancho Cordova	349
Unincorporated Sacramento County	1,286

Dam Inundation Areas/ Jurisdiction	Facility Count
Rancho Seco (High Hazard Dam Inside the County)	
Unincorporated Sacramento County	4
Willow Hill (High Hazard Dam Inside the County)	
Folsom	3
Camp Far West (Extremely High Hazard Dam Outside the County)	
City of Sacramento	5
Unincorporated Sacramento County	5
Oroville (Extremely High Hazard Dam Outside the County)	
City of Sacramento	40
Isleton	5
Rancho Cordova	1
Unincorporated Sacramento County	87
Cameron Park (High Hazard Dam Outside the County)	
Unincorporated Sacramento County	2
Hinkle Dam (High Hazard Dam Outside the County)	
Folsom	1
Jackson Creek (High Hazard Dam Outside the County)	
Galt	1
Unincorporated Sacramento County	29
Shasta (High Hazard Dam Outside the County)	
Unincorporated Sacramento County	3
Folsom Dam 235,000 cfs Release	
City of Sacramento	2,102
Elk Grove	55
Rancho Cordova	4
Unincorporated Sacramento County	495

Source: Sacramento County GIS, Cal OES, DSOD

Table 4-54 Unincorporated Sacramento County– Critical Facilities in Dam Inundation Areas by Dam Inundation Area and Facility Category and Type

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
Calero (High Hazard Dam Inside the County)		
Essential Services Facilities	Water Well	1
	Total	**7**
At Risk Population Facilities	–	–
	Total	**0**
Hazardous Materials and Solid Waste Facilities	–	–

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
	Total	**0**
Calero Dam Total		**7**
Folsom Dam (High Hazard Dam Inside the County)		
Essential Services Facilities	Airport	2
	Bridge	9
	Cellular Tower	3
	Emergency Evacuation Center	26
	EMS Stations	23
	FDIC Insured Banks	28
	Fire Station	26
	Hospital or Urgent Care	1
	Law Enforcement	10
	Microwave Service Towers	211
	Power Plants	9
	Public Transit Stations	7
	Pump Stations	7
	Sandbag Site	2
	Sewage Treatment Plan	2
	State Government Building	3
	Water Well	366
	Total	**738**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	11
	Community Center	2
	Day Care Center	64
	Mobile Home Park	22
	Places of Worship	224
	School	128
	Total	**451**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	15
	Leaky Underground Storage Tank	74
	Solid Waste Facility Total	7
	Total	**97**
Folsom Dam Total		**1,286**
Rancho Seco Dam (High Hazard Dam Inside the County)		
Essential Services Facilities	Microwave Service Towers	2

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
	Water Well	2
	Total	**4**
At Risk Population Facilities	–	–
	Total	**0**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Rancho SecoDam Total		**4**
Camp Far West (Extremely High Hazard Dam Outside the County)		
Essential Services Facilities	Port Facilities	4
	Water Well	1
	Total	**5**
At Risk Population Facilities	–	–
	Total	**0**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Camp Far West Dam Total		**5**
Oroville Dam (Extremely High Hazard Dam Outside the County)		
Essential Services Facilities	Bridge	7
	Cellular Tower	2
	Emergency Evacuation Center	2
	EMS Stations	1
	Fire Station	1
	Microwave Service Towers	14
	Port Facilities	23
	Water Well	3
	Total	**79**
At Risk Population Facilities	Mobile Home Park	4
	Places of Worship	1
	Total	**5**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	2
	Solid Waste Facility Total	1
	Total	**3**
Oroville Dam Total		**87**
Cameron Park (High Hazard Dam Outside the County)		
Essential Services Facilities	Water Well	2
	Total	**2**
At Risk Population Facilities	–	–

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
	Total	**0**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Cameron Park Dam Dam Total		**2**
Jackson Creek Dam (High Hazard Dam Outside the County)		
Essential Services Facilities	Bridge	10
	Microwave Service Towers	3
	Port Facilities	2
	Power Plant	1
	Water Well	13
	Total	**29**
At Risk Population Facilities	–	–
	Total	**0**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Jackson Creek Dam Total		**29**
Shasta Dam (High Hazard Dam Outside the County)		
Essential Services Facilities	Port Facilities	3
	Total	**3**
At Risk Population Facilities	–	–
	Total	**0**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Shasta Dam Total		**40**
Folsom Dam 235,000 cfs Scenario		
Essential Services Facilities	Airport	1
	Bridge	5
	Emergency Evacuation Center	7
	EMS Stations	6
	FDIC Insured Banks	11
	Fire Station	8
	Law Enforcement	6
	Microwave Service Towers	108
	Power Plants	6
	Public Transit Stations	4
	Pump Stations	7
	Sewage Treatment Plan	1

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
	State Government Building	2
	Water Well	126
	Total	**298**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	8
	Day Care Center	26
	Mobile Home Park	10
	Places of Worship	80
	School	234
	Total	**158**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	5
	Leaky Underground Storage Tank	32
	Solid Waste Facility Total	1
	Total	**39**
Folsom Dam 235,000 cfs Scenario Total		**495**

Source: Sacramento County GIS, Cal OES, DSOD

Overall Community Impact

Dam failure floods and their impacts vary by location and severity of any given dam failure event and will likely only directly affect certain areas of the Sacramento County Planning Area during specific times. Based on the risk assessment, it is evident that dam failure floods have the potential for devastating life safety, property, environmental, and economic impacts to certain areas of the County. Impacts that are not always quantified, but can be anticipated in a large dam failure event, include:

- Injury and loss of life;
- Impacts to agricultural;
- Commercial and residential structural and property damage;
- Disruption of and damage to critical infrastructure and services;
- Health hazards associated with mold and mildew, contamination of drinking water, etc.;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) to the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.
- Impact on the overall mental health of the community.

Future Development

Although new growth and development corridors would fall in the area flooded by a dam failure, given the limited potential of total dam failure and the large area that a dam failure would affect, development in the dam inundation area will continue to occur.

GIS Analysis

In order to ascertain if future development areas fall in dam inundation areas, a GIS analysis was performed. Using GIS, the following methodology was used in determining parcel counts and values associated with future development in the unincorporated Sacramento County Planning Area. Sacramento County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the seven future development projects were mapped, and overlayed on the Cal OES and DSOD dam inundation areas. This can be seen on Figure 4-50 for dam inundation areas from dams inside the County, Figure 4-51 for dam inundation areas from outside the County, Figure 4-52 for dam inundations from the Folsom Dam 235,000 cfs Scenario. Table 4-55 details the future development areas that fall in each dam inundation areas. Maps of future development and dam inundation areas in each City in the County are presented in their respective annexes to this Plan Update.

Figure 4-50 Sacramento County – Future Development in Dam Inundation Areas from Dams Inside the County

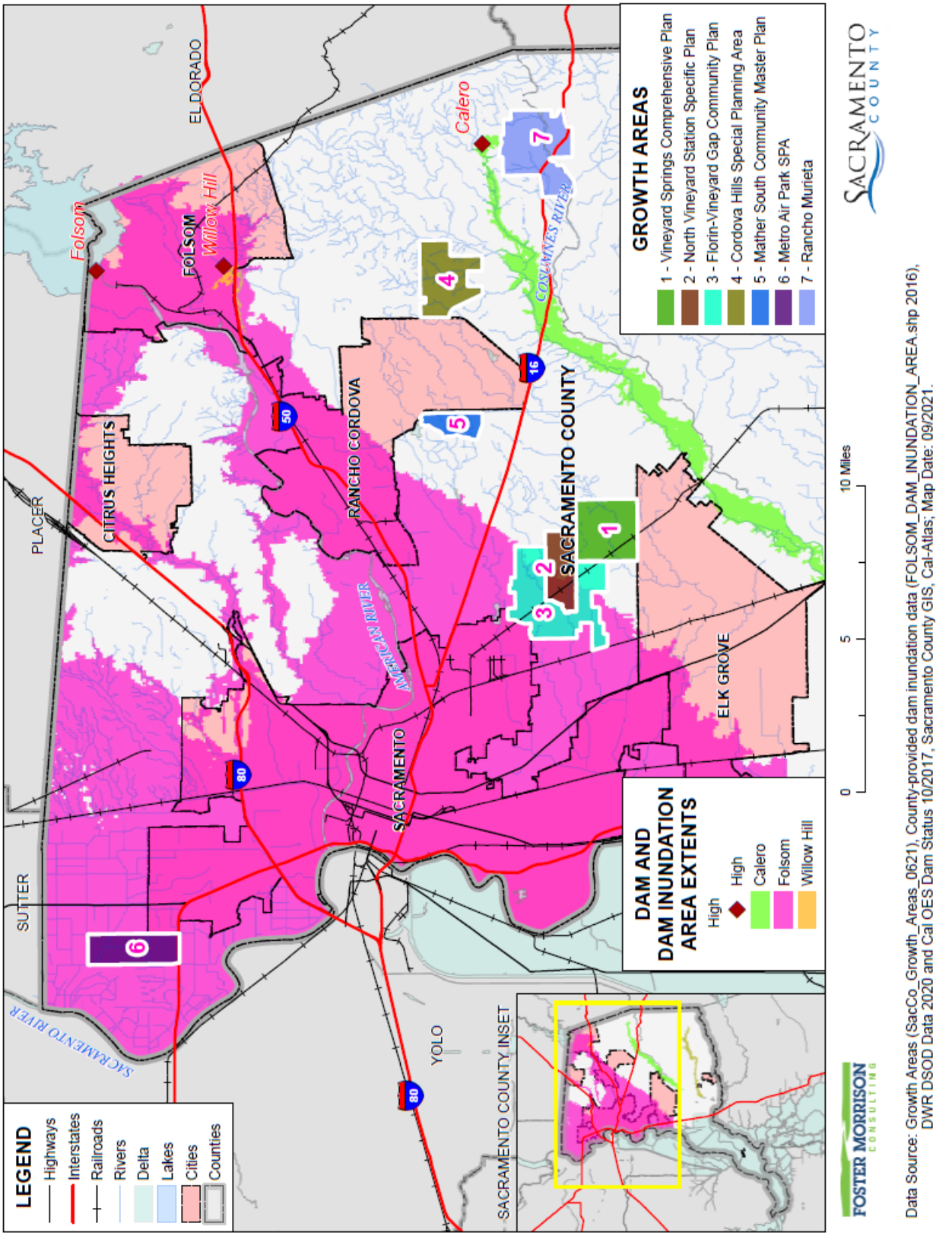


Figure 4-51 Sacramento County – Future Development in Dam Inundation Areas from Dams Outside the County

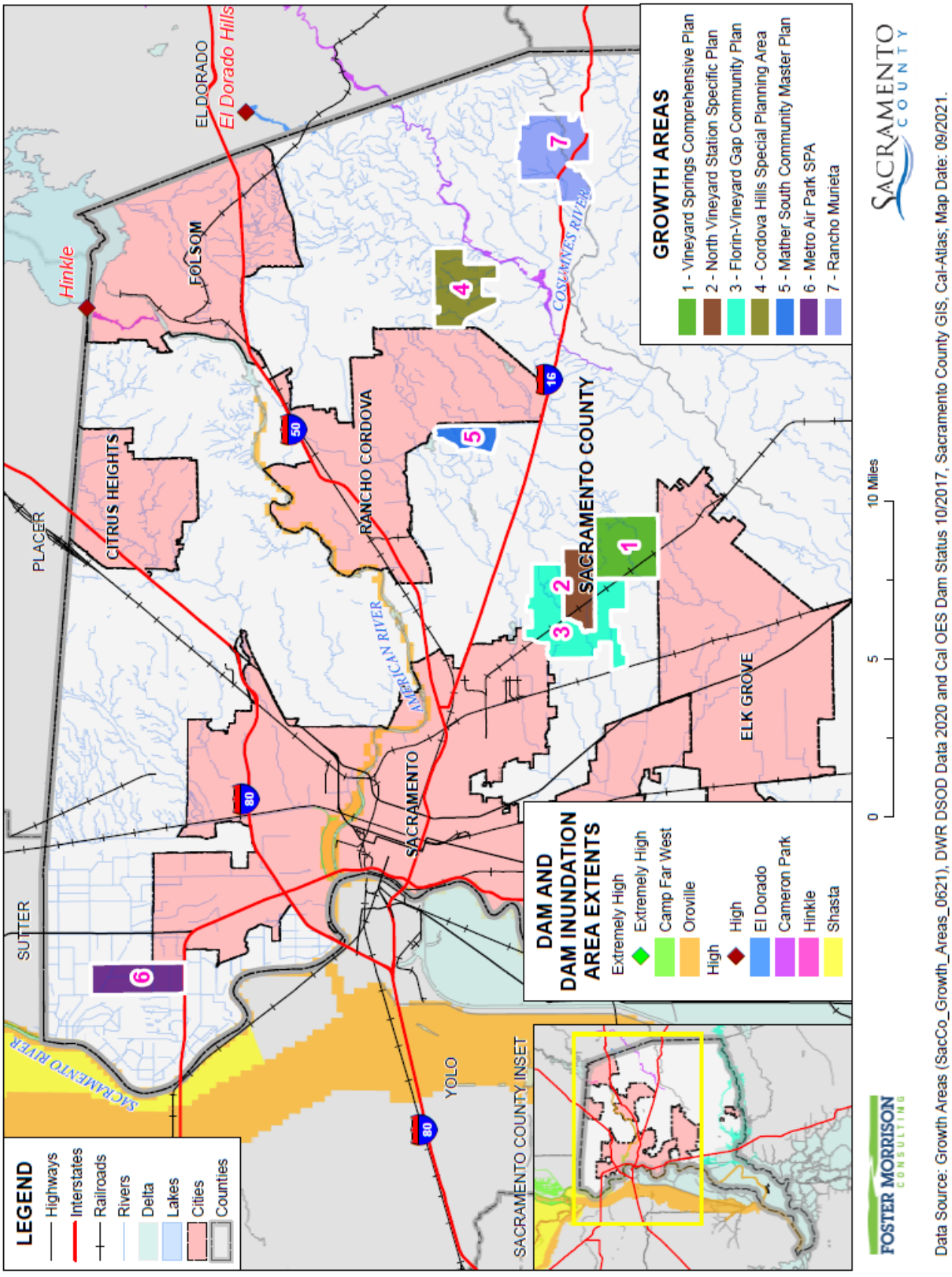


Figure 4-52 Sacramento County – Future Development in Folsom Dam 235,000 cfs Scenario Inundation Areas

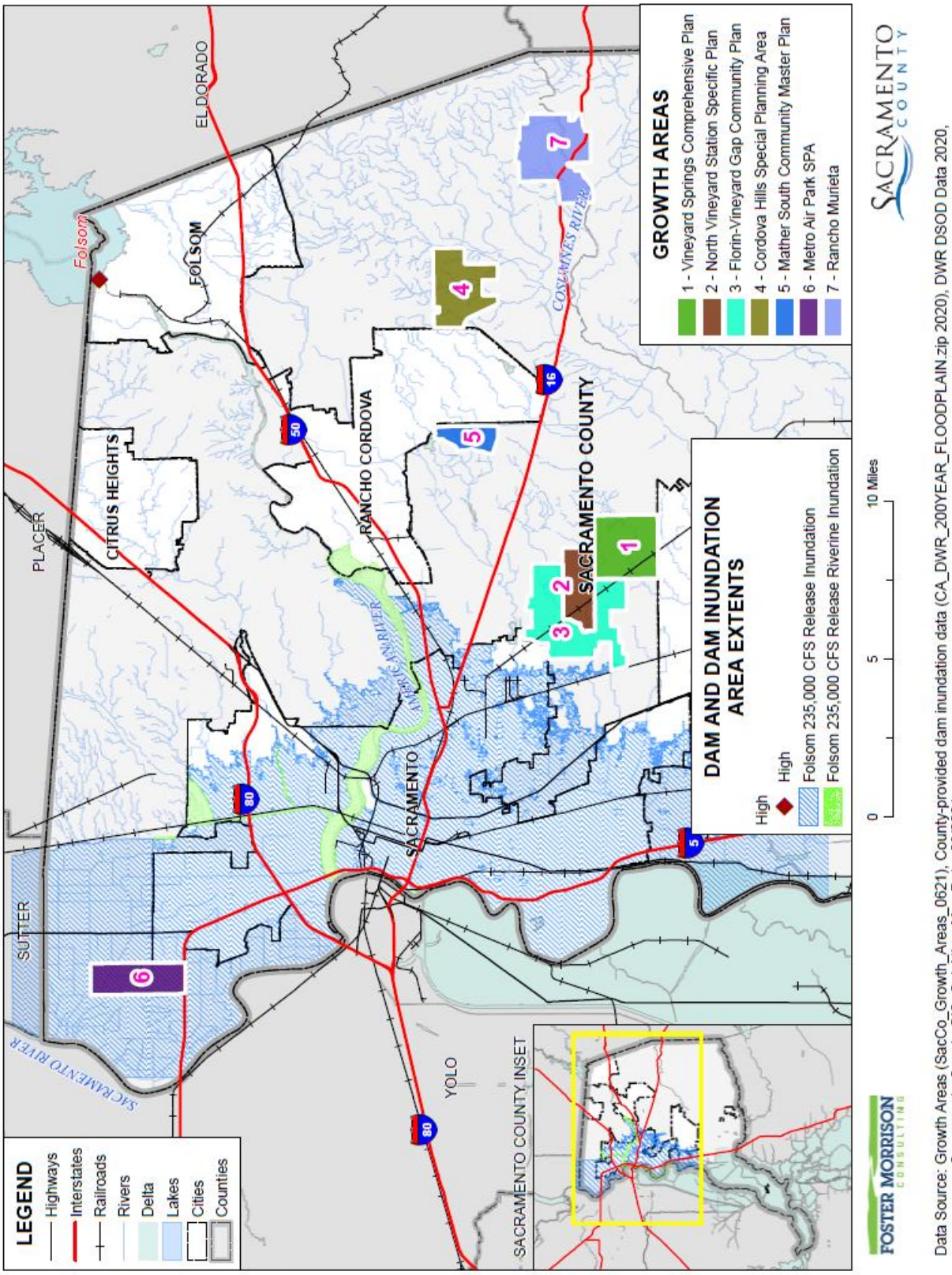


Table 4-55 Unincorporated Sacramento County – Future development Areas in Dam Inundation Areas

Future Development Area / Dam Inundation Area	Total Parcel Count	Improved Parcel Count	Total Acres
Folsom			
Florin-Vineyard Gap Community Plan	914	730	2,970
Metro Air Park SPA	74	4	1,807
North Vineyard Station Specific Plan	1,160	848	587
Folsom Total	**2,148**	**1,582**	**5,365**
Folsom 235,000 CFS Release Inundation			
Florin-Vineyard Gap Community Plan	3	1	28
Metro Air Park SPA	74	4	1,807
Folsom 235,000 CFS Release Inundation Total	**77**	**5**	**1,836**

Source: Sacramento County, Cal OES, DSOD

4.3.8. Drought and Water Shortage

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

Drought

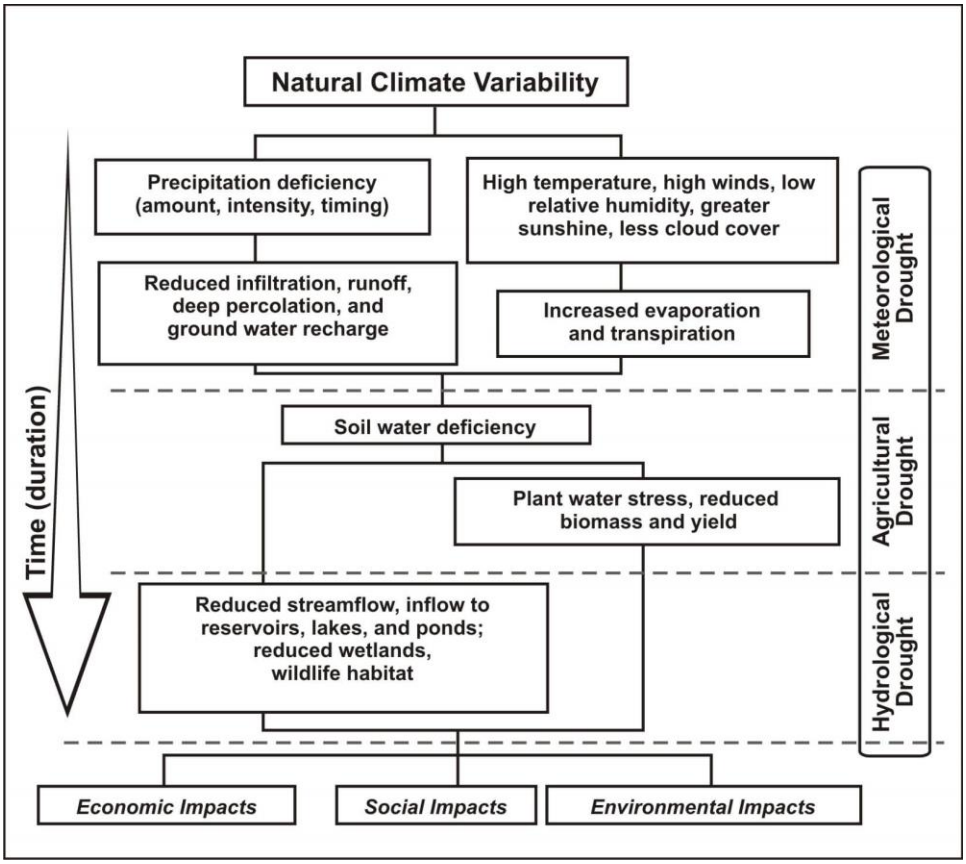
Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Water districts normally require at least a 10-year planning horizon to implement a multiagency improvement project to mitigate the effects of a drought and water supply shortage.

Drought is a complex issue involving (see Figure 4-53) many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects:

- **Meteorological drought** is usually defined by a period of below average water supply.
- **Agricultural drought** occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock.
- **Hydrological drought** is defined as deficiencies in surface and subsurface water supplies. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels.

- **Socioeconomic drought** occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

Figure 4-53 Causes and Impact of Drought

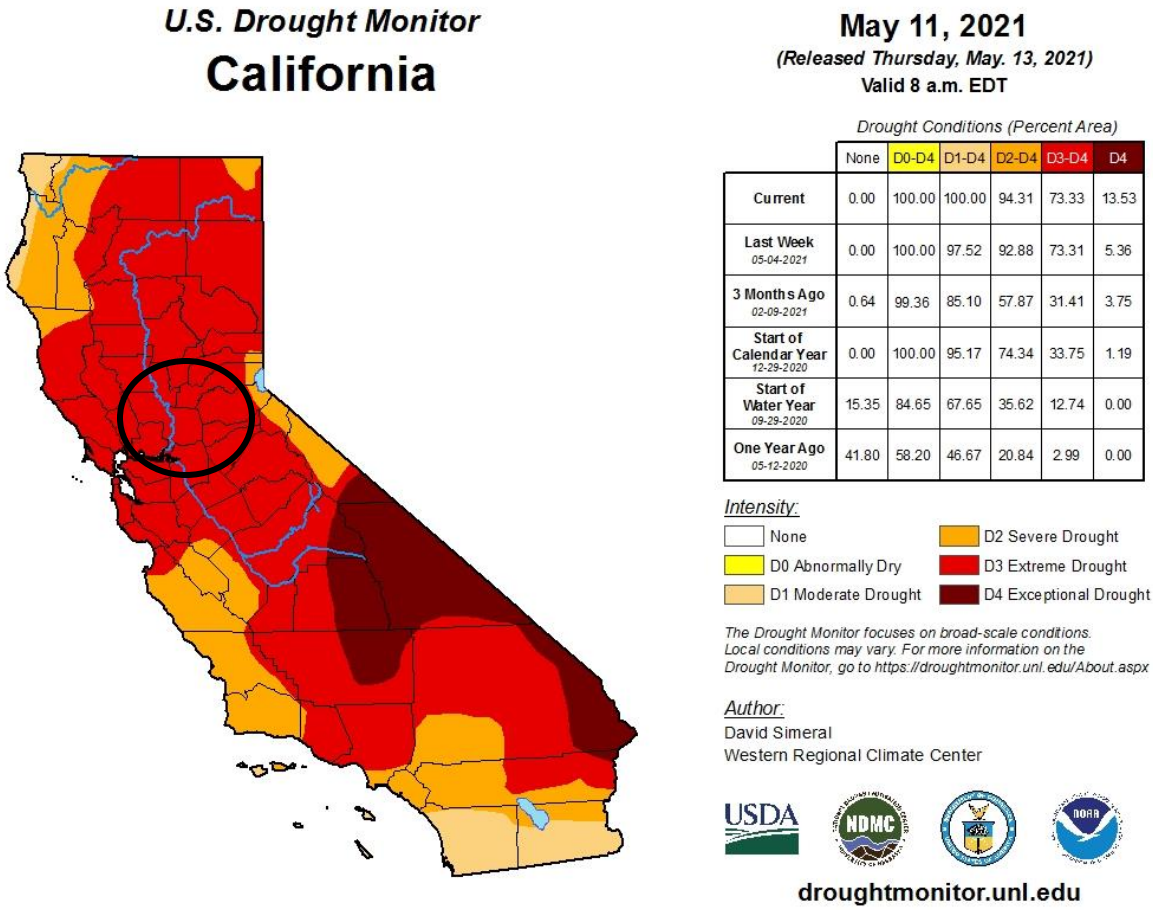


Source: National Drought Mitigation Center (NDMC)

Location and Extent

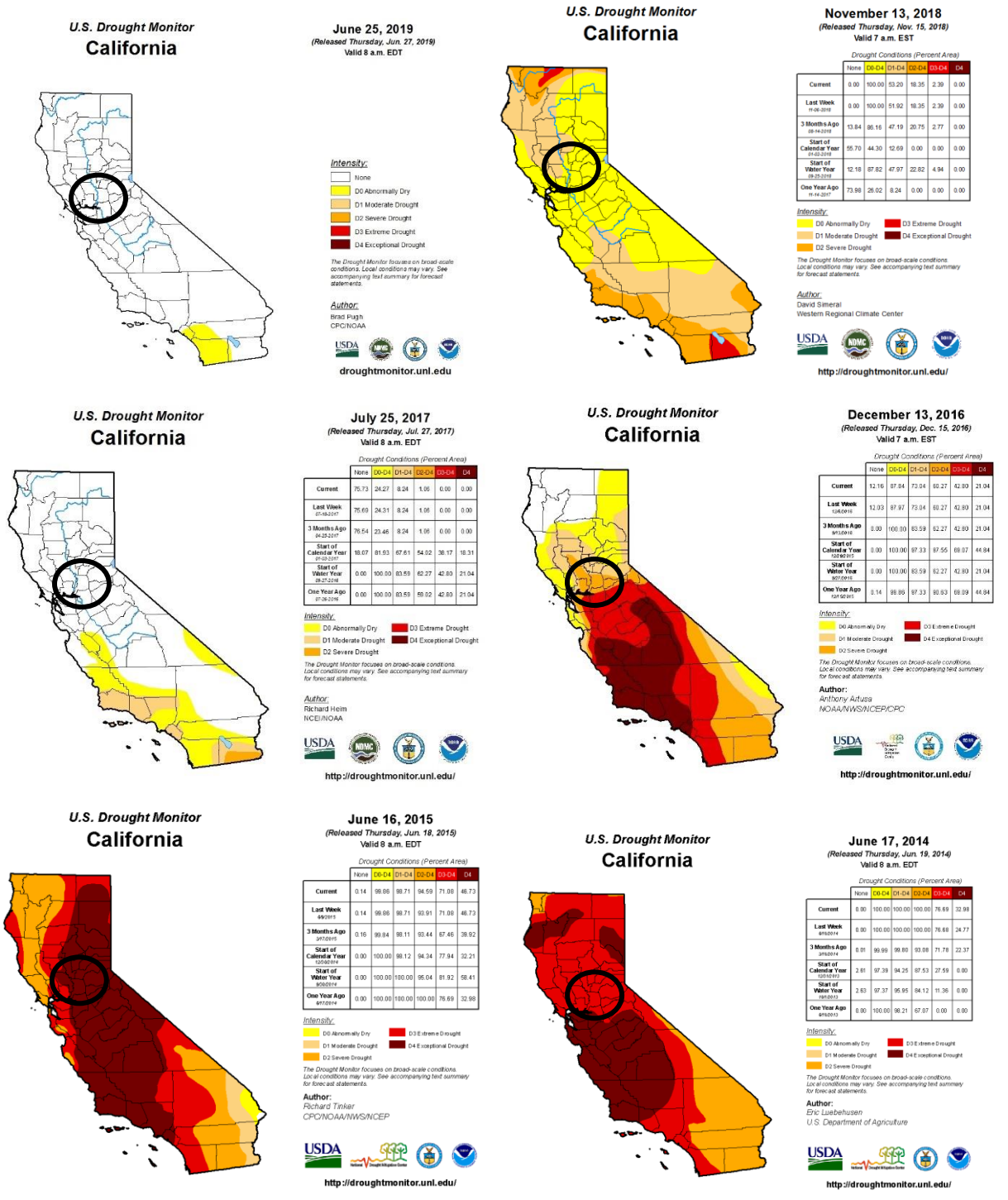
Since drought is a regional phenomenon, it affects the whole of the County. Speed of onset of drought is slow, while the duration varies from short (months) to long (years). Drought in the United States is monitored by the National Integrated Drought Information System (NIDIS). A major component of this portal is the U.S. Drought Monitor. The Drought Monitor concept was developed jointly by the NOAA's Climate Prediction Center, the NDMC, and the USDA's Joint Agricultural Weather Facility in the late 1990s as a process that synthesizes multiple indices, outlooks and local impacts, into an assessment that best represents current drought conditions. The final outcome of each Drought Monitor is a consensus of federal, state, and academic scientists who are intimately familiar with the conditions in their respective regions. A snapshot of the drought conditions in California and Sacramento County (2020) can be found in Figure 4-54. Snapshots from 2014 through 2019, when California's most recent multi-year drought started, is shown in Figure 4-55.

Figure 4-54 Sacramento County – Current Drought Status



Source: US Drought Monitor

Figure 4-55 Previous Drought Status in Sacramento County



Source: US Drought Monitor

CA DWR says the following about drought:

One dry year does not normally constitute a drought in California. California's extensive system of water supply infrastructure—its reservoirs, groundwater basins, and inter-regional conveyance facilities—mitigates the effect of short-term dry periods for most water users. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.

The drought issue in California is further compounded by water rights. Water is a commodity possessed under a variety of legal doctrines. The prioritization of water rights between farming and federally protected fish habitats in California contributes to this issue.

As shown on the previous figures, drought is tracked by the US Drought Monitor. The Drought Monitor includes a scale to measure drought intensity:

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)

Water Shortage

Sacramento County relies on a combination of surface and groundwater for their water supply. Snowmelt originating from the Sierra Nevada Mountains is a key source of surface water for the Sacramento Planning Area. The Sacramento, American, Consumnes, and Mokelumne rivers provide municipal, agricultural, and recreational uses to Sacramento County and depend on the spring and summer snowmelt in the Sierra Nevada for their flows. The network of dams constructed in Northern California to support the State Water Project and the Central Valley Project help provide California and Sacramento with water security during droughts. Sacramento County also sits over the north central portion of the California's Great Valley Groundwater Basin, which provides approximately 50 percent of all municipal and agricultural water supply in the County. Groundwater recharge occurs primarily from the American and Cosumnes rivers, with additional recharge from the Sacramento River and local streams. Groundwater stores are directly linked to surface water in the County and snowmelt in the Sierra Nevada.

Thus, Sacramento County, generally has sufficient groundwater and surface water supplies to mitigate even the severest droughts of the past century. Many other areas of the State, however, also place demands on these water resources during severe drought. For example, Northern California agencies, including those from Sacramento County, were major participants in the Governor's Drought Water Bank of 1991, 1992 and 1994.

Location and Extent

Since water shortage happens on a regional scale, the entirety of the County is at risk. There is no established scientific scale to measure water shortage. The speed of onset of water shortage tends to be lengthy. The duration of water shortage can vary, depending on the severity of the drought that accompanies it.

Past Occurrences

Disaster Declaration History

There has been one federal disaster related to drought and water shortage in Sacramento County issued in 1977. There have been two state disasters related to drought and water shortage in Sacramento County issued in 2008 and 2014. This can be seen in Table 4-56.

Table 4-56 Sacramento County – Disaster Declarations from Drought 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	3	2008, 2014, 2021	1	1977

Source: FEMA, Cal OES

NCDC Events

There have been 32 NCDC drought events in Sacramento County, related to events in the 2014 to 2016 drought. No deaths, injuries, or property damages were reported to the NCDC from these events.

*Table 4-57 NCDC Drought Events for Sacramento County 1996–5/31/2020**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Drought	32	0	0	0	0	$0	$0

Source: NCDC

*Note: Losses reflect totals for all impacted areas, some of which fell outside of Sacramento County

CA DWR and Hazard Mitigation Planning Committee Events

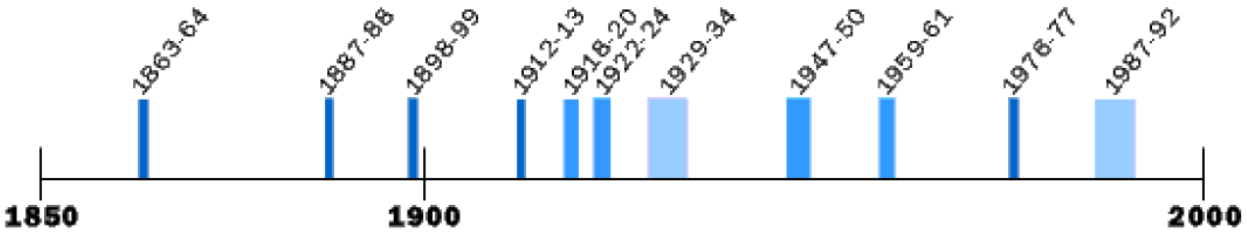
Historically, California has experienced multiple severe droughts. According to the CA DWR, droughts exceeding three years are relatively rare in Northern California, the source of much of the State's developed water supply. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large northern California reservoirs. Table 4-58 compares the 1929-34 drought in the Sacramento and San Joaquin Valleys to the 1976-77, 1987-92, and 2007-09 droughts. Figure 4-56 depicts California's Multi-Year Historical Dry Periods, 1850-2000.

Table 4-58 Severity of Extreme Droughts in the Sacramento and San Joaquin Valleys

Drought Period	Sacramento Valley Runoff		San Joaquin Valley Runoff	
	(maf*/yr)	(percent Average 1901-96)	(maf*/yr)	(percent Average 1906-96)
1929-34	9.8	55	3.3	57
1976-77	6.6	37	1.5	26
1987-92	10.0	56	2.8	47
2007-09	11.2	64	3.7	61

Source: California's Drought of 2007-2009, An Overview. State of California Natural Resources Agency, California Department of Water Resources.
*maf=million acre feet

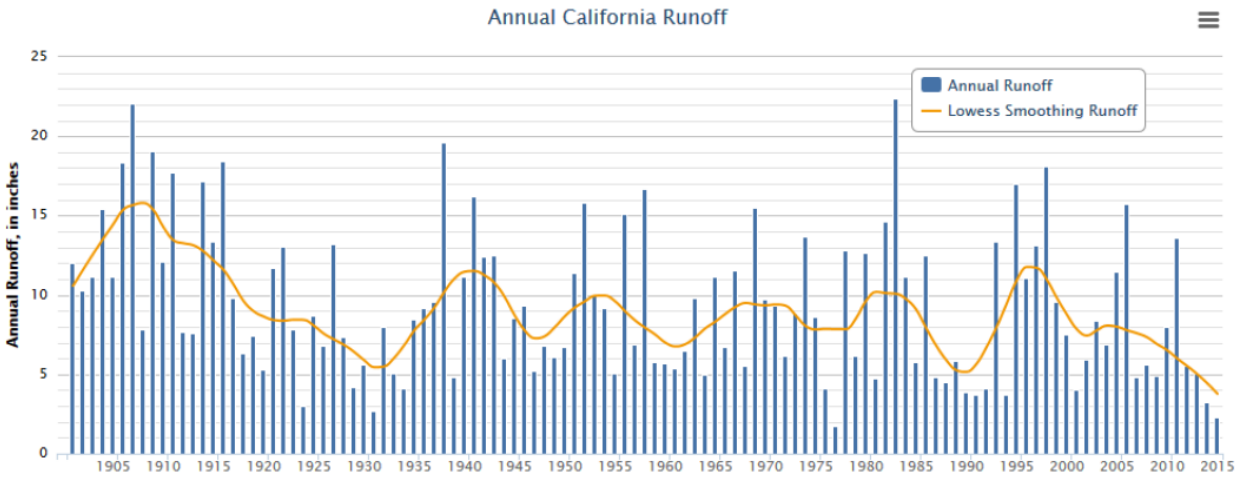
Figure 4-56 California's Multi-Year Historical Dry Periods, 1850-2000



Source: California Department of Water Resources, www.water.ca.gov/
Notes: Dry periods prior to 1900 estimated from limited data; covers dry periods of statewide or major regional extent

Figure 4-57 depicts runoff for the State from 1900 to 2015. This gives a historical context for the 2014-2015 drought to compare against past droughts.

Figure 4-57 Annual California Runoff –1900 to 2015



Source: California DWR

The 2018 California State Hazard Mitigation Plan fleshed out the major droughts from 1900 to 2017. This discussion below appends to the tables and figures above.

The 1975-1977 Drought

From November 1975 through November 1977, California experienced one of its most severe droughts. Although people in many areas of the state are accustomed to very little precipitation during the growing season (April to October), they expect it in the winter. In 1976 and 1977, the winters brought only one-half and one-third of normal precipitation, respectively. Most surface storage reservoirs were substantially drained in 1976, leading to widespread water shortages when 1977 turned out to be even drier. 31 counties were affected, resulting in $2.67 billion in crop damages.

The 1987-1992 Drought

From 1987 to 1992, California again experienced a serious drought due to low precipitation and run-off levels. The hardest-hit region was the Central Coast, roughly from San Jose to Ventura. In 1988, 45 California counties experienced water shortages that adversely affected about 30 percent of the state's population, much of the dry-farmed agriculture, and over 40 percent of the irrigated agriculture. Fish and wildlife resources suffered, recreational use of lakes and rivers decreased, forestry losses and fires increased, and hydroelectric power production decreased. In February 1991, DWR and Cal OES surveyed drought conditions in all 58 California counties and found five main problems: extremely dry rangeland, irrigated agriculture with severe surface water shortages and falling groundwater levels, widespread rural areas where individual and community supplies were going dry, urban area water rationing at 25 to 50 percent of normal usage, and environmental impacts.

Storage in major reservoirs had dropped to 54 percent of average, the lowest since 1977. The shortages led to stringent water rationing and severe cutbacks in agricultural production, including threats to survival of permanent crops such as trees and vines. Fish and wildlife resources were in critical shape as well. Not since the 1928-1934 drought had there been such a prolonged dry period. In response to those conditions, the Governor established the Drought Action Team. This team almost immediately created an emergency drought water bank to develop a supply for four critical needs: municipal and industrial uses, agricultural uses, protection of fish and wildlife, and carryover storage for 1992. The large-scale transfer program, which involved over 800,000 acre-feet of water, was implemented in less than 100 days with the help and commitment of the entire water community and established important links between state agencies, local water interests, and local governments for future programs.

The 2007-2009 Drought

Water years 2007-2009 were collectively the 15th driest three-year period for DWR's eight-station precipitation index, which is a rough indicator of potential water supply availability to the State Water Project (SWP) and Central Valley Project (CVP). Water year 2007 was the driest single year of that drought, and fell within the top 20 percent of dry years based on computed statewide runoff. In June 2008, a state emergency proclamation was issued due to water shortage in selected Central Valley counties. In February 2009, for the first time in its history, the State of California proclaimed a statewide drought. The state placed unprecedented restrictions on CVP and SWP diversions from the Delta to protect listed fish species, a regulatory circumstance that exacerbated the impacts of the drought for water users.

The greatest impacts of the 2007–2009 drought were observed in the CVP service area on the west side of the San Joaquin Valley, where hydrologic conditions combined with reduced CVP exports resulted in substantially reduced water supplies (50 percent supplies in 2007, 40 percent in 2008, and 10 percent in 2009) for CVP south-of Delta agricultural contractors. Small communities on the west side highly dependent on agricultural employment were especially affected by land fallowing due to lack of irrigation supplies, as well as by factors associated with current economic recession. The coupling of the drought and economic recession necessitated emergency response actions related to social services, such as food banks and unemployment assistance.

The 2012-2017 Drought

The statewide drought of 2012-2017 will be remembered as one of the most severe and costliest droughts of record in California. The drought that spanned water years 2012 through 2017 included the driest four-year statewide precipitation on record (2012-2015) and the smallest Sierra-Cascades snowpack on record (2015, with 5 percent of average). It was marked by extraordinary heat: 2014, 2015, and 2016 were California's first, second, and third warmest years in terms of statewide average temperatures. By the time the drought was declared officially over in April 2017, the state had expended $6.6 billion in drought response and mitigation programs, and had been declared a federal disaster area. The immediate cause of California's 2014 drought can be traced to the altered route of atmospheric water vapor, which is necessary for strong winter precipitation in the state. Ordinarily, water evaporates from the ocean in the warm Tropical Pacific Ocean and winds carry that water vapor to the U.S. west coast. However, in 2014 the water vapor transport split into two branches and ended up going either north or south of California.

In Sacramento County, it was noted that the following issues were experienced in past drought events:

- **2011 through 2017.** Significant crop loss and loss of jobs related to agriculture.
- Construction of a $40 million temporary barrier at West False River in the Sac-San Joaquin Delta was installed to keep salt water from contaminating drinking water to Bay Area residents.
- **2014** – On January 17, 2014 the governor declared a State of Emergency for drought throughout California. This declaration came on the heels of a report that stated that California had the least amount of rainfall in its 163-year history. Californians were asked to voluntarily reduce their water consumption by 20 percent. Drought conditions worsened through 2014 and into 2015. On April 1, 2015, following the lowest snowpack ever recorded, Governor Brown announced actions that will save water, increase enforcement to prevent wasteful water use, streamline the State's drought response, and invest in new technologies that will make California more drought resilient. The Governor directed the State Water Resources Control Board to implement mandatory water reductions in cities and towns across California to reduce water usage by 25 percent. This savings amounts to approximately 1.5 million acre-feet of water through the end of 2015.
- **2015 –** An extremely dry March followed a below normal February for most areas. By the end of March, the snowpack was only about 5 percent of normal levels. Melting snowpack supplies about a third of the annual water supply for California. Reservoirs across the area by the end of March were already well below normal levels. By the end of April, the snowpack was only about 4 percent of normal levels. As a result, reservoirs across the area by the end of April remained well below normal levels with little or no spring rise, due to the lack of snow melt. In June, as a result of continuing drought, emergency legislation appropriated over $1 billion in additional funds for drought related projects". The long-term drought continued through August with little change. Without a snowpack

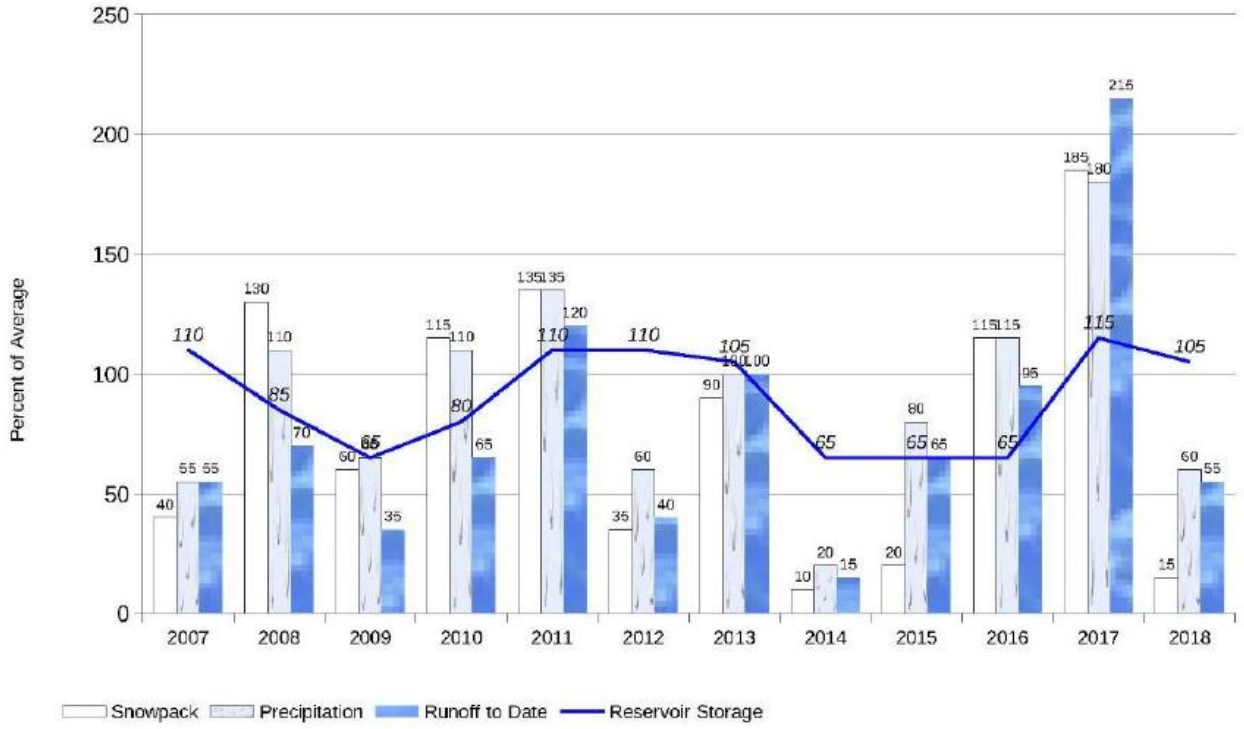
for late spring/early summer, reservoirs across the area by the end of the month were continuing to drop well below normal levels. All major reservoirs across the state were less than 40% of capacity by the end of the month. Folsom Lake was down to 20% of capacity, approaching near-record low levels for August, seen last in 1977. A UC Davis Center for Watershed Sciences report – (due to drought) showed statewide drought impact in 2015 at $2.7 Billion and loss of more than 21,000 jobs. Approx. 743,642 boxes of food distributed to 300k households that suffered unemployment from the drought. The long-term drought continued through September with little change. Folsom Lake was down to 18% of capacity, approaching near-record low levels for September, seen last in 1977. By November, Folsom Lake was down to 14% of capacity, breaking the all-time record low set in 1977. Lake Oroville came close to a record low, but did not reach it.

- **2021** – Prolonged droughts affected the County. The County was affected by shrinking reservoirs of water. Lake Oroville — the state's second-largest reservoir — is on the Feather River, which feeds into the Sacramento River and delivers water to Sacramento residents. Meanwhile, Folsom Lake, which feeds the Lower American River and is another one of the city's primary surface water reservoirs, is also seeing tragically low water levels. The river is also a critical habitat for salmon and steelhead fish. The State Water Resources Control Board also sent out a notice last week about the lack of water availability to thousands of water rights holders in the Sacramento-San Joaquin region. The notice urged water users in the agriculture, municipal, recreation and environmental protection sectors to preserve the rapidly declining water supply to meet demands for the current and following year. The Sacramento City Council on Aug. 24 voted to declare a "Water Alert," which increases fines for wasting water, restricts car washing and asks residents to voluntarily reduce their water use by 15 percent – an increase from the 10-percent reduction already in place. A Water Alert is the second of six stages in the City's plan to reduce overall water usage during a water shortage.

Water Shortage

Figure 4-58 illustrates several indicators commonly used to evaluate water conditions in California. The percent of average values are determined by measurements made in each of the ten major hydrologic regions. The chart describes water conditions in California between 2007 and 2018. The chart illustrates the cyclical nature of weather patterns in California.

Figure 4-58 Water Supply Conditions, 2007 to 2018



Source: 2018 State of California Hazard Mitigation Plan

Beginning in 2012, snowpack levels in California dropped dramatically. 2015 estimates placed snowpack as 5 percent of normal levels. Snowpack measurements have been kept in California since 1950 and nothing in the historic record comes close to 2015's severely depleted level. The previous record for the lowest snowpack level in California, 25 percent of normal, was set both in 1976-77 and 2013-2014. In "normal" years, the snowpack supplies about 30 percent of California's water needs, according to the California Department of Water Resources. Snowpack levels began to increase in 2016, and in 2017 snowpack increased to the largest in 22 years, according to the State Department of Water Resources. In late 2017 and early 2018, drought conditions began to return to California but were dampened by periods of above average rainfall in the first part of 2019. Sacramento County has been in and out of drought conditions since 2019, with drought conditions returning in 2021.

Likelihood of Future Occurrence

Drought

Likely—Historical drought data for the Sacramento County Planning Area and region indicate there have been 5 significant droughts in the last 85 years. This equates to a drought every 17 years on average or a 5.9 percent chance of a drought in any given year. However, based on this data and given the multi-year length and cyclical nature of droughts, future drought occurrences in the Planning Area are likely.

Water Shortage

Occasional — Recent historical data for water shortage indicates that Sacramento County may at some time be at risk to both short and prolonged periods of water shortage. Based on this it is possible that water shortages will affect the County in the future during extreme drought conditions. Water supply has not been a significant issue in Sacramento County in years past due to the extensive surface and groundwater supplies in the region; the County's senior water rights; and their ability to maximize water resources through conjunctive use.

Climate Change and Drought and Water Shortage

Climate change and its effect on extreme heat in the County has been discussed utilizing four sources:

- 2021 Draft Climate Action Plan Update
- California Climate Adaptation Strategy (CAS) – 2014
- Public Policy Institute
- Cal-Adapt

2021 Draft Sacramento County CAP

Sacramento County is not located in an area where snow accumulates; however, major water districts and utilities in the County receive and depend on a substantial amount of water from watersheds that rely upon spring and early-summer snowmelt in the Sierra Nevada mountain range. The Sierra Nevada snowpack, which serves as a natural water supply reservoir for California during the dry months, is predicted to decline in area covered and water volume stored, as average temperatures rise and precipitation falls more frequently as rain instead of snow at mountain elevations. Further, increased temperatures will affect the timing of historical snowmelt such that the snowpack will typically melt earlier reducing late spring/summer flows.

Approximately 50 percent of Sacramento County is served by groundwater supplies. Changes in surface water flow will have a direct impact on groundwater recharge, including decreased periods of recharge when late spring/summer stream flows diminish. Further, groundwater usage is higher in periods of drought; therefore, groundwater supplies may be reduced during and after periods of limited surface water flows.

California (including Sacramento County) is prone to prolonged drought. The State experienced severe drought in 1973, 1976 through 1977, 1987 through 1991, 2007 through 2009, and 2012 through 2016. During the most recent severe drought period in June of 2015, statewide reservoir storage levels were between 18 and 67 percent of normal (State Water Resources Control Board [SWRCB] 2017). Climate change is expected to increase the number, duration, and severity of future droughts. Exacerbated drought conditions, early snowmelt, and reduced snowpack size, combined with increased demand as population and development increases, could result in water supply constraints in future years.

2014 CAS

Climate scientists studying California find that drought conditions are likely to become more frequent and persistent over the 21st century due to climate change. The experiences of California during recent years underscore the need to examine more closely the state's water storage, distribution, management, conservation, and use policies. The 2014 CAS stresses the need for public policy development addressing long term climate change impacts on water supplies. The CAS notes that climate change is likely to significantly diminish California's future water supply, stating that: California must change its water management and uses because climate change will likely create greater competition for limited water supplies needed by the environment, agriculture, and cities.

Public Policy Institute

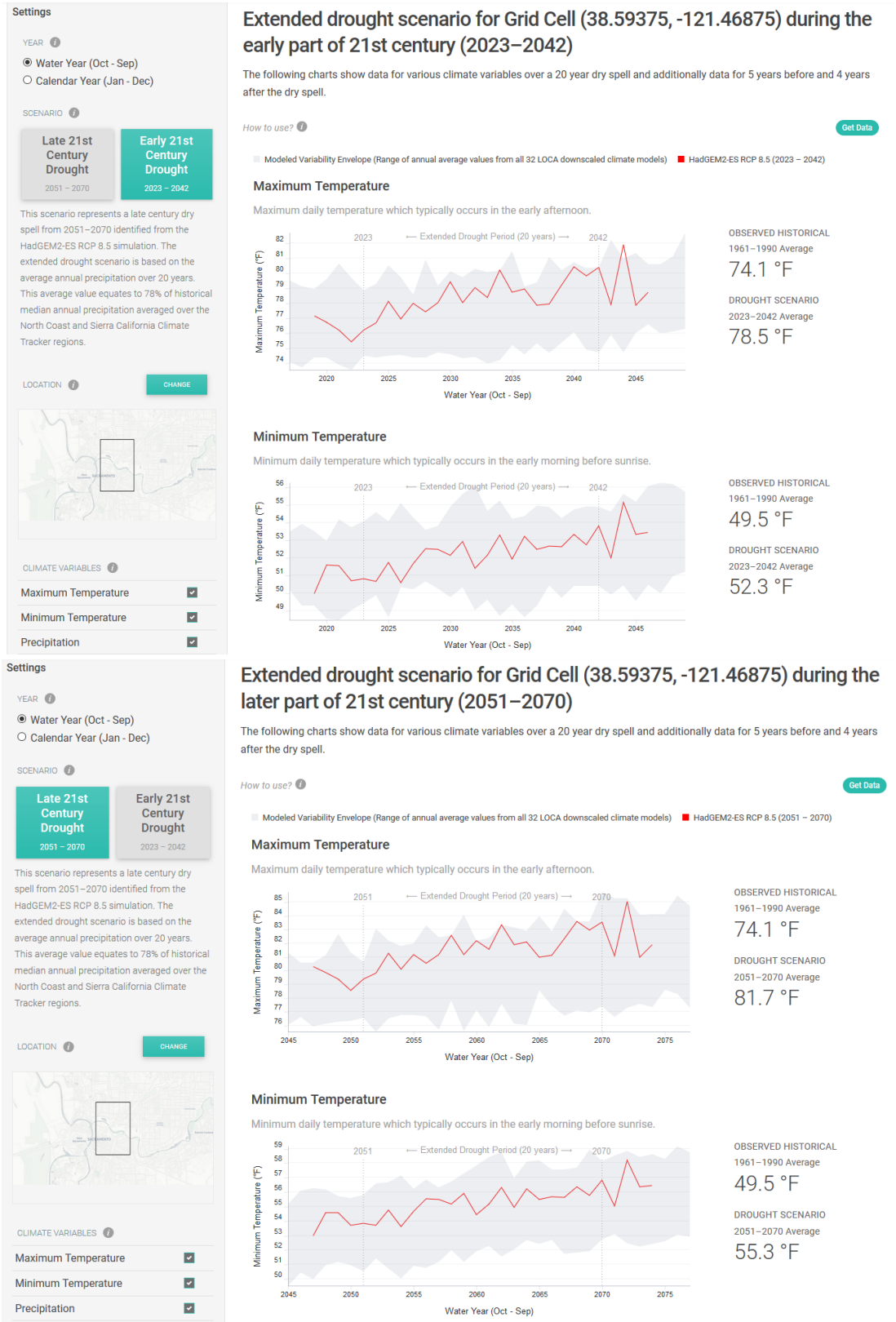
A report from the Public Policy Institute of California noted that thousands of Californians – mostly in rural, small, disadvantaged communities – already face acute water scarcity, contaminated groundwater, or complete water loss. Climate change would make these effects worse.

Cal-Adapt

Cal-Adapt has modeled future risk of drought. Recent research suggests that extended drought occurrence ("mega-drought") could become more pervasive in future decades. This tool explores data for two 20-year drought scenarios (using the quad that contains the City of Sacramento) derived from LOCA downscaled meteorological and hydrological simulations (Figure 4-59) – one for the earlier part of the 21st century, and one for the latter part:

- The upper chart represents a mid-century dry spell from 2023-2042 identified from the HadGEM2-ES RCP 8.5 simulation. The extended drought scenario is based on the average annual precipitation over 20 years. This average value equates to 78% of historical median annual precipitation averaged over the North Coast and Sierra California Climate Tracker regions.
- The lower chart represents a late century dry spell from 2051–2070 identified from the HadGEM2-ES RCP 8.5 simulation. The extended drought scenario is based on the average annual precipitation over 20 years. This average value equates to 78% of historical median annual precipitation averaged over the North Coast and Sierra California Climate Tracker regions.

Figure 4-59 Sacramento County – Future Extended Drought Scenarios



Source: Cal Adapt – Extended Drought Scenarios

Vulnerability Assessment

Vulnerability—Medium

Based on historical information, the occurrence of drought in California, including Sacramento County, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts is often extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users.

Impacts

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Tracking drought impacts can be difficult. The Drought Impact Reporter from the NDMC is a useful reference tool that compiles reported drought impacts nationwide. Table 4-59 show drought impacts for the Sacramento County Planning Area from 1850 to August 2020. The data represented is skewed, with the majority of these impacts from records within the past ten years.

Table 4-59 Sacramento County Drought Impacts

Category	Number of Impacts
Agriculture	416
Business and Industry	104
Energy	13
Fire	263
Plants & Wildlife	367
Relief, Response, and Restrictions	640
Society and Public Health	418
Tourism and Recreation	127
Water Supply and Quality	926

Source: National Drought Mitigation Center, 1/1/1850-11/1/2020

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

With a reduction in water, water supply issues based on water rights becomes more evident. Some agricultural uses are severely impacted through limited water supply, especially those with livestock. Drought and water supply issues will continue to be a concern to the Planning Area. The drawdown of the groundwater table is one factor that has been recognized to occur during repeated dry years. Lowering of groundwater levels results in the need to deepen wells, which subsequently lead to increased pumping costs. These costs are a major consideration for residents relying on domestic wells and agricultural producers that irrigate with groundwater and/or use it for frost protection. Land subsidence can also occur when the groundwater table is depleted.

Climate change may create additional impacts to drought and water shortage in the County. This was discussed in detail in Section 4.3.6. Drought can also increase the wildfire risk in the County. This is discussed in Section 4.3.18.

Future Development

Sacramento County, primarily through the Sacramento County Water Agency, has access to large quantities of water through surface water, groundwater, and recycled water. Population in the County in the future is expected to increase (see Table 4-18), which increases pressure on water companies during periods of drought and water shortage. Water companies will need to continue to plan for and add infrastructure capacity to replace aging systems and accommodate additional users.

4.3.9. Earthquake

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction. This section briefly discusses issues related to types of seismic hazards.

Ground Shaking

Ground shaking is motion that occurs as a result of energy released during faulting. The damage or collapse of buildings and other structures caused by ground shaking is among the most serious seismic hazards. Damage to structures from this vibration, or ground shaking, is caused by the transmission of earthquake vibrations from the ground to the structure. The intensity of shaking and its potential impact on buildings is determined by the physical characteristics of the underlying soil and rock, building materials and workmanship, earthquake magnitude and location of epicenter, and the character and duration of ground motion.

Actual ground breakage generally affects only those buildings directly over or nearby the fault. Ground shaking generally has a much greater impact over a greater geographical area than ground breakage. The amount of breakage and shaking is a function of earthquake magnitude, type of bedrock, depth and type of soil, general topography, and groundwater.

Seismic Structural Safety

Older buildings constructed before building codes were established, and even newer buildings constructed before earthquake-resistance provisions were included in the codes, are the most likely to be damaged during an earthquake. Buildings one or two stories high of wood-frame construction are considered to be the most structurally resistant to earthquake damage. Older masonry buildings without seismic reinforcement (unreinforced masonry buildings [URM]) and soft story buildings are the most susceptible to the type of structural failure that causes injury or death.

The susceptibility of a structure to damage from ground shaking is also related to the underlying foundation material. A foundation of rock or very firm material can intensify short-period motions which affect low-rise buildings more than tall, flexible ones. A deep layer of water-logged soft alluvium can cushion low-rise buildings, but it can also accentuate the motion in tall buildings. The amplified motion resulting from softer alluvial soils can also severely damage older masonry buildings.

Other potentially dangerous conditions include, but are not limited to: building architectural features that are not firmly anchored, such as parapets and cornices; roadways, including column and pile bents and abutments for bridges and overcrossings; and above-ground storage tanks and their mounting devices. Such features could be damaged or destroyed during strong or sustained ground shaking.

Liquefaction Potential

Liquefaction, which can occur in earthquakes with strong ground shaking, is mostly found in areas with sandy soil or fill and a high water table located 50 feet or less below the ground surface. Liquefaction can cause damage to property with the ground below structures liquefying making the structure unstable causing sinking or other major structural damage. Evidence of liquefaction may be observed in "sand boils," which are expulsions of sand and water from below the surface due to increased pressure below the surface.

Liquefaction during an earthquake requires strong shaking and is not likely to occur in most areas of the County due to the relatively low occurrence of seismic activity in the area. However, due to the damage

liquefaction poses to the levees in Sacramento County, a separate, more detailed discussion of liquefaction can be found in Section 4.3.10.

Settlement

Settlement can occur in poorly consolidated soils during ground shaking. During settlement, the soil materials are physically rearranged by the shaking to result in a less stable alignment of the individual minerals. Settlement of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial soils or improperly founded or poorly compacted fill. These areas are known to undergo extensive settling with the addition of irrigation water, but evidence due to ground shaking is not available.

Location and Extent

California is seismically active because it sits on the boundary between two of the earth's tectonic plates. Most of the state - everything east of the San Andreas Fault - is on the North American Plate. The cities of Monterey, Santa Barbara, Los Angeles, and San Diego are on the Pacific Plate, which is constantly moving northwest past the North American Plate. The relative rate of movement is about two inches per year. The San Andreas Fault is considered the boundary between the two plates, although some of the motion is taken up on faults as far away as central Utah.

Faults

A fault is defined as "a fracture or fracture zone in the earth's crust along which there has been displacement of the sides relative to one another." For the purpose of planning there are two types of faults, active and inactive. Active faults have experienced displacement in historic time, suggesting that future displacement may be expected. Inactive faults show no evidence of movement in recent geologic time, suggesting that these faults are dormant. This does not mean, however, that faults having no evidence of surface displacement within the last 11,000 years are necessarily inactive. For example, the 1975 Oroville earthquake, the 1983 Coalinga earthquake, and the 1987 Whittier Narrows earthquake occurred on faults not previously recognized as active. Potentially active faults are those that have shown displacement within the last 1.6 million years (Quaternary). An inactive fault shows no evidence of movement in historic (last 200 years) or geologic time, suggesting that these faults are dormant.

Two types of fault movement represent possible hazards to structures in the immediate vicinity of the fault: fault creep and sudden fault displacement. Fault creep, a slow movement of one side of a fault relative to the other, can cause cracking and buckling of sidewalks and foundations even without perceptible ground shaking. Sudden fault displacement occurs during an earthquake event and may result in the collapse of buildings or other structures that are found along the fault zone when fault displacement exceeds an inch or two. The only protection against damage caused directly by fault displacement is to prohibit construction in the fault zone.

Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near

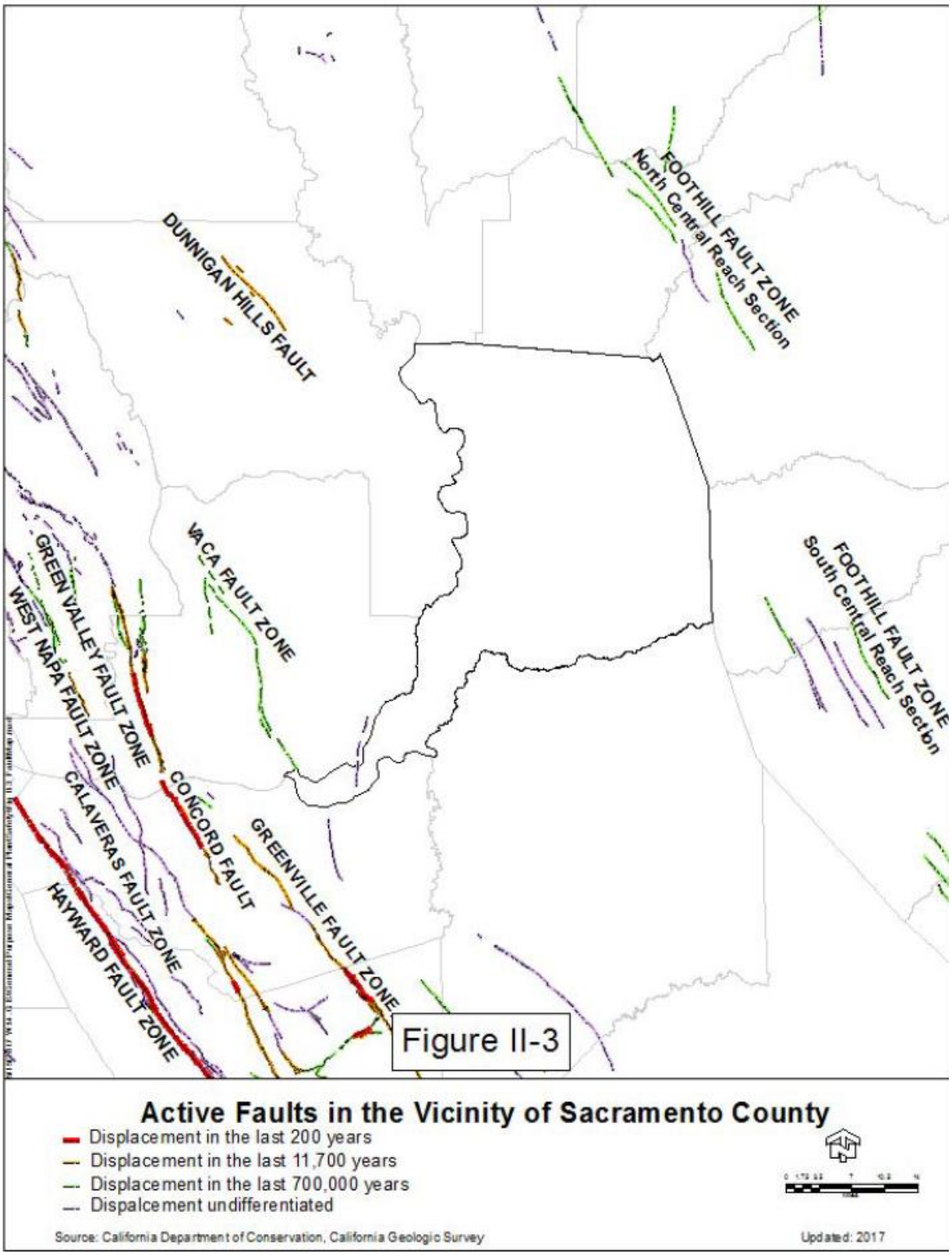
7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees. Table 4-60 and Figure 4-60 identify the faults in close proximity to Sacramento County.

Table 4-60 Historically Active Faults in the Vicinity of Sacramento County

Fault	Approximate Distance from Sacramento County Border (Miles)	Earthquake Date	Magnitude (Richter)
San Andreas	46	1906, 1989, 2014	7.8; 7.1, 6.0
Vaca	5	1892	6.6
Concord	12	1955	5.4
Greenville	17	1980	5.1
Hayward	26	1868	7.0
Calaveras	21	1861; 1979; 2007	5.8; 5.74; 5.44
Foothill Fault System	48	1975 (Oroville)	5.7
Las Positas	24	1980	5.4
Midland	0	1892	5.6
West Napa	22	2014	6.02

Source: Sacramento County General Plan Safety Element Background Report (2017)

Figure 4-60 Active Faults in and near Sacramento County



Source: Sacramento County General Plan Safety Element Background Report (2017)

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales. One of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale is used to quantify the magnitude or strength of the seismic energy released by an earthquake. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface (see Table 4-61). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Table 4-61 Modified Mercalli Intensity (MMI) Scale

MMI	Felt Intensity
I	Not felt except by a very few people under special conditions. Detected mostly by instruments.
II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
III	Felt noticeably indoors. Standing automobiles may rock slightly.
IV	Felt by many people indoors; by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable in buildings of poor construction.
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, and great in poorly built structures. Heavy furniture is overturned.
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.
XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

Source: Multi-Hazard Identification and Risk Assessment, FEMA 1997

Other Hazards

Earthquakes can also cause landslides and dam failures. Earthquakes may cause landslides (discussed in Section 4.3.13), particularly during the wet season, in areas of high water or saturated soils. Finally, earthquakes can cause dams to fail (see Section 4.3.7 Dam Failure).

Past Occurrences

Disaster Declaration History

There have been no disaster declarations in the County related to earthquakes, as shown on Table 4-4.

NCDC Events

Earthquake events are not tracked by the NCDC database.

USGS Events

The USGS National Earthquake Information Center database contains data on earthquakes in the Sacramento County area. Table 4-62 shows the approximate distances earthquakes can be felt away from the epicenter. According to the USGS data, a magnitude 5.0 earthquake could be felt up to 90 miles away. The USGS database was searched for magnitude 5.0 or greater on the Richter Scale within 90 miles of the City of Sacramento in Sacramento County. There are 40 results that are detailed in Table 4-63.

Table 4-62 Approximate Relationships between Earthquake Magnitude and Intensity

Richter Scale Magnitude	Maximum Expected Intensity*	Distance Felt (miles)
2.0 - 2.9	I – II	0
3.0 - 3.9	II – III	10
4.0 - 4.9	IV – V	50
5.0 - 5.9	VI – VII	90
6.0 - 6.9	VII – VIII	135
7.0 - 7.9	IX – X	240
8.0 - 8.9	XI – XII	365

*Modified Mercalli Intensity Scale.
Source: United State Geologic Survey, Earthquake Intensity Zonation and Quaternary Deposits, Miscellaneous Field Studies Map 9093, 1977.

*Table 4-63 Magnitude 5.0 Earthquakes or greater within 90 Miles of Sacramento County**

Date	Richter Magnitude	Location
12/14/2016	5.01	8km NW of The Geysers, California
8/10/2016	5.09	20km NNE of Upper Lake, California
8/24/2014	6.02	South Napa
10/31/2007	5.45	San Francisco Bay area, California
6/13/1988	5.3	San Francisco Bay area, California
3/31/1986	5.7	Northern California
4/24/1984	6.2	Northern California
11/28/1980	5.1	Northern California
1/27/1980	5.4	San Francisco Bay area, California
1/24/1980	5.1	San Francisco Bay area, California
1/24/1980	5.8	San Francisco Bay area, California
8/2/1975	5.2	Northern California
8/2/1975	5.1	Northern California
8/1/1975	5.7	0km WSW of Palermo, California

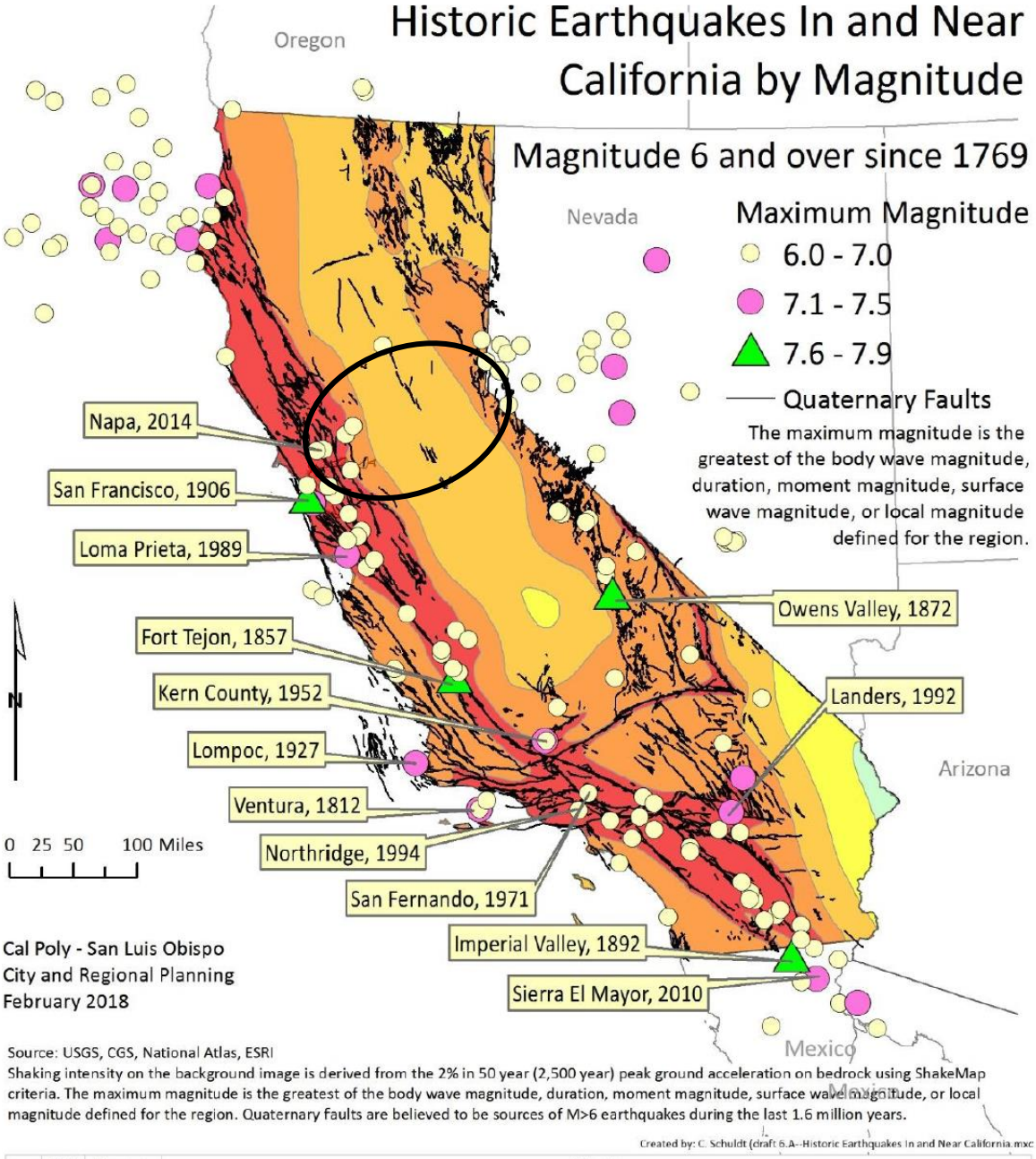
Date	Richter Magnitude	Location
10/2/1969	5.1	Northern California
4/29/1968	5	Northern California
9/12/1966	5.91	Northern California
3/22/1957	5.3	San Francisco Bay area, California
10/24/1955	5.4	San Francisco Bay area, California
9/5/1955	5.5	San Francisco Bay area, California
3/22/1953	5	Northern California
3/30/1943	5.3	Northern California
12/17/1942	5.1	Northern California
7/1/1911	6.6	San Francisco Bay area, California
6/23/1909	5.7	Northern California
3/3/1909	5	Northern California
4/18/1906	7.9	The 1906 San Francisco Earthquake
8/3/1903	5.8	San Francisco Bay area, California
6/11/1903	5.8	San Francisco Bay area, California
5/19/1902	5.4	Northern California
06/02/1899	5.4	San Francisco Bay area, California
03/31/1898	6.2	San Francisco Bay area, California
08/09/1893	5.1	Northern California
04/30/1892	5.5	Northern California
04/21/1892	6.2	Northern California
04/19/1892	6.4	Northern California
10/12/1891	5.5	Northern California
01/02/1891	5.5	San Francisco Bay area, California
07/31/1889	5.2	San Francisco Bay area, California
05/19/1889	6	San Francisco Bay area, California
04/29/1888	5.9	Northern California
04/10/1881	6.3	Southwest of Modesto, California
07/10/1877	5.5	Lake Tahoe area, California-Nevada border
04/02/1870	5.8	Near Berkeley, California
10/21/1868	6.8	The 1868 Hayward Fault Earthquake, California
07/15/1866	6	Southwest of Stockton, California
05/21/1864	5.8	Alameda County, California
03/05/1864	6.1	Alameda County, California
07/04/1861	5.8	San Francisco Bay area, California
11/26/1858	6.1	San Francisco Bay area, California
02/15/1856	5.5	San Mateo County, California
01/02/1856	5.3	San Mateo County, California
01/25/1855	5.5	Sierra County, California

Date	Richter Magnitude	Location
05/15/1851	5	San Francisco Bay area, California

Source: USGS
*Search dates 1/1/1850 – 11/1/2020

Figure 4-61 shows major historical earthquakes in California from 1769 to 2017.

Figure 4-61 Historic Earthquakes in California 1769 to 2017



	MMI	Damage	Effects
	X	Very Heavy	Some well-built, wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
	IX	Heavy	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
	VIII	Moderate to Heavy	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
	VII	Moderate	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly-built or badly designed structures; some chimneys broken.
	VI	Light	Felt by all, many frightened. Some heavy furniture moved; a few instance of fallen plaster. Damage slight.
	V	Very Light	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.

Source: 2018 State of California Multi-Hazard Mitigation Plan

Hazard Mitigation Planning Committee Events

Historically, major earthquakes have not been an issue for Sacramento County. However, minor earthquakes have occurred in or near the County in the past. The HMPC has identified several earthquakes that were felt by area residents and/or caused damaging shaking in the County. Details on some of these events follow.

- The greatest amount of ground shaking experienced in the County occurred on **April 21, 1892**, when an earthquake shook Yolo County between Winters and Vacaville. While the damage in Yolo County was severe, the damage in Sacramento County was substantially less. Damage to buildings in Sacramento was limited to statuary falling from building tops and cracks in chimneys.
- The **1906** San Francisco earthquake generated little shaking in Sacramento County and damage locally was limited to minor cracks in a local post office and jail.
- A **December 16, 1954** earthquake near Fairview Peak, Nevada measured 7.1 on the Richter Scale. The earthquake caused some damage in Sacramento, while virtually no damage occurred in Reno, Nevada.
- On **August 1, 1975**, a moderate earthquake (magnitude 5.7) occurred near Oroville on the Cleveland Hills fault. This earthquake was felt in Sacramento County, although no direct damage was reported.
- Sacramento County suffered little damage from the **October 17, 1989** Loma Prieta earthquake, which was felt over an area covering 400,000 square miles from Los Angeles to the California-Oregon border. The earthquake measured 7.1 on the Richter Scale; the epicenter was located along the San Andreas fault beneath the Santa Cruz Mountains, about 60 miles southeast of San Francisco. In contrast to Sacramento County, the San Francisco Bay region suffered over $6 billion in property damage and 62 lives were lost. The Loma Prieta earthquake resulted in a federal disaster declaration (DR-845) for the area around San Francisco, including Sacramento County.
- **2014 Napa Earthquake** – A magnitude 6.0 earthquake occurred 51.1 miles west/southwest of the City of Sacramento. Damage estimates in the County were negligible. No damage was observed on the Delta levees.
- **July 9, 2021** – Two earthquakes struck near Sacramento County. A 6.0 magnitude earthquake with an epicenter in Antelope Valley, Ca and a 5.2 magnitude with an epicenter near Walker, Ca both caused shaking in Sacramento County. Residents noted felt effects in areas throughout the County.

Likelihood of Future Occurrence

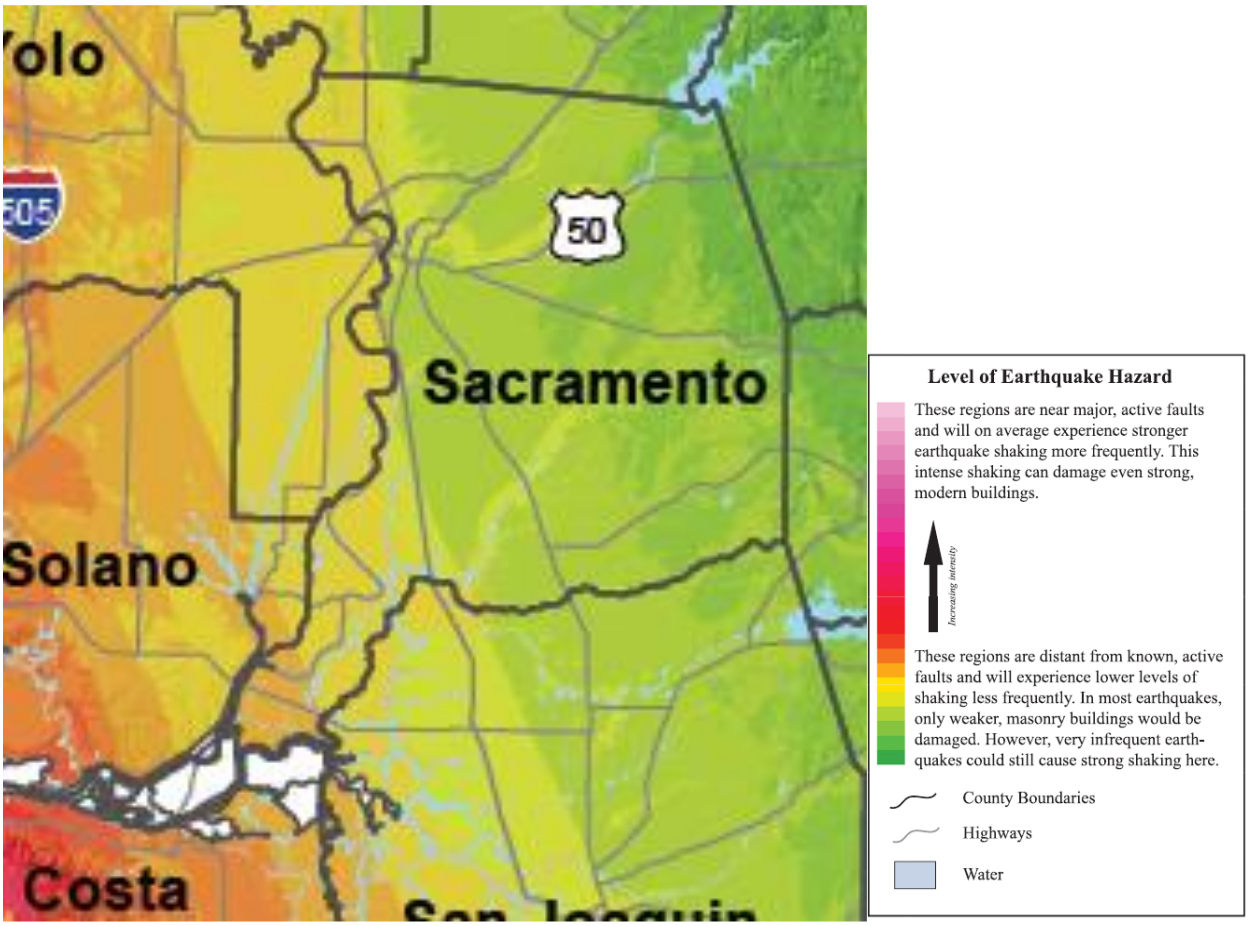
Occasional—No major earthquakes have been recorded within the County; although the County has felt ground shaking from earthquakes with epicenters located elsewhere. Based on historical data and the location of the Sacramento County Planning Area relative to active and potentially active faults, the County will experience an earthquake occasionally.

Mapping of Future Occurrences

Maps indicating the maximum expectable intensity of ground shaking for the County are available through several sources. Figure 4-62, prepared by the California Division of Mines and Geology, shows the expected relative intensity of ground shaking and damage in California from anticipated future earthquakes. The shaking potential is calculated as the level of ground motion that has a 2% chance of being exceeded in 50 years, which is the same as the level of ground-shaking with about a 2,500-year average repeat time.

This data shows that Sacramento County falls within an area of mostly low seismic risk. As seen in Figure 4-62, the Delta area of the County is at greater risk to earthquakes than the rest of the County.

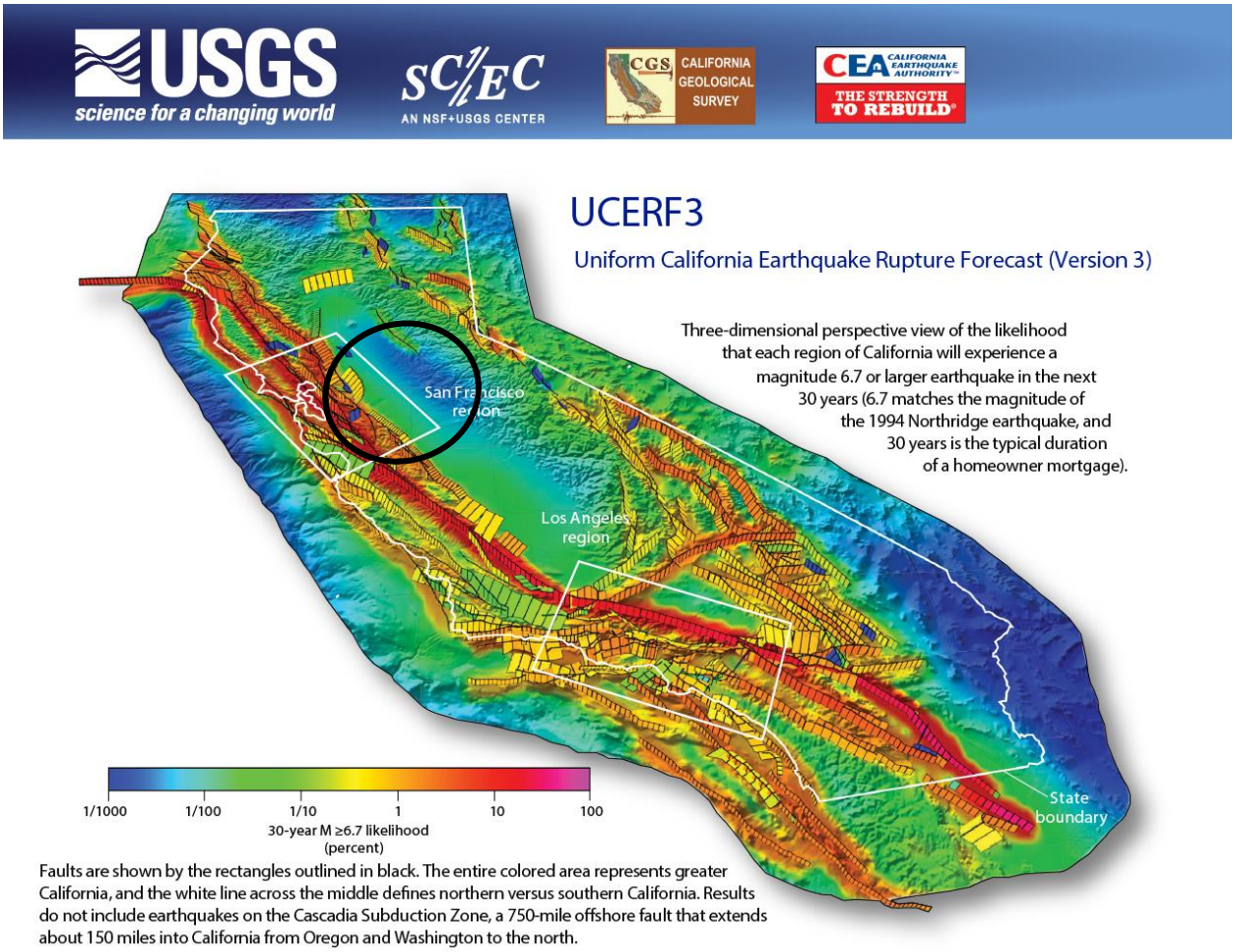
Figure 4-62 Maximum Expectable Earthquake Intensity – 2% Chance in 50 Years



Source: California Division of Mines and Geology (2016)

In 2014, the USGS and the California Geological Survey (CGS) released the time-dependent version of the Uniform California Earthquake Rupture Forecast (UCERF III) model. The UCERF III results have helped to reduce the uncertainty in estimated 30-year probabilities of strong ground motions in California. The UCERF map is shown in Figure 4-63 and indicates that Sacramento County has a low to moderate risk of earthquake occurrence, which coincides with the likelihood of future occurrence rating of occasional.

Figure 4-63 Probability of Earthquake Magnitudes Occurring in 30 Year Time Frame



Source: United States Geological Survey Open File Report 2015-3009

Climate Change and Earthquake

Climate changes is unlikely to increase earthquake frequency or strength.

Vulnerability Assessment

Vulnerability—Extremely High

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable. The primary impacts of concern are life safety and property damage. Although several faults are within and near the County, seismic hazard mapping indicates that the County has low seismic hazard potential. Additionally, the County is not located within a delineated Alquist-Priolo Earthquake Fault Zone. The risks associated with earthquakes, such as surface fault rupture, within the County are considered low.

Ground shaking is the primary earthquake hazard. Many factors affect the survivability of structures and systems from earthquake-caused ground motions. These factors include proximity to the fault, direction of rupture, epicentral location and depth, magnitude, local geologic and soils conditions, types and quality of construction, building configurations and heights, and comparable factors that relate to utility, transportation, and other network systems. Ground motions become structurally damaging when average peak accelerations reach 10 to 15 percent of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the Modified Mercalli Intensity Scale is about VII (18-34 percent peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured housing is very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry, as was seen in the Oroville, Coalinga, Santa Cruz, and Paso Robles earthquakes. This was seen to a certain extent in the Lake Almanor earthquake.

Seismic events can have particularly negative effects on older buildings constructed of URM, including materials such as brick, concrete and stone. The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. Sacramento County is within the less hazardous Zone 3.

Impacts

While a large earthquake event in the County is not likely, should one occur, impacts could be catastrophic. Impacts to the County would include damages to infrastructure (roads, bridges, railroad tracks, etc.), damages to utilities (and loss of services) and critical infrastructure, damages to residential and commercial buildings, and possible loss of life and injuries. Rebuilding efforts would be substantial and could take years. The biggest concern associated with a large earthquake event would be the failure of area levees and which provide protection for much of the existing built environment throughout the County. More information can be found in the levee profile in Section 4.3.14.

Estimating Potential Losses

Earthquake losses will vary across the Sacramento County Planning Area depending on the source and magnitude of the event. To further evaluate potential losses associated with earthquake activity in the Planning Area, a HAZUS-MH probabilistic 7.0 earthquake event earthquake scenarios was run for this 2021 LHMP Update:

This event was chosen from data gathered from the General Plan Safety Element. The probabilistic event is a “worst case” event, and assumes an earthquake takes place on an unknown fault that lies inside the County.

Probabilistic 7.0 Earthquake Event

HAZUS-MH 4.2 was utilized to model earthquake losses for the County. Specifically, the probabilistic magnitude used for Sacramento County utilized a 7.0 magnitude earthquake. Level 1 analyses were run, meaning that only the default data was used and not supplemented with local building inventory or hazard data. There are certain data limitations when using the default data, so the results should be interpreted accordingly; this is a planning level analysis. The represents a "worst case" scenario.

The methodology for running the probabilistic earthquake scenario used seismic hazard contour maps developed by the U.S. Geological Survey (USGS) for the 2002 update of the National Seismic Hazard Maps that are included with HAZUS-MH. The USGS maps provide estimates of potential ground acceleration and spectral acceleration at periods of 0.3 second and 1.0 second, respectively. The 2,500-year return period analyzes ground shaking estimates with a 2 percent probability of being exceeded in 50 years, from the various seismic sources in the area. The International Building Code uses this level of ground shaking for building design in seismic areas and is more of a worst-case scenario.

The results of the probabilistic scenario are captured in Table 4-64 and shown on Figure 4-64. Key losses included the following:

- Total economic loss estimated for the earthquake was $18.177 billion, which includes building losses and lifeline losses based on the HAZUS-MH inventory.
- Building-related losses, including direct building losses and business interruption losses, totaled $16.043 billion.
- 66,898 buildings in the County were at least moderately damaged. 4,700 buildings were completely destroyed.
- Over 59 percent of the building- and income-related losses were residential structures.
- 15 percent of the estimated losses were related to business interruptions.
- The mid-day earthquake had the highest number of casualties at 472.
- 287,466 households experienced a loss of potable water the first day after the earthquake.
- 30,902 households experienced a loss of electricity the first day after the earthquake.

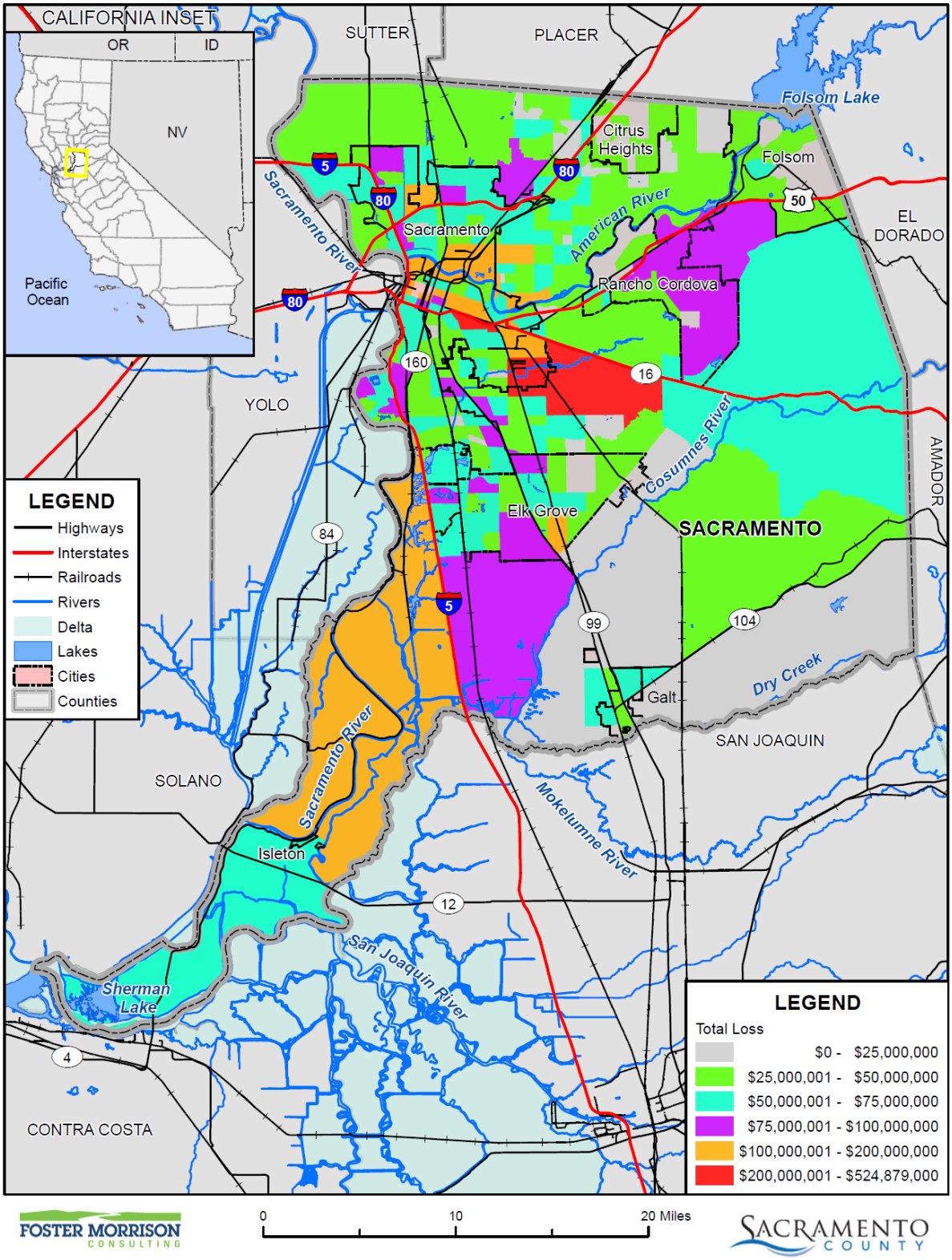
Table 4-64 HAZUS-MH Earthquake Loss Estimation Probabilistic 2,500-Year Scenario Results

Type of Impact	Impacts to County from 7.0 Probabilistic San Andreas Earthquake
Total Buildings Damaged (based on 458,000 buildings)	Slight: 151,601 Moderate: 66,898 Extensive: 12,532 Complete: 4,700
Building and Income Related Losses	$16,043,310,000
Total Economic Losses (Includes building, income and lifeline losses)	$18,177,150,000
Casualties (Based on 2 a.m. time of occurrence)	Without requiring hospitalization: 1,868 Requiring hospitalization:352 Life threatening: 37 Fatalities: 69

Type of Impact	Impacts to County from 7.0 Probabilistic San Andreas Earthquake	
Casualties (Based on 2 p.m. time of occurrence)	Without requiring hospitalization: 5,863 Requiring hospitalization: 1,548 Life threatening: 247 Fatalities: 472	
Casualties (Based on 5 p.m. time of occurrence)	Without requiring hospitalization: 3,811 Requiring hospitalization: 1,011 Life threatening: 256 Fatalities: 296	
Damage to Transportation Systems	31 highways, 2 bus facilities, and 16 port facilities, and 3 airports with at least moderate damage	
Damage to Essential Facilities	11 hospital, 219 schools, 21 police stations, and 25 fire stations with at least moderate damage	
Damage to Utility Systems	49 facilities with at least moderate damage 1,810 potable water line breaks and 909 wastewater line breaks	
Households without Power/Water Service (Based on 31,437 total households)	Power loss, Day 1: 30,902 Power loss, Day 3: 16,686 Power loss, Day 7: 5,601 Power loss, Day 30: 893 Power loss, Day 90: 50	Water loss, Day 1: 287,466 Power loss, Day 3: 280,676 Power loss, Day 7: 266,413 Water loss, Day 30: 165,234 Water loss, Day 90: 0
Displaced Households	10,592 displaced households	
Shelter Requirements	7,009 persons	
Debris Generation	2,869,000 tons	

Source: HAZUS-MH 4.2, 2020

Figure 4-64 Sacramento County – Total Loss Map from 7.0 Magnitude Probabilistic Hazus Earthquake Scenario



Data Source: Hazus-MH 4.2, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

Future Development

Although new growth and development corridors would fall in the area affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in the earthquake area will continue to occur. This development will be subject to local building codes that take earthquake shaking into account when siting and building new residential, commercial, and industrial properties.

4.3.10. Earthquake: Liquefaction

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

Liquefaction during major earthquakes has caused severe damage to structures on level ground as a result of settling, titling, or floating. Such damage occurred in San Francisco on bay-filled areas during the 1989 Loma Prieta earthquake, even though the epicenter was several miles away. If liquefaction occurs in or under a sloping soil mass, the entire mass may flow toward a lower elevation. Also of particular concern in terms of developed and newly developing areas are fill areas that have been poorly compacted.

Typical effects of liquefaction include:

- **Loss of bearing strength**—the ground can liquefy and lose its ability to support structures.
- **Lateral spreading**—the ground can slide down very gentle slopes or toward stream banks riding on a buried liquefied layer.
- **Sand boils**—sand-laden water can be ejected from a buried liquefied layer and erupt at the surface to form sand volcanoes; the surrounding ground often fractures and settles.
- **Flow failures**—earth moves down steep slope with large displacement and much internal disruption of material.
- **Ground oscillation**—the surface layer, riding on a buried liquefied layer, is thrown back and forth by the shaking and can be severely deformed.

- **Flotation**—light structures that are buried in the ground (like pipelines, sewers and nearly empty fuel tanks) can float to the surface when they are surrounded by liquefied soil.
- **Settlement**—when liquefied ground re-consolidates following an earthquake, the ground surface may settle or subside as shaking decreases and the underlying liquefied soil becomes denser.

Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the county are rebuilt or leveed areas are dewatered and the levees rebuilt. In Sacramento County, the Delta and areas of downtown Sacramento are at risk to liquefaction. The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand pockets and silt in the levees and their foundations indicates that liquefaction is also a possibility.

Although there have been no significant quakes in or closely adjacent to the Delta since high levees were originally constructed, there are at least five major faults within the vicinity of the Delta capable of generating peak ground acceleration values that would likely lead to levee failures. More information on earthquakes and the faults affecting the Sacramento County area can be found in Section 4.3.9.

Past Occurrences

Disaster Declaration History

There have been no disaster declarations in the County related to earthquakes, as shown on Table 4-4.

NCDC Events

Earthquake liquefaction events are not tracked by the NCDC database.

Hazard Mitigation Planning Committee Events

There have been no tracked liquefaction events that have caused damages in the County.

Likelihood of Future Occurrence

Occasional – Due to the presence of faults in the area, and the ever increasing height of levees protecting the Delta, there is concern that liquefaction could be a cause of levee failure. Embankment and foundation materials for most Delta levees are substandard, adding to the risk of failure during seismic events. The U.S. Geological Survey estimates that an earthquake of magnitude 6.7 or greater has a 62 percent probability of occurring in the San Francisco Bay Area between 2003 and 2032. Such an earthquake is capable of causing multiple levee failures in the Delta Region which could result in fatalities, extensive property damage and the interruption of water exports from the Delta for an extended period of time.

Climate Change and Earthquake: Liquefaction

Climate changes is unlikely to increase earthquake frequency or strength.

Vulnerability Assessment

Vulnerability—Medium

Earthquake is discussed in the Section 4.3.9, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas. In Sacramento County, the HMPC identified two of these areas: downtown Sacramento and the Delta area, which could lead to a possible collapse of delta levees. This levee failure differs from the levee failure discussion in Section 4.3.14 which generally focuses on levee failure due to high water conditions or other types of structural failure. These two areas are described further below.

Downtown

A geological and seismological study in 1972 indicated that the Housing and Redevelopment Agency building site located downtown at the intersection of 7th and I Streets has a potential for liquefaction. This study also concluded that potential liquefaction problems may exist throughout the downtown area where loose sands and silts are present below the ground water table. Exact property value estimates are not available. Due to the fact that downtown Sacramento is located away from active faults, there may be limited vulnerability to damage from liquefaction.

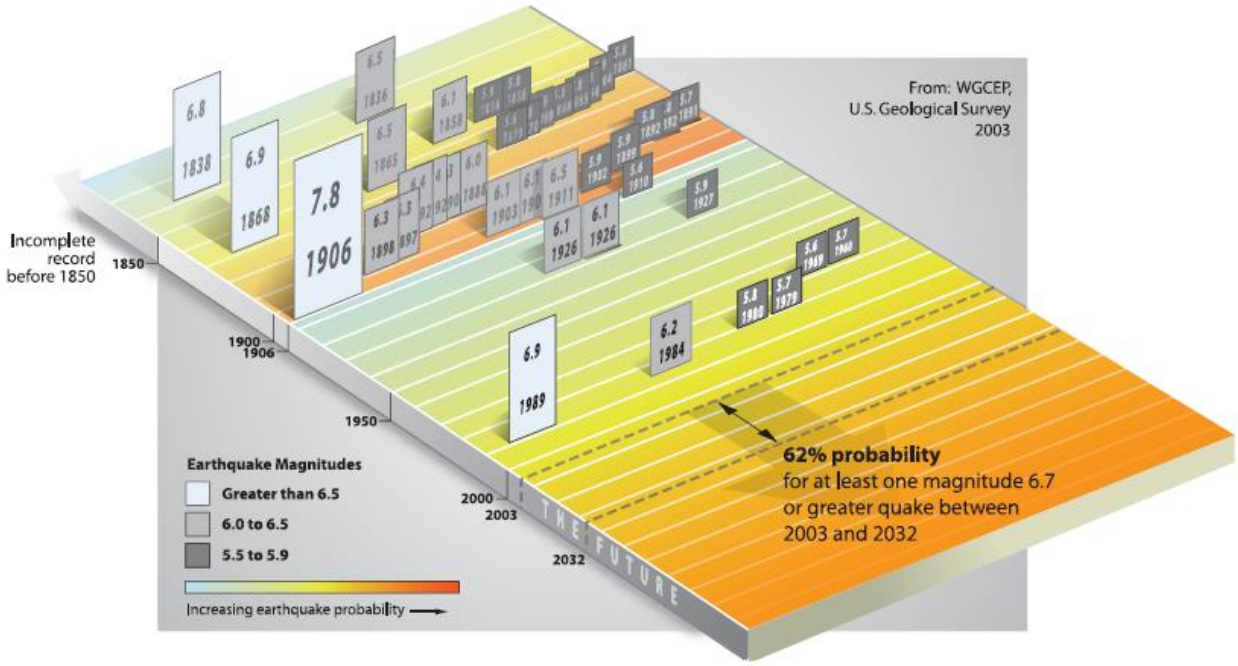
Delta

Historically, there have been 165 Delta and Suisun Marsh flood-induced levee failures leading to island inundations since 1900. Most of these failures occurred prior to 1990. Also, many of these failures were outside of Sacramento County. Since that time, there have been few levee failures due to improvements on the levee system in Sacramento as a whole.

No reports could be found to indicate that seismic shaking had ever induced significant damage or were the cause of the levee failures mentioned above. However, the lack of historical damage is not a reliable indicator that Delta levees are not vulnerable to earthquake shaking. Furthermore, the present-day Delta levees, at their current size, have not been significantly tested by moderate to high seismic shaking.

The USGS estimates that an earthquake of magnitude 6.7 or greater has a 62 percent probability of occurring in the San Francisco Bay Area between 2003 and 2032 (see Figure 4-65). Such an earthquake is capable of causing multiple levee failures in the Delta Region which could result in fatalities, extensive property damage and the interruption of water exports from the Delta for an extended period of time. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees.

Figure 4-65 Past and Future Earthquakes in the San Francisco Bay Area and the Delta



Source: DRMS Risk Report (URS/JBA 2008c) Figure 13-8

The largest earthquakes experienced in recent history in the region include the 1906 Great San Francisco Earthquake and the 1989 Loma Prieta Earthquake. The 1906 earthquake occurred while the levees were in their early stages of construction. They were much smaller than they are today, and were not representative of the current configuration. The epicenter of the 1989 Loma Prieta earthquake was too distant and registered levels of shaking in the Delta too small to cause perceptible damage to the levees. In 2009, the California Department of Water Resources, in their document titled Delta Risk Management Strategy, performed a special simulation analysis of the 1906 Great San Francisco Earthquake to evaluate the potential effects of that event on the current levees.

In addition to the simulation of these largest regional earthquakes, recent smaller and closer earthquakes were also evaluated. They include: the 1980 Livermore Earthquake (M 5.8), the 1984 Morgan Hill Earthquake (M 6.2), and the 2014 South Napa Earthquake (M 6.0). Except for the 1906 earthquake, which would have caused deformations of some of the weakest levees, the other earthquakes were either too small or too distant to cause any significant damage to the Delta levees. These results are consistent with the seismic vulnerability prediction model developed for this study.

General seismic performance observations were:

- The areas most prone to liquefaction potential are in the northern region and the southeastern region of the Delta. The central and western regions of the Delta and Suisun Marsh show discontinuous areas of moderate to low liquefaction potential.
- The vulnerability classes 1 through 4 are the most vulnerable levees to seismic loading. These include islands with liquefiable levee fill, and peat/organic soil deposits and potentially liquefiable sand

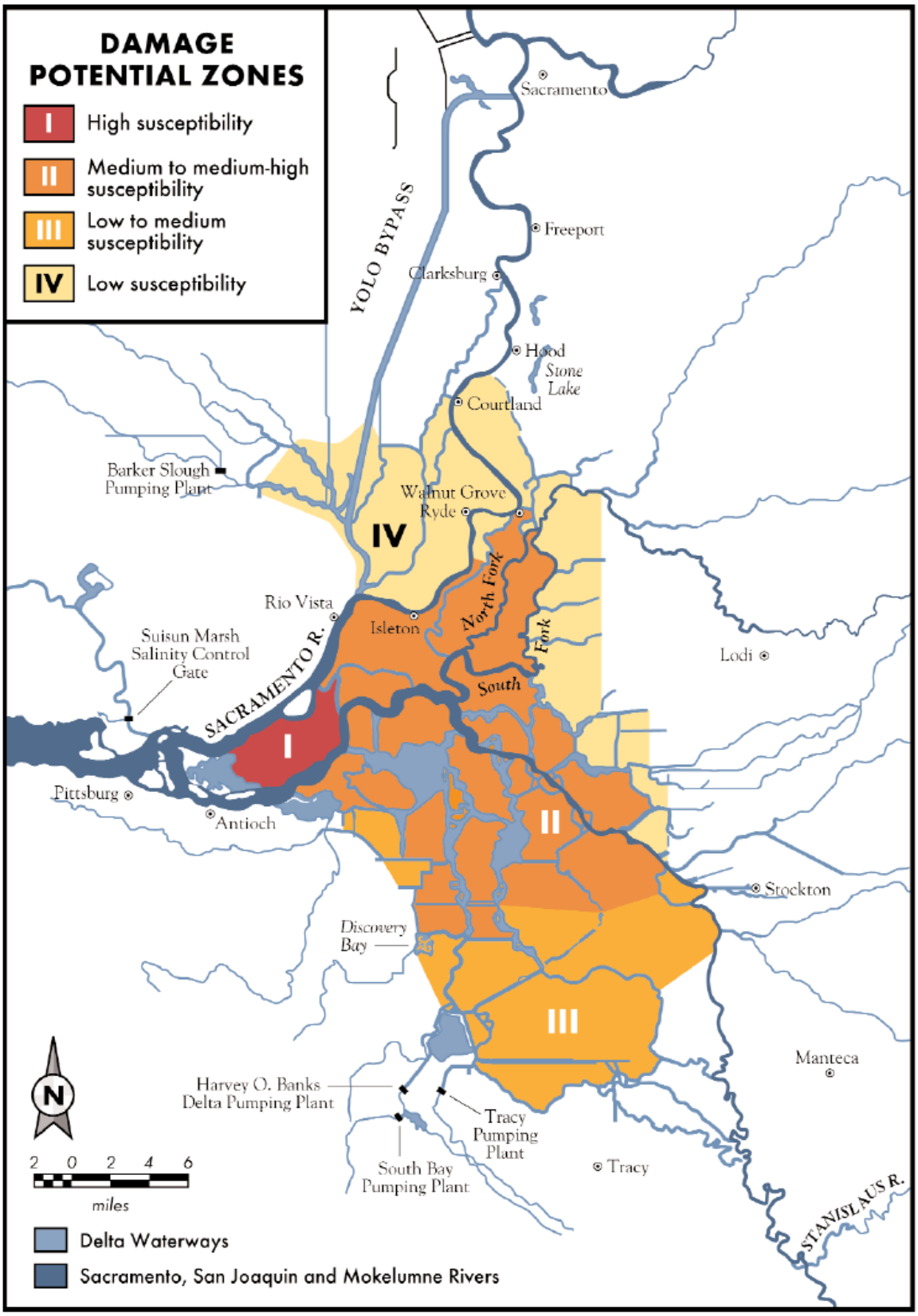
deposits in the foundation. Such islands include but are not limited to Sherman, Brannan-Andrus, Twitchel, Webb, Venice, Bouldin, and many others.

- The majority of the islands have at least one levee reach in vulnerability classes 1 to 4.
- Levees composed of liquefiable fill are likely to undergo extensive damage as a result of a moderate to large earthquake in the region.
- The median probabilities of failure for classes with no liquefiable foundation sand and no liquefiable levee fill increase with peat thickness under the levee. When peat is absent, generally the probabilities of failure are small (less than 22 percent) for the largest ground motions of 0.5g. However, the probabilities of failure at the locations of the thickest peat (more than 25 feet) range from 30 percent to 60 percent for a PGA of 0.5g.
- Levees founded on liquefiable foundations are expected to experience large deformations (in excess of 10 feet) under a moderate to large earthquake in the region.

Assets at Risk – Flooding

A preliminary analysis of the risk of levee failure due to seismicity was prepared for the CALFED Levee System Integrity Program. Based on standard methods and local expertise, it was estimated the magnitude and recurrence intervals of peak ground accelerations throughout the Delta. Two competing fault models were evaluated for this study, producing a wide range of potential accelerations. Then, based on local knowledge and limited geotechnical information, Damage Potential Zones were established for the Delta (Figure 4-66). The zones of highest risk lie in the central and west Delta where tall levees are constructed on unstable soils that are at high risk of settling or liquefaction during an earthquake.

Figure 4-66 Delta Area – Potential Damage Due to Liquefaction and Levee Collapse



This report estimated recurrence intervals for ground accelerations and the number of potential levee failures in each Damage Potential Zone. It is useful to examine their estimates of the number of failures that might occur during a 100-year event, or an event with a 1% annual chance probability of being equaled or exceeded in any given year. Based on their estimates, it is a roughly 50-50 chance that 5 to 20 levee segments will fail during a 100-year event in the Delta. This does not imply that 5 to 20 islands will flood, but just that 5 to 20 levee segments will fail. The loss of 5 to 20 levee segments in the Delta constitutes considerable and abrupt landscape change, since island flooding is likely to be widespread and persistent for a long period of time.

In sum, liquefaction has not been observed as a result of recent seismic activity (including 1989 and 2014); however, it is recognized as a potential risk. In the event it does occur, liquefaction may pose a serious threat to levees, especially as levees are built larger and higher to deal with continuing island subsidence. Levee failure, depending on the extent, could have disastrous effects on agriculture, natural gas supply, fisheries, and saltwater intrusion of the San Francisco Bay. Water supply to California could be affected for years. A greater discussion of levee failure can be found in Section 4.3.14.

A major earthquake can cause extensive damage to large sections of levees on multiple islands at the same time. As a result, many islands could be flooded simultaneously. For example, the DRMS report indicated that there is a 40 percent probability of a major earthquake causing 27 or more islands to flood at the same time in the 25-year period from 2005 to 2030. It is not specified which islands in Sacramento County would be included in this flooding.

The duration and cost of levee repairs increases with the number of islands that are flooded due to an earthquake, as shown in Table 4-65. This is not only due to the extensive number of repairs required, but also to the availability of labor and materials to make the repairs. These numbers from the DRMS report are applicable to Sacramento County.

Table 4-65 Duration and Cost of Repairs for Earthquake-Induced Levee Failures

Number of flooded islands	Estimated range of cost of repair and dewatering*	Estimated range of time to repair breaches and dewater [days]
1	$43,000,000 – $240,000,000	136 – 276
3	$204,000,000 – $490,000,000	270 – 466
10	$620,000,000 – $1,260,000,000	460 – 700
20	$1,400,000,000 – $2,300,000,000	750 – 1,020
30	$3,000,000,000 – $4,200,000,000	1,240 – 1,660

Source: DRMS Risk Report [URS/JBA 2008c], Table 13-9

*These represent 2008 values. Using the Bureau of Labor Statistics CPI Inflation calculator, these values would be 23.4% higher in 2020 when adjusted for inflation.

In addition to dewatering costs, the Delta contains improved parcels at risk to flooding. More information about the Delta and its risk may be found in the Delta annex to this Plan Update.

Future Development

The consequences of a major earthquake in the Delta Region will also increase with time. Because of increasing water demand and the state's growing population and economy, the economic consequences of an interruption in Delta water supply operations due to an earthquake will increase. Consequences to the Delta Region will also increase due to additional development. The risks for future development in the areas in the City of Sacramento are unknown.

4.3.11. Flood: 1%/0.2% Annual Chance

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

Flooding is the rising and overflowing of a body of water onto normally dry land. History clearly highlights floods as one of the primary natural hazards impacting Sacramento County. Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. The Sacramento County Planning Area is susceptible to various types of flood events as described below.

- **Riverine flooding** – Riverine flooding, defined as when a watercourse exceeds its "bank-full" capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with snowmelt and/or already saturated soils from previous rain events. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. The onset and duration of riverine floods may vary from a few hours to many days and is often characterized by high peak flows combined with a large volume of runoff. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. In the Sacramento County Planning Area, riverine flooding can occur anytime from November through April and is largely caused by heavy and continued rains, sometimes combined with snowmelt, increased outflows from upstream dams, and heavy flow from tributary streams. These intense storms can overwhelm the local waterways as well as the integrity of flood control structures. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions. The warning time associated with slow rise riverine floods assists in life and property protection
- **Flash flooding** – Flash flooding describes localized floods of great volume and short duration. This type of flood usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort usually occurs in the winter and spring. Flash floods often require immediate evacuation within the hour and thus early threat identification and warning is critical for saving lives.
- **Localized/Stormwater flooding** – Localized flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems.

According to the 2018 Flood Insurance Study for Sacramento County, general rain floods can occur in the study area anytime during the period from November through April. This type of flood results from prolonged heavy rainfall and is characterized by high peak flows of moderate duration and by a large volume of runoff. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions. The severity of flooding on all the streams studied is intensified by backwater conditions between stream systems. Floodwater elevations are increased in the lower portions of tributary streams due to the backwater effect from main streams reducing hydraulic gradients and flow-storage areas. During this time there will be a high degree of coincidental l-percent-annual-chance floodflows on all the study area waterways.

The area is also at risk to flooding resulting from levee failures and dam failures. Dam failure flooding is discussed separately in Section 4.3.7 of this document; Levee failure flooding are discussed separately in Section 4.3.14 of this document. Regardless of the type of flood, the cause is often the result of severe weather and excessive rainfall, either in the flood area or upstream reach.

Streambank Erosion

In addition to the damages to people and property from the above flooding issues, Sacramento County's waterways often experience streambank erosion. Streambank erosion is a natural process, but acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects. Streambank erosion processes, although complex, are driven by two major components: streambank characteristics (erodibility) and hydraulic/gravitational forces. Many land use activities can affect both of these components and lead to accelerated bank erosion. The vegetation rooting characteristics can protect banks from fluvial entrainment and collapse, and also provide internal bank strength. When riparian vegetation is changed from woody species to annual grasses and/or forbs, the internal strength is weakened, causing acceleration of mass wasting processes. Streambank aggradation or degradation is often a response to stream channel instability. Since bank erosion is often a symptom of a larger, more complex problem, the long-term solutions often involve much more than just bank stabilization. Numerous studies have demonstrated that streambank erosion contributes a large portion of the annual sediment yield.

Determining the cause of accelerated streambank erosion is the first step in solving the problem. When a stream is straightened or widened, streambank erosion increases. Accelerated streambank erosion is part of the process as the stream seeks to re-establish a stable size and pattern. Damaging or removing streamside vegetation to the point where it no longer provides for bank stability can cause a dramatic increase in bank erosion. A degrading streambed results in higher and often unstable, eroding banks. When land use changes occur in a watershed, such as clearing land for agriculture or development, runoff increases. With this increase in runoff the stream channel will adjust to accommodate the additional flow, increasing streambank erosion. Addressing the problem of streambank erosion requires an understanding of both stream dynamics and the management of streamside vegetation.

Approximately 150 years ago, the levees of the Sacramento-San Joaquin Delta were raised to prevent flooding on what remains some of the most fertile farmland in the nation. While the peat soils were excellent for agriculture, they do not create strong foundations for levee barriers meant to contain a constant flow of river water. Nevertheless, it was these native soils that were primarily used to create the levee system.

As farmers settled the valleys, the Gold Rush drew prospectors to the hills. As mining in the Sierra Nevada turned to the more "efficient" methods of hydraulic mining, the use of environmentally destructive high-pressure water jets washed entire mountainsides into local streams and rivers. Hydraulic gold mining in the northern Sierra Nevada foothills produced 1.1 billion cubic meters of sediment. As a result, the enormous amounts of silt deposited in the riverbeds of the Central Valley increased flood risk. As a remedy to these rising riverbeds, levees were built very close to the river channels to keep water velocity high and thereby scour away the sediment.

However, the design of these narrow channels has been too successful. While the Gold Rush silt is long gone, the erosive force of the constrained river continues to eat away at the levee system. In addition, the peat soils of the Delta have subsided, gradually lowering the elevations of Delta islands. As a result, some of these parcels are now more than 20 feet below sea level.

Erosion and deposition are occurring continually at varying rates over the Planning Area. Swiftly moving floodwaters cause rapid local erosion as the water carries away earth materials. Severe erosion removes the earth from beneath bridges, roads and foundations of structures adjacent to streams. By undercutting it can lead to increased rockfall and landslide hazard. The deposition of material can block culverts, aggravate flooding, destroy crops and lawns by burying them, and reduce the capacity of water reservoirs as the deposited materials displace water.

Streambank erosion increases the sediment that a stream must carry, results in the loss of fertile bottomland and causes a decline in the quality of habitat on land and in the stream.

Location and Extent

Major Sources of Flooding

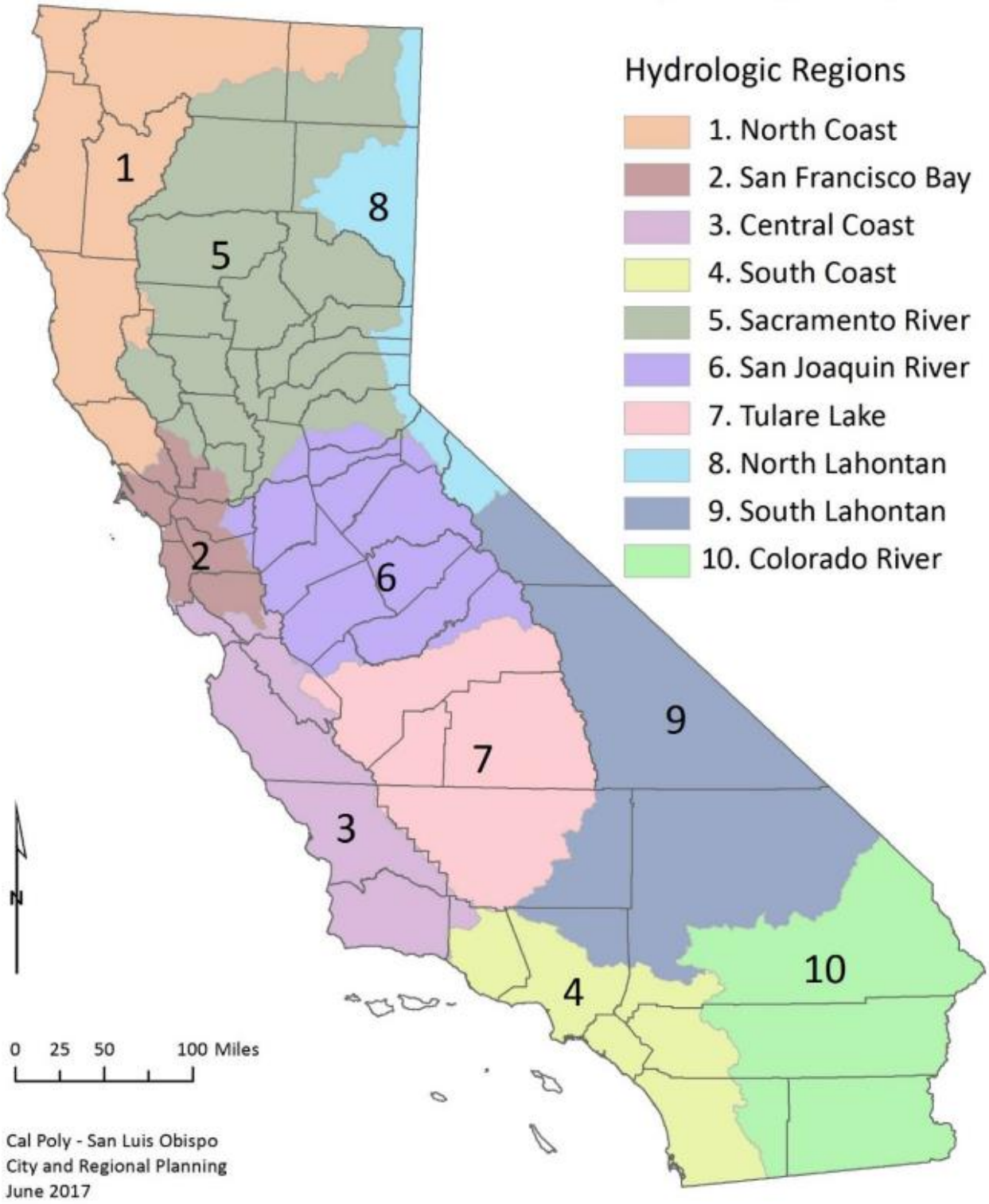
California has 10 hydrologic regions. Sacramento County sits in the Sacramento and San Joaquin hydrologic region.

- The Sacramento River hydrologic region covers approximately 17.4 million acres (27,200 square miles). The region includes all or large portions of Modoc, Siskiyou, Lassen, Shasta, Tehama, Glenn, Plumas, Butte, Colusa, Sutter, Yuba, Sierra, Nevada, Placer, Sacramento, El Dorado, Yolo, Solano, Lake, and Napa counties. Small areas of Alpine and Amador counties are also within the region. Geographically, the region extends south from the Modoc Plateau and Cascade Range at the Oregon border to the Sacramento-San Joaquin Delta. The Sacramento Valley, which forms the core of the region, is bounded to the east by the crest of the Sierra Nevada and southern Cascades and to the west by the crest of the Coast Range and Klamath Mountains. The Sacramento metropolitan area and surrounding communities form the major population center of the region. With the exception of Redding, cities and towns to the north, while steadily increasing in size, are more rural than urban in nature, being based in major agricultural areas.
- The San Joaquin River hydrologic region covers approximately 9.7 million acres (15,200 square miles) and includes all of Calaveras, Tuolumne, Mariposa, Madera, San Joaquin, and Stanislaus counties, most of Merced and Amador counties, and parts of Alpine, Fresno, Alameda, Contra Costa, Sacramento, El Dorado, and San Benito counties. Significant geographic features include the northern half of the San

Joaquin Valley, the southern part of the Sacramento-San Joaquin Delta, the Sierra Nevada and Diablo Range. The region is home to about 1.6 million people.

A map of the California's hydrological regions is provided in Figure 4-67.

Figure 4-67 California Hydrologic Regions



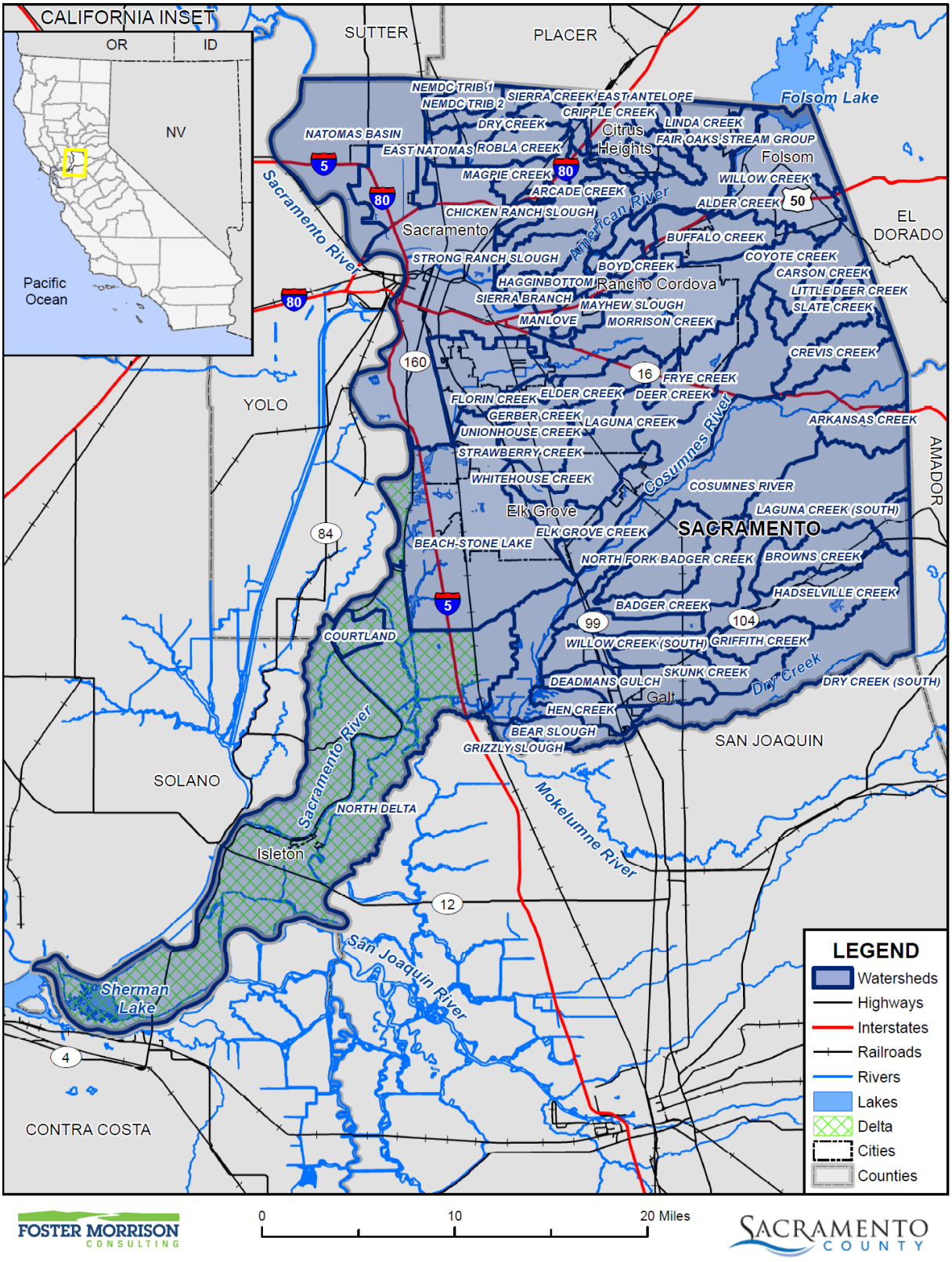
Source: 2018 State of California Hazard Mitigation Plan

The Sacramento County Waterway System

In the Sierra Nevada Mountains, small creeks and high streams are fed by underground springs, storm run-off, and melting snow. Descending from the upper watershed, these creeks and streams form large rivers such as the Sacramento, American, Feather, Yuba, San Joaquin, Mokelumne, and Consumnes. These waterways are characterized by small riverbeds conveying normal flow from the mountains and wide overbank floodplains carrying flood flows cause by heavy mountain rainfall. The Sacramento River Watershed, which includes the American River, encompasses some 27,000 square miles and drains most of Northern California.

The watersheds of Sacramento County include numerous watersheds contained within the County as well as several watersheds that drain into Sacramento County from Placer, El Dorado, or Amador Counties. Figure 4-68 illustrates the watersheds of Sacramento County. Table 4-66 details the watersheds in Sacramento County.

Figure 4-68 Sacramento County Watersheds



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 4-66 Watersheds in Sacramento County

Watershed Name	Area (acres)	Watershed Name	Area (acres)
Alder Creek	7,226	Hadselville Creek	11,759
Antelope Creek	973	Hagginbottom	2,571
Arcade Creek	6,508	Hagginwood Creek	885
Arcade Creek South Branch	1,657	Hen Creek	4,759
Arkansas Creek	4,768	Laguna Creek	21,176
Badger Creek	11,109	Laguna Creek (South)	32,471
Beach-Stone Lake	40,118	Linda Creek	3,580
Bear Slough	2,699	Little Deer Creek	1,040
Boyd Creek	2,201	Magpie Creek	3,789
Brooktree Creek	1,180	Manlove	1,987
Browns Creek	8,077	Mariposa Creek	812
Buffalo Creek	9,167	Mayhew Slough	2,954
Carmichael Creek	2,726	Minnesota Creek	1,095
Carson Creek	6,811	Morrison Creek	34,502
Chicken Ranch Slough	3,722	Natomas Basin	26,449
Cordova/Coloma Stream Group	1,728	Negro Slough	285
Cosumnes River	45,130	NEMDC Trib 1	865
Courtland	3,099	NEMDC Trib 2	2,744
Coyle Creek	987	NEMDC Trib 3	1,567
Coyote Creek	4,625	North Delta	100,143
Crevis Creek	5,940	North Fork Badger Creek	10,423
Cripple Creek	4,327	Robla Creek	5,141
Date Creek	694	Rolling Draw Creek	1,128
Deadmans Gulch	8,641	San Juan Creek	1,334
Deer Creek	26,125	Sierra Branch	978
Diablo Creek	893	Sierra Creek	1,743
Dry Creek	4,138	Skunk Creek	6,744
Dry Creek (South)	20,158	Slate Creek	510
East Antelope	1,118	Strawberry Creek	5,588
East Natomas	1,816	Strong Ranch Slough	4,573
Elder Creek	7,632	Sunrise Creek	636
Elk Grove Creek	4,019	Unionhouse Creek	2,194
Fair Oaks Stream Group	7,819	Unnamed	51,157
Florin Creek	2,857	Verde Cruz Creek	1,226
Frye Creek	1,286	Whitehouse Creek	1,585

Watershed Name	Area (acres)	Watershed Name	Area (acres)
Gerber Creek	2,579	Willow Creek	15,207
Griffith Creek	4,806	Willow Creek (Middle)	359
Grizzly Slough	1,374	Willow Creek (South)	3,843

Source: Sacramento County GIS

Sacramento County encompasses multiple rivers, streams, creeks, and associated watersheds. Figure 4-69 illustrates the major waterways of Sacramento County. The following streams in Table 4-67, listed by stream groups, are found in Sacramento County.

Figure 4-69 Sacramento County Major Waterways

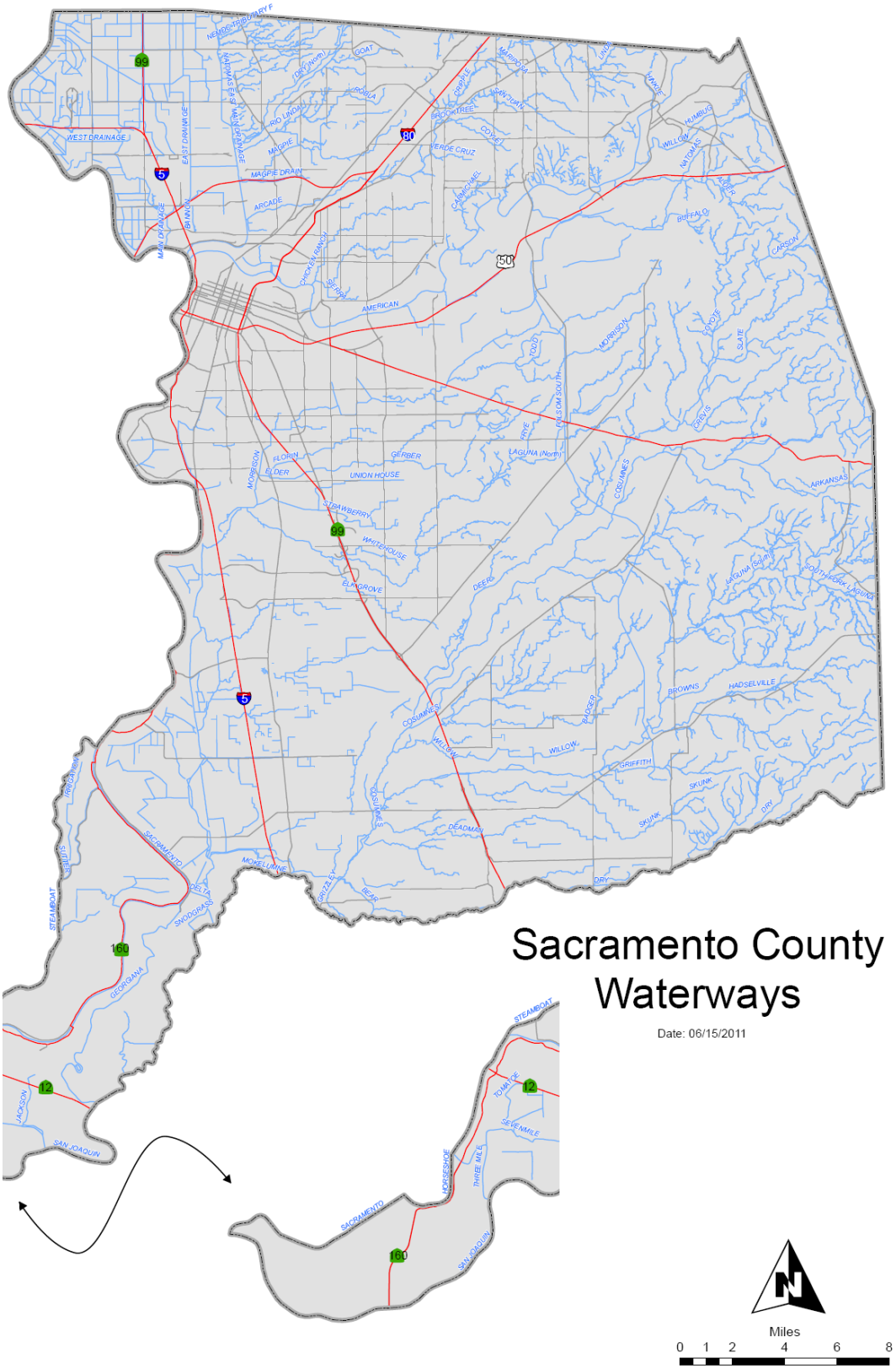


Table 4-67 Waterways and Streams in Sacramento County

Stream Group and Stream	
American River Stream Group	
American River	Magpie Creek
Arcade Creek	Mariposa Creek
Arcade Creek (South Branch)	Natomas East Main Drainage Canal
Brooktree Creek	Natomas East Main Drainage Canal Tributary 1
Carmichael Creek	Natomas East Main Drainage Canal Tributary 2
Chicken Ranch Slough	Natomas East Main Drainage Canal Tributary 3
Cripple Creek	Robla Creek
Coyle Creek	San Juan Creek
Dry Creek	Sierra Creek
Dry Creek (North Branch)	Strong Ranch Slough
Linda Creek	Verde Cruz Creek
Morrison Creek Stream Group	
Elder Creek	Morrison Creek
Elk Grove Creek	North Fork Laguna Creek
Florin Creek	Strawberry Creek
Gerber Creek	Unionhouse Creek
Laguna Creek	Whitehouse Creek
Laguna Creek Tributary 1	
Sacramento River and Delta Slough Group	
Georgiana Slough	Steamboat Slough
Sacramento River	Sutter Slough
Sevenmile Slough	Three Mile Slough
San Joaquin River Stream Group	
Delta Cross Canal	San Joaquin River
Mokelumne River	Snodgrass Slough
North Mokelumne River	
Natomas Area Stream Group	
Natomas East Drainage Canal	Deer Creek
Natomas Main Drainage Canal	Dry Creek
Natomas North Drainage Canal	Hadselville Creek
Natomas West Drainage Canal	Hen Creek
Arkansas Creek	Laguna Creek
Badger Creek	North Fork Badger Creek
Browns Creek	North Stone Lake Tributary

Stream Group and Stream	
Carson Creek	Skunk Creek
Cosumnes River	South Stone Lake-North Tributary
Cosumnes River Overflow	South Stone Lake-South Tributary
Crevis Creek	Willow Creek
Deadman Gulch	

Source: Sacramento County Flood Insurance Study, 2008

In Sacramento County, there are three main rivers, the Sacramento, American and Cosumnes Rivers. The Sacramento and American Rivers and several tributaries to the east, north, and west all flow toward the City of Sacramento. The watersheds of these two main rivers drain most of northern California and part of southern Oregon for a total of some 26,000 square miles. The third, the Cosumnes River, flows southwesterly through the southern portion of the County and into the Delta.

The Sacramento River extends north to Mount Shasta and the Shasta Reservoir. Many other rivers are tributary to the Sacramento, including (immediately north of Sacramento) the Bear and Feather Rivers. The American River extends to the Sierra Nevada foothills in three branches (South, North and Middle). Folsom Reservoir is at the eastern boundary of Sacramento County and serves to control the American River.

The Cosumnes River is a wild and natural river originating in the Sierra Nevada foothills, flowing into southern Sacramento County. This area is mostly rural farmland. Levees were constructed by agricultural interests, and they are inadequate for containing record storm flows such as those experienced in February 1986 and again in January 1997. These two storms left the levee system sorely damaged. Each time, the levee breaks were repaired, but the overall system sits in wait of another flood event.

Another river, the Mokelumne River is the southernmost river in the County and is controlled by a dam in the neighboring county and a series of levees.

All of the watersheds converge at the Sacramento River Delta, the flood issues in the Delta are of concern as the agricultural interests continue to farm the land which is subsiding annually, making the levee systems more vulnerable to breaching.

When the Sacramento River reaches its peak capacity, the American River and other tributaries that flow into the Sacramento River, cannot flow at a normal rate. These conditions result in “backflows’ which cause tributaries to overflow and flood local areas. The Sacramento River is also affected by ocean tides that periodically raise and lower the water level. High tides that occur simultaneously with flooding conditions could increase the rate of flooding.

All surface water originating in or passing through Sacramento County discharges to the ocean via the Sacramento and San Joaquin Rivers, which join at the head of Suisun Bay, the easternmost arm of San Francisco Bay. With a combined tributary drainage area of approximately 60,000 square miles, these rivers provide most of the freshwater inflow to San Francisco Bay.

High water levels along the Sacramento and American Rivers are a common occurrence in the winter and early spring months due to increased flow from storm runoff and snowmelt. An extensive system of dams,

levees, overflow weirs, drainage pumping plants, and flood control bypass channels strategically located on the Sacramento and American Rivers has been established to protect the area from flooding. These facilities control floodwaters by regulating the amount of water passing through a particular reach of the river. The amount of water flowing through the levee system can be controlled by Folsom Dam on the American River and the reserve overflow area of the Yolo Bypass on the Sacramento River. However, flood problems in Sacramento County are still quite a concern, especially since the flood of 1986. Numerous areas of the county are still subject to flooding by the overtopping of rivers and creeks, levee failures, and the failure of urban drainage systems that cannot accommodate large volumes of water during severe rainstorms. However, with the implementation of multiple improvements to the area's flood control structures, including those designed to provide a 200+ level of flood protection, flood risk is being reduced including the potential for devastating floods in the Planning Area.

High flows on the Cosumnes River are less frequent, as the river is essentially dam free and has little in the way of flow regulation. Flooding along the river, such as in 1997, has been due to high water coupled with the failure of non-standard, poorly constructed private levees.

The Sacramento County Flood Control System and Associated Flood Issues

Sacramento County is protected from the American River and Sacramento River by a comprehensive system of dams, levees, overflow weirs, and flood bypasses. Local creeks are often controlled by detention basins that attenuate peak flow by allowing flood water to spill over a weir, detained, and released when the creek subsides. Sacramento County maintains a system of ALERT Flood Warning gages throughout the County that provide real time monitoring information on current flood conditions (www.stormready.org).

In the aftermath of the 1986 and 1997 floods, multiple flood control projects were identified to address flood risks in the Sacramento area. Many of these projects were designed to correct structural deficiencies, others to address levee conditions, while additional projects were intended to increase the level of flood protection provided by the system. The Sacramento River improvements would focus predominantly on rehabilitating the existing system, while the American River required a significant increase in the system's flood control capacity.

Established in 1989, Sacramento Area Flood Control Agency (SAFCA) is a regional joint-exercise-of-powers agency consisting of Sacramento and Sutter counties, the City of Sacramento, Reclamation District 1000, and the American River Flood Control District. SAFCA's long-term goal is to provide the urbanized portions of Sacramento with a minimum 200-year level of flood protection in order to reduce the risk of catastrophic damages and loss of life associated with a failure of the flood control system in the Sacramento area. SAFCA initiated a number of studies to determine the best implementable approach to address the area's flood problems. These flood control projects are in various stages of implementation; some have been completed, others are under construction, and a number are still being planned.

American River Flood Control System

The American River flood control system consists of the Folsom Dam, an auxiliary dam at Mormon Island, eight earth-filled dikes, Nimbus Dam, and levees on either side of the downstream river. The system

receives runoff from the American River watershed, which is about 2,100 square miles of the western slope in the Sierra Nevada.

An initial reconnaissance report, "American River Investigation, January 1988" concluded that Folsom Dam and the American River levees were only capable of handling a 70-year flood event. Recommendations were to increase the carrying capacity of the American River below Nimbus Dam, modifying the Folsom Dam outlets, increasing storage capacity at Folsom Lake, and for greatest protection (200-year level), construct a new upstream storage facility. Immediately after the Folsom Dam was completed in 1956, a huge flood filled the reservoir, saving Sacramento. The dam protected the County from at least four potentially catastrophic floods in 1986, 1995, 1997, and 2005. The dam continues to protect the County an estimated 4 years out of every 10, and it stores water and generates electricity, protects fisheries and provides for recreation.

American River Common Features and Folsom Dam

SAFCA and the Central Valley Flood Protection Board (CVFPB), working with US Army Corp of Engineers (USACE), identified an American River project to address the low level of flood protection provided by the existing system. Unable to gain support for construction of an expandable flood control dam near Auburn, SAFCA identified a series of American River Common Features and Folsom Dam improvement projects. The Common Features projects focused on the identification of features that were "common" to any project associated with controlling flood flows at Folsom Dam. These projects focused on the conveyance of higher flood flows through the leveed portion of the American River. Currently, with the new spillway, the 0.5 percent annual recurrence (200-year) flood discharge from Folsom Dam is calculated to be 160,000 cubic feet per second (cfs). The Folsom Dam Raise Project will increase the height of the wing dams and dikes at Folsom Lake an additional 3.5 feet to match the height of the main dam. When this project is completed, the 200-year release will be substantially less, approximately equal to the current 100-year flow rate or about 115,000 cfs. The lower American River levees are being improved to a standard that is calculated to safely convey flood flows up to 160,000 cfs. Thus, upon completion of the Folsom Dam Raise Project there will be an added factor of safety to the system. The Folsom Dam improvements are scheduled for completion in 2025 and are an important component of an adequate progress finding.

American River-Related Projects

Additional projects have significantly improved the capacity and flows of the American River levee system. These include:

- Mayhew levee Improvements – This entailed raising and widening the levee and constructing a slurry wall, providing for 160,000 cfs to pass and providing greater than 100-year level of protection. The Mayhew Drain Closure Structure project completed in 2009 prevents water from the American River from backing up the drain and putting additional strain on drain levees.
- Upper Levee Slope Protection – Levee slope protection measures were implemented in the area between Cal Expo to Rio Americano High School, the narrowest portion of the American River Parkway to prevent high scour velocities on the upper face of the levee during flood events.
- Slurry Wall Construction – Approximately 23 miles of slurry walls were constructed to prevent underseepage from affecting the levee foundation due to sand layers under the levee.

- Bank Protection – Portions of the American River are subject to extremely high velocities during a major flood event, eroding banks and levee toes, leading to levee failure. Several projects have been completed preserving levee integrity and providing additional protection during floods.
- Regional Sanitation Perimeter Levee – In order to protect the regional sanitation plan from flooding, a perimeter levee was required.
- American River North Levee upstream of Natomas East Main Drainage Canal and American River South Levee upstream of H Street – SAFCA has been instrumental in orchestrating levee improvement projects on the American River downstream of Folsom Dam. Adequate progress is being made. FEMA Is already reviewing the levee certification reports for reaches of the levee improvements. This levee accreditation program is slated for completion in 2023. Full certification to the ULOP standard will require completion of the Folsom Dam raise in 2025.
- American River South (downstream of H-Street) and Sacramento River East Levee (downstream of the American River confluence) to Freeport – This flood control system greatly affects the City of Sacramento, yet there are some areas in unincorporated Sacramento County protected by this levee reach. The work that is needed to bring this levee system up to ULOP standard includes construction to address seepage, stability, erosion, and freeboard issues. This levee accreditation program is slated for completion in 2023. Full certification to the ULOP standard will require completion of the Folsom Dam Raise Project in 2025.

The Sacramento River Flood Control System

The Sacramento River flood control system consists of the several dams including Shasta and Oroville (on the Feather River), the Fremont Weir, Sacramento Weir, Yolo Bypass, and levees along the Sacramento River, and the Sacramento Bypass Channels. The Corps report "Sacramento River System Evaluation, June 1988" revealed that levees on both the Sacramento and American Rivers have inadequate freeboard and/or stability problems.

Sacramento River Projects

Several projects have been identified to rehabilitate the existing flood control system and work towards providing a minimum of 200-year level of flood protection in the urbanized portions of the Sacramento County Planning Area. Key projects include:

- Sacramento Urban Area Levee Reconstruction Project (SUALRP) – This project addressed through-levee seepage problems (i.e., landside sloughing of the levee in Natomas and seepage boils along the landside toe in the Pocket) within the Sacramento River Flood Control System (SRFCS) due to porous levee materials and poor compaction. This project improved flood protection but did not increase the design level of flood protection.
- The Sacramento Riverwall - A project feature of the SRFCS, is a concrete floodwall adjacent to old Sacramento. Due to erosion issues on the waterside toe and design deficiencies found with original construction, reconstruction of the Riverwall was addressed and improves flood protection to Old Sacramento, downtown, and portions of Interstate 5.
- Levee Slump on Garden Highway south of I-6 – To correct settling in an area of the levee near an agricultural well, a Slurry cutoff wall was constructed to prevent levee seepage and to raise the levee back to its original height. This seepage fix was designed to provide 200-year level of protection.
- Little Pocket and Sump 132 Underseepage Remediation – This project entailed construction of an approximately 2,400 feet of a levee underseepage cutoff wall in the Little Pocket area and 400-feet of

levee underseepage cutoff wall construction at Sump 132 in the Pocket area. To address know underseepage problems. The project was designed to protect against the 200-year storm event.

- Pocket Underseepage – Reach 2 and Reach 9 – This project entailed construction of an approximately 2,500 feet of cutoff wall to address underseepage issues. Completion of this project along with erosion repairs provided a minimum of 100-year level of flood protection.
- Sacramento River Bank Protection Program (Sac bank) – this is an ongoing effort to address systematic erosion issues along the Sacramento River and its tributaries, including the American River. Erosion, primarily caused by high water events, which lead to scour and high bank erosion and summer boat traffic, which creates wave induced erosion at the levee toe.
- Pioneer Reservoir – Pioneer Reservoir is located along the Sacramento River just upstream of the California Auto Museum. This project constructed a seepage berm and six relief wells to address high seepage pressures in the area.

South Sacramento Streams Group (SSSG)

USACE, in cooperation with SAFCA and the City and County of Sacramento completed a study of alternatives, including both upstream detention and modifications to the downstream levee system. Results of the study supported work to be done to the existing Morrison Creek levees as well as to the Unionhouse, Florin, and Elder Creek levees. The County is also collecting development impact fees from upstream developers, which will be used to build detention basins to hold the additional run-off generated as new development occurs.

The Morrison Creek System

In 1987, the USACE in a study concluded that the levees and channels lacked adequate capacity to handle the 100-year storm. In 2005, USACE completed construction of nearly four miles of levee from Freeport Boulevard/Sacramento River Levee on the west to the Union Pacific Railroad to the east, raising the existing levee system to protect against a 200-year storm. USACE also constructed floodwalls along the four creeks (Elder, Unionhouse Florin, and Morrison) up to Franklin Boulevard.

Unionhouse Creek Channel Improvements

Channel improvements completed in 2012 increased the amount of water that can be contained in the channel, resulting in 100-year flood protection.

Florin Creek Improvements

Channel improvements in this area, combined with plans to construct a detention basin along Florin Creek will provide FEMA level of flood protection along much of Florin Creek.

The Natomas Area

After the 1986 flood demonstrated the inadequacy of the levee system in this area, efforts ensued to implement a series of levee improvements and other flood control improvements designed to address through-levee seepage and work in tandem with increased storage on the American River to provide affected areas with increased flood protection. This project provided a minimum 100-year level of flood

protection to the Natomas Basin and to the lower Dry and Arcade Creek watersheds, including portions of Rio Linda and North Sacramento.

A huge development effort followed including residential in the incorporated City and commercial/industrial in the unincorporated County of Sacramento. The Natomas area includes about 70,000 residents, both Interstates 5 and 80, Sacramento Airport, and significant commercial and industrial development. Natomas is protected from flooding by levees on all sides. Some believe Natomas to be threatened by high probability flood events, but the fact remains that the area has never suffered a levee breach.

December 2008, FEMA remapped the Natomas Area as not having protection from the 1% annual recurrence flood event, and SAFCA kicked off a massive effort to improve the levees. SAFCA's efforts have been to restore at a minimum a 100-year level of protection, while working toward 200-year level of protection. This is still in progress.

The Natomas Basin's effective FEMA flood zone, Zone A99, is a special flood hazard designation identifying an area protected by decertified levees where a plan with associated funding is in place to achieve the required level of protection. The Natomas Basin qualified for this designation effective June 16, 2015. Zone A99 designation provides a local agency the opportunity to allow building permits subject to its determination that an area is reasonably safe and to allow development that would not otherwise be allowed in an area with flood protection that does not meet FEMA requirements.

Flood Zone A99 is an area of undefined flood risk, thus, pursuant to the Code of Federal Regulations, 44CFR60.3(a)(3), the local agency must determine if the area is reasonably safe from flooding. This assures FEMA that the land use agency is taking an active interest in public safety when allowing development in this flood zone designation even while levees are being improved to the required standards.

The Board of Supervisors Report from May 19, 2015, Item 76 (Resolution 2015-0392), described the ULOP, the FEMA flood zone A99, and the importance of finding an area to be reasonably safe from flooding before permitting new construction on existing entitled land. The Board allowed for a limited, measured approach to the issuance of building permits and development approvals in the Natomas Basin allowing issuance of Floodplain Management Permits (required for building permit approvals) for only:

- Substantial repairs or improvements for existing structures,
- Construction on previously entitled lots, and
- Entitlement and land division consistent with the Zoning Code.

Further, all building permits in the Natomas Basin, except on County owned land, are conditioned upon recordation by the property owner of an instrument that includes notice and acknowledgment of the flood hazard, insurance requirements, and levee project uncertainties.

The Sacramento County Zoning Code SZC-2016-0023, known as the Floodplain Management Ordinance (search at www.Saccounty.net) dated January 13, 2017, provides some direction on new development in the Natomas Basin. Section 902-57.1 defines where ULOP standards apply for a development project and/or new construction. Section 906-06(0) indicates how the County must find that development projects subject to ULOP 200-year flood protection requirement.

The Natomas Levee Improvement Project work on the north side and the west side of the Natomas Basin is completed to the 200-year flood control standard. This accounts for about 43 percent of the Natomas perimeter levee system. The SAFCA report describes the substantial amount of work required to complete the Natomas levee improvements. The schedule for the remainder of the Natomas levee work is being implemented by the U.S. Army Corps of Engineers and expected to be completed in 2025.

The 200-year flood protection plan for the Natomas Basin will make it one of the most flood-safe areas in the 1,600 mile Central Valley flood control system. The RD 1000 Natomas perimeter levees have never failed, are better than ever, and the current plan describes accomplishing ULOP by 2025; however, there is much remaining work. The ULOP criteria, and Zoning Code Section 5.11, would not allow building permits for new construction in the Natomas Basin if at any time the County is unable to make an adequate progress finding toward achieving the required level of flood protection by 2025.

SAFCA's 2019 Report describes that adequate progress is being made on improvements to protect the Natomas Basin to a 200-year level of protection by 2025 pursuant to the Central Valley Flood Protection Act Urban Level of Flood Protection Criteria (ULOP). However, the work that remains in order to meet 200-year protection in Natomas is substantial. As there are numerous variables and uncertainty with a construction project of this magnitude a current determination of adequate progress does not imply 100% certainty that the project will continue to stay on track with the 2025 deadline. Therefore staff's recommendation is that the County continue to allow limited development in the Natomas Basin, consistent with the Board's limited and measured approach adopted on May 19, 2015, until such time as 200-year flood protection is certain.

The Delta Region

In the Delta, for the last five thousand years to the 1850s, relative sea-level rise was balanced by vertical marsh growth through biomass accumulation and sediment deposition. A transition from deposition of organic silt-clay to peat formation in the Delta largely reflects the decline in inundation frequency and the maturation of the marsh plain towards mean higher high water elevations. The resulting freshwater tidal marshes developed because a relatively large freshwater inflow compared to the size of the tidal prism sustained a low salinity, which supported highly productive organic peat formation through plant growth. As plants such as tules began to grow in the silt deposits, organic sediments such as peat from decomposed roots and rhizomes and other organic soils began to accumulate above these deposits due to plant material decaying and accumulating under anaerobic conditions as the sea level rose. Once the plants were firmly established, their growth and decay lead to accumulations of peat that kept pace with the rising sea levels and basin subsidence. Organic deposit thickness ranges from less than three feet in the eastern, northern, and southern margins of the Delta, to over thirty feet in the western delta. These thicker deposits of peat accumulated in the areas that had the lowest elevation during the final low sea levels. These low basin areas were the first areas receiving deposits and growing plants, allowing the peat buildup to match that of the shallower surrounding areas.

The peat accumulations eventually formed peat islands, with river channels and sloughs established around them and within some of the larger islands. During floods, rivers would overtop the banks of the peat islands, and as the water receded, would leave deposits of sand and silt that formed natural levees along the edges of the islands. Many of the levees currently in the Delta are founded on these natural levees.

For over a century, subsidence of the organic soils in portions of the Delta has led to an increasing need for subsurface drainage. Aerobic oxidation of organic carbon, the primary cause of subsidence, began in the late 1800s as the nutrient-rich organic soils were cleared and farming began. Peat fires, lit to level agricultural fields prior to 1950, and wind erosion are also significant causes of subsidence throughout the Delta. Since reclamation of the island began, elevations have fallen to as much as twenty feet below sea level, requiring protection by over 1,125 miles of man-made levees throughout the Delta. Drainage is provided by a network of ditches that collect and transport shallow groundwater, irrigation runoff, and levee seepage to pump stations that discharge back into the Delta waterways. These ditches create an unsaturated root zone for crops, and provide a more stable levee foundation.

Historically, flooding in the Delta has resulted from levee failures caused by the separate or coincidental occurrence of very high tides, and high runoff and river outflow through the Delta region. Strong onshore winds associated with low barometric pressure storms aggravate flood potential by causing an additional rise of the water surface elevations, and can cause severe erosion on levees in a short period of time. Flood events resulting from high tides and/or high river outflow must be expected to occur in the future.

Levee failures from collapse of rodent dens, seepage, falling trees, or some other mechanical failure are unpredictable and relatively uncommon. Routine levee inspections are the primary preventative measure to identify potential threats that could result in these types of levee failure events.

It should be noted that since 1986, significant improvements have been made to the levee system within the Legal Delta, which has resulted in an overall reduction in the number of flooded islands since the 1986 Delta high water events. Flood events prior to the inception of the Delta Levees Programs in 1973 are not a reliable indicator of current levee condition or flood threat.

Ongoing and Planned Improvements to the Existing Flood Control Systems

Individual reclamation districts, in charge of levee maintenance, are pursuing individual projects that are funded by local and/or State assistance. These are further described in their respective chapters in the Delta Annex.

There are currently six federally authorized projects by the US Army Corps of Engineers (USACE) that are being implemented to reduce flood risk to the Sacramento area:

- Natomas Levee Improvement Project
- American River Common Features - WRDA 96/99 and WRDA 2016
- Folsom Dam Modifications/Join Federal Project
- Folsom Dam Raise project
- South Sacramento Streams Group Project
- Sacramento River Bank Protection Program

Other ongoing projects include:

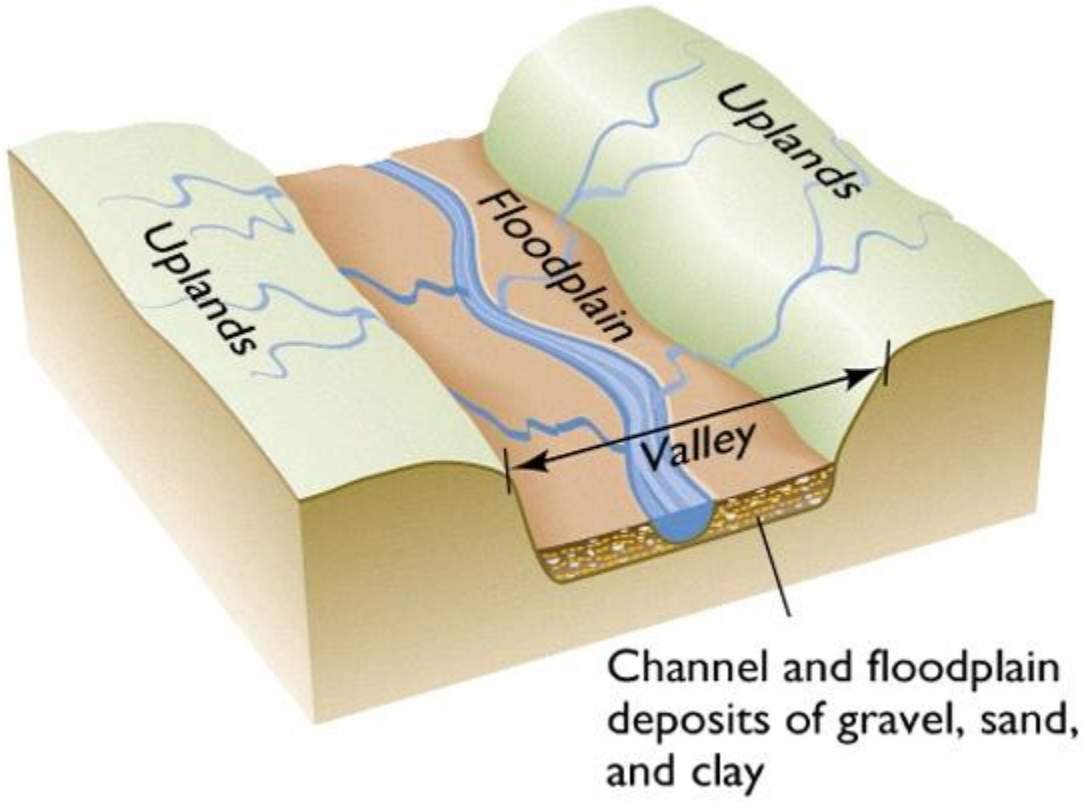
- SAFCA levee accreditation for FEMA level of protection
- Regional planning as part of the Central Valley Flood Protection Plan

- USACE-CVFPB-SAFCA General Reevaluation Report (GRR) planning for 200-year flood protection for Sacramento area
- SAFCA and local community plan development for 200-year flood protection to meet state requirements for urban Level of Protection and Urban Levee Design Criteria.

Floodplains

The area adjacent to a channel is the floodplain (see Figure 4-70). Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage, the floodplain most often refers to that area that is inundated by the 1% annual chance (or 100-year) flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 1% annual chance flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program. The 200-year flood is the flood that has a 0.5% chance of being equaled or exceeded in any given year. The 500-year flood is the flood that has a 0.2% chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

Figure 4-70 Floodplain Schematic



Source: FEMA

Sacramento County Flood Mapping

As part of the County's ongoing efforts to identify and manage their flood prone areas, Sacramento County relies on a variety of different mapping efforts. What follows is a brief description of FEMA and DWR mapping efforts covering the Sacramento County Planning Area.

FEMA Floodplain Mapping

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The NFIP makes flood insurance available to property owners in participating communities adopting FEMA-approved local floodplain studies, maps, and regulations. Floodplain studies that may be approved by FEMA include federally funded studies; studies developed by state, city, and regional public agencies; and technical studies generated by private interests as part of property annexation and land development efforts. Such studies may include entire stream reaches or limited stream sections depending on the nature and scope of a study. The FEMA floodplain are lands subject to the 1% annual chance (100-year) flood. FEMA mapping also includes areas subject to the .02% annual chance (500-year) flood. The State Senate Bill 5 (SB5) required all communities to map their communities. SB5 requires levee protection in urban areas to a 200-year (or 0.5% annual chance flood. A general overview of floodplain mapping is provided in the following paragraphs.

Flood Insurance Study (FIS)

The FIS develops flood-risk data for various areas of the community that will be used to establish flood insurance rates and to assist the community in its efforts to promote sound floodplain management. The current Sacramento County FIS is dated July 19, 2018. This study covers both the unincorporated and incorporated areas of the County.

Flood Insurance Rate Map (FIRM)

The FIRM is designed for flood insurance and floodplain management applications. For flood insurance, the FIRM designates flood insurance rate zones to assign premium rates for flood insurance policies. For floodplain management, the FIRM delineates 1% and 0.2% annual chancer floodplains, floodways, and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulation. The County FIRMs have been replaced by digital flood insurance rate maps (DFIRMs) as part of FEMA's Map Modernization program, which is discussed further below.

Letter of Map Revision (LOMR) and Map Amendment (LOMA)

LOMRs and LOMAs represent separate floodplain studies dealing with individual properties or limited stream segments that update the FIS and FIRM data between periodic FEMA publications of the FIS and FIRM.

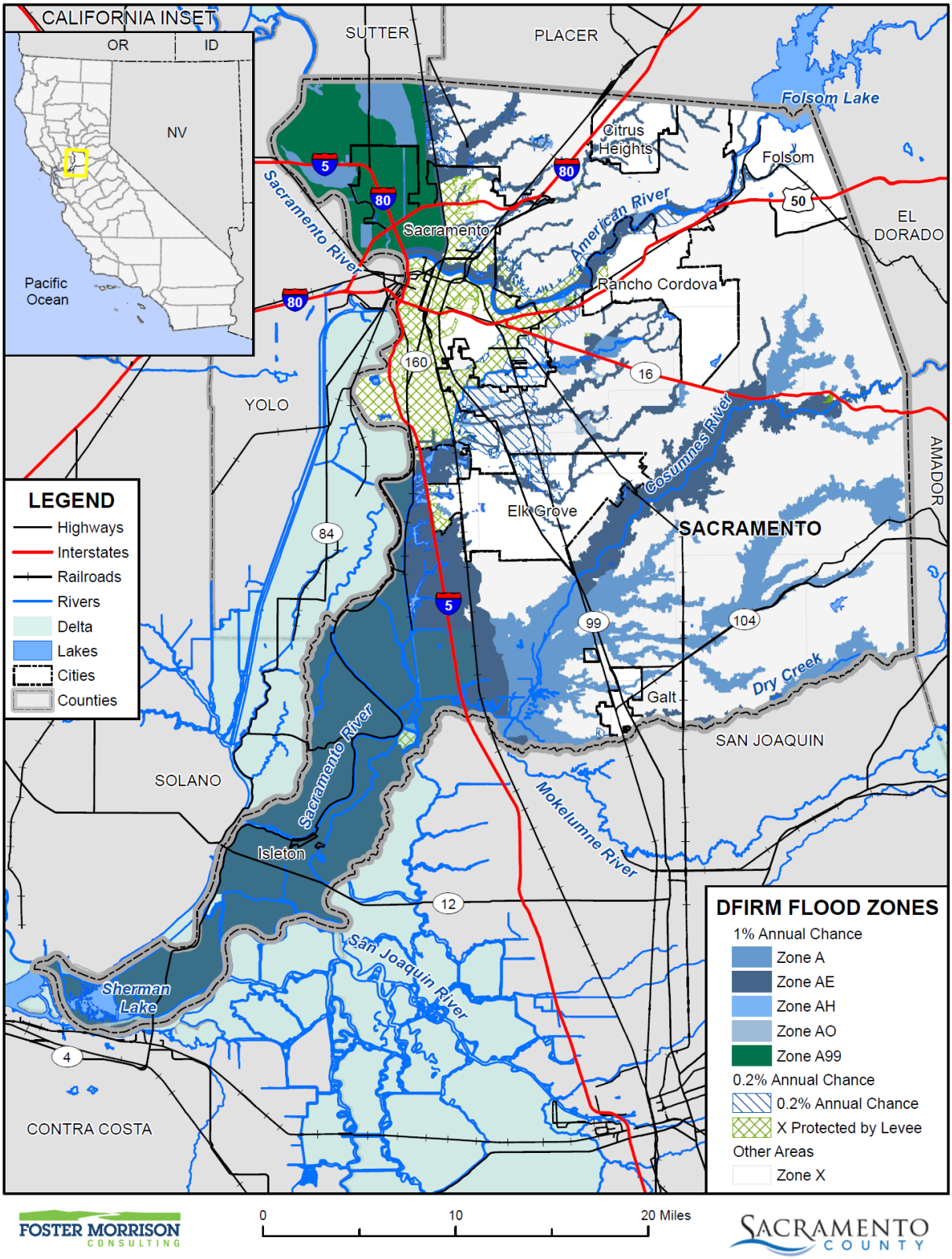
Digital Flood Insurance Rate Maps (DFIRM)

As part of its Map Modernization program, FEMA is converting paper FIRMS to digital FIRMs, DFIRMS. These digital maps:

- Incorporate the latest updates (LOMRs and LOMAs);
- Utilize community supplied data;
- Verify the currency of the floodplains and refit them to community supplied basemaps;
- Incorporate levee accreditation status in accordance with FEMA requirements at 44 CFR 65.10;
- Upgrade the FIRMs to a GIS database format to set the stage for future updates and to enable support for GIS analyses and other digital applications; and
- Solicit community participation.

DFIRMs for Sacramento County have been developed, are dated July 19, 2015, and are being used for the flood analysis for this LHMP Update. The DFIRM is shown in Figure 4-71.

Figure 4-71 Sacramento County DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Mapping of Levees

Also as part of FEMA's Map Modernization program, FEMA is mapping levees within communities, with a primary focus on maps determined to provide a 100-year level of flood protection.

In August of 2005, FEMA Headquarters' issued Memo 34 Interim Guidance for Studies Including Levees. This memo recognizes the risk and vulnerability of communities with levees. The memo mandates the inclusion of levee evaluations for those communities that are undergoing map changes such as the conversion to DFIRMs. No maps can become effective without an evaluation of all levees within a community against the criteria set forth in 44 CFR 65.10 Mapping of Areas Protected by Levee Systems. Generally, these levee certification requirements include evaluations of freeboard, geotechnical stability and seepage, bank erosion potential due to currents and waves, closure structures, operations and maintenance, and wind wet and wave run-up. In short, these guidelines require certification of levees before crediting any levee with providing protection from the 1 percent annual event (e.g., the 100-year flood).

In Sacramento County, similar to other locations in California, levees and flood control facilities have been built and are maintained variously by public and private entities, including water, irrigation and flood control districts, other state and local agencies, and private interests. Some of these facilities were constructed with flood control as secondary or incidental to their primary purpose, so are not considered as providing protection from the 100-year or greater flood. Levees in the County are discussed in Section 4.3.14 of this Plan Update.

California Floodplain Mapping

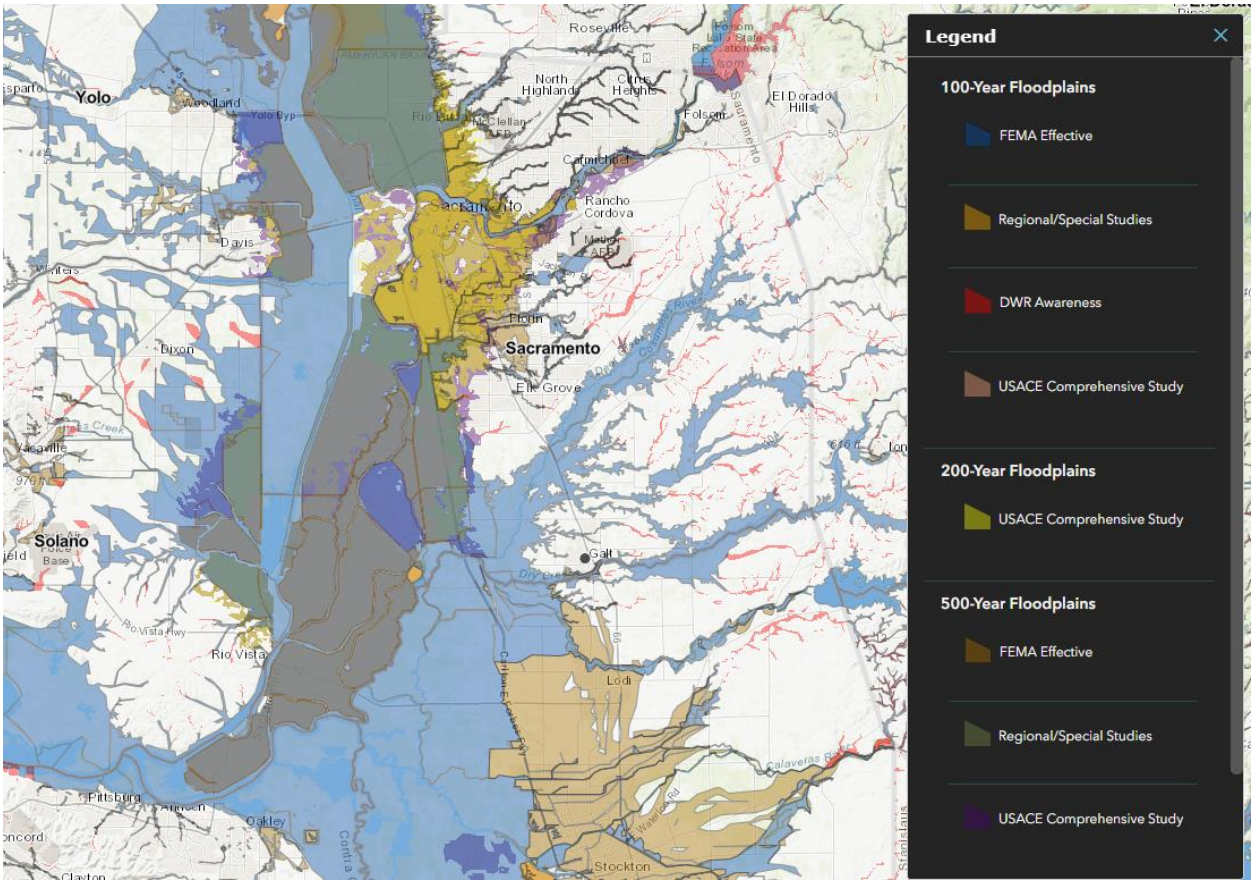
Also to be considered when evaluating the flood risks in Sacramento County are various floodplain maps developed by the California DWR for various areas throughout California, and in the Sacramento-San Joaquin Valley cities and counties. The FEMA regulatory maps provide just one perspective on flood risks in Sacramento County. Senate Bill 5 (SB 5), enacted in 2007, authorized Cal-DWR to develop the Best Available Maps (BAM) displaying 1% and 0.5% (200-year) annual chance floodplains for areas located within the Sacramento-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 0.2% annual chance flood zones.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and generally reflect only the 1% and 0.2% annual chance flood risks, the BAMs are provided for informational purposes and are intended to reflect current 1%, 0.5% (200-year) as applicable, and 0.2% annual chance flood risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 1% annual chance floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 1% annual chance flood zones. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 1%, 0.5%, and 0.2% annual chance floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the County than that provided in the FEMA DFIRMs. This provides the community and residents with an additional tool

for understanding potential flood hazards not currently mapped as a regulated floodplain. Improved awareness of flood risk can reduce exposure to flooding for new structures and promote increased protection for existing development. Informed land use planning will also assist in identifying levee maintenance needs and levels of protection. By including the FEMA 1% annual chance flood zone, it also supports identification of the need and requirement for flood insurance. Figure 4-72 shows the BAM for the Sacramento County Planning Area.

Figure 4-72 Sacramento County– Flood Awareness (Best Available) Map



Source: California DWR, Retrieved 1/29/2021

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1%r (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2% (2002 Sac and San Joaquin River Basins Comp Study).

Geographical Flood Extents

Flood extents are usually measured in depths of flooding, geographical extent of the floodplain, as well as flood zones that a location falls in (i.e. 1% or 0.2% annual chance flood). Expected flood depths in the County vary and are not well defined. Flood durations in the County tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Geographical flood extent from the FEMA DFIRMs is shown in Table 4-68.

Table 4-68 Sacramento County Planning Area – Geographical Flood Hazard Extents in FEMA DFIRM Flood Zones

Flood Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
1% Annual Chance	240,861	37.38%	122,572	33.95%	118,288	41.74%
0.2% Annual Chance	55,867	8.67%	4,1050	11.37%	14,817	5.23%
Other Areas	347,691	53.95%	197,381	54.68%	150,309	53.04%
Total	**644,418**	**100.00%**	**361,003**	**100.00%**	**283,415**	**100.00%**

Source: 7/19/2018 DFIRM

Streambank erosion occurs on rivers, streams, and other moving waterways, including leveed areas, in the County Planning Area. The speed of onset of this erosion is slow, as the erosion takes place over periods of years. Duration of erosion is extended. Greater erosion occurs during periods of high stream flow and during storm and wind events when wave action contributes to the extent and speed of streambank erosion.

Past Occurrences

Disaster Declaration History

A list of state and federal disaster declarations for Sacramento County from flooding, (including heavy rains and storms) is shown on Table 4-69. No disasters were related to streambank erosion.

Table 4-69 Sacramento County – State and Federal Disaster Declaration from Flood 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

NCDC Events

The NCDC tracks flooding events for the County. Events have been tracked for flooding since 1993. Table 4-70 shows events in Sacramento County since 1993. Other heavy rain and storm events can be found in the Past Occurrences of the Severe Weather: Heavy Rains and Storms in Section 4.3.4. More information from the NCDC on some of the flooding is woven into the discussion of HMPC events below. The NCDC does not track streambank erosion.

*Table 4-70 NCDC Flood Events in Sacramento County 1993 to 5/31/2020**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Flash Flood	4	1	0	0	0	$4,400,000	$0
Flood	80	1	0	1	0	$8,877,000	$7,800,000
Heavy Rain	28	0	0	1	0	$365,000	$50,000
Total	**112**	**2**	**0**	**2**	**0**	**$13,642,000**	**$7,850,000**

Source: NCDC

*Note: Losses reflect totals for all impacted areas, much of which fell outside of Sacramento County

January 2, 1997 – The heavy rains brought the Cosumnes River to record flows above designed limits for the protective levees. Twenty breaks occurred, with the largest near the town of Wilton in the southern end of the County. The surging floodwaters inundated 33,000 acres of cropland and 84 homes. Emergency workers effected several roof-top and car-top rescues by boat and helicopter. The single death occurred at the Cosumnes River bridge near the town of McConnel.

January 22, 1997 – Localized heavy rain brought Chicken Ranch Slough out of its banks, flooding the Arden-Arcade area of the city. At least 1,000 homes and apartment buildings were flooded.

January 26, 1997 – Heavy showers and thunderstorms moved over the metro area, re-flooding the neighborhoods surrounding Chicken Ranch Slough, which had just experienced flooding the previous 22nd. The flooding was higher and caused additional damage to 500 more homes.

February 2, 1998 – In Sacramento County, the Consumnes River threatened the town of Wilton, where levees broken by the January 1997, flooding had not been repaired. Fortunately, flooding impact was minor.

January 23, 2000 – Persistent rains which measured for 34 continuous hours swelled Dry Creek over its banks in Rio Linda. Cherry Lane, 6th Street, as well as Curved Bridge Road were flooded. Twelve homeowners had water over their property. Two of them sustained interior flooding while another five sustained flooded garages. The Grant Joint Union High School District closed Rio Linda junior and senior high schools in fear that students would not get home safely. Approximately 2,500 students were sent home early

January 1, 2006 – A series of warm winter storms brought heavy rain, mudslides, flooding, and high winds to Northern California. Levee overtopping, breaching, and river flooding occurred along the Feather and Sacramento mainstem rivers as well as along numerous smaller rivers, creeks, and streams. Several urban areas had significant street flooding. The Sacramento weir was opened for the first time since 1997 with twenty gates opened. Transportation throughout the area was difficult during the course of the storms as airports were closed due to the high winds and major road closures resulted from flooding and mudslides. Interstate 80...the main artery between Sacramento and the San Francisco Bay area...was closed near Fairfield in Solano County for several hours due to severe flooding. Additionally, Interstate 80 eastbound between Sacramento and Reno, NV, was closed for more than a day due to a massive mudslide, as was both directions of U.S. Highway 50 between Sacramento and South Lake Tahoe.

December 3, 2014 – Heavy rain showers and thunderstorms brought record rainfall and flooding issues to portions of the Central Valley and foothills. There were 2 berm levees which failed in Tehama County, flooding over 200 homes and damaging farms and orchards. Significant traffic delays were caused by road flooding across interior Northern California. Snow levels remained above 7500 feet, so snowfall was limited to higher Sierra peaks and Lassen Peak. Watt Ave. and Roseville Rd. number 1 lane flooded with 2 feet of water due to clogged drain.

December 15-16, 2016 – Heavy rain fell in the County. Multiple homeless people were trapped in encampments along the Arden Garden Connector, by Acoma Street. Extensive rescue operations by the Sacramento Fire Department were needed. Folsom police closed White Rock Road, between Placerville and Scott roads, Thursday night and into the Friday morning commute because of flooding and debris in the road. Flooding caused a road closure on Eastern Road between Marconi and Robertson in Carmichael. Deer Creek flooded, forcing the closure of Scott Road near Rancho Murieta.

January 7-10, 2017 – Flooding of Deer Creek reported at Scott Rd. in Sloughhouse. A driver was rescued when his truck got stuck as he drove across the flooded road. Heavy rainfall brought street flooding to Wilton on Green Rd. Kiefer Boulevard north of Jackson Rd. was closed due to flooding. Heavy rainfall and water over topping a levee along the Cosumnes brought street flooding to Wilton on Green Rd and Dillard Rd, and into adjacent properties. There were voluntary evacuations of about 7000 to 10000 people, due to the levee over topping and the threat of possible levee failure.

February 6-20, 2017 – Deer Creek overflowed and floodwaters surrounded Sloughouse Inn. Discovery Park in Sacramento was flooded, with water about 8 feet deep. Green Rd. in Wilton flooded due to levee over topping. Evacuations were ordered for low lying portions of Wilton and Point Pleasant. A freight train carrying food products derailed Friday afternoon near Elk Grove in Sacramento County, sending 22 train cars into the Cosumnes River near Highway 99, according to the Cosumnes Fire Department. A levy on the river nearby had broken, eroding the material under the railroad trestle the train went over, apparently causing the derailment. Three levees along the Cosumnes River were breached Friday night at Pear Lane, allowing flood waters into the Wilton area. Localized flooding closed Green Road and others nearby roads as waters into Dillard Road. Several roads remained closed through the night, according to the Sacramento County Office of Emergency Services. At 08:00 on 2/11, a levee breach on McCormack-Williamson Tract occurred at Station 28+00 on the Mokelumne River. The 150 foot wide breach was located approximately half a mile downstream of the upstream end of McCormack-Williamson Tract. Flooding from Dry Creek in Rio Linda from around 6th St. to Cherry Lane to Rio Linda Blvd, causing road closures. Voluntary evacuation of homes in the area. Winding Way closed from Valhalla Dr. to Walnut Ave. due to flooding of Arcade Creek.

March 17-21, 2017 – Ethel Way was flooded between Fruitridge Rd. and 28th Ave., Sacramento. Roadway flooding reported in eastern Sacramento at Folsom Blvd and 47th St. More than half an inch of rain fell within 15 minutes, flooding roadway at Madison Ave. and I80. Lots of freeway spin-outs. CHP reported roadway flooding at US 50E and 34th Street off-ramp. Roadway flooding reported by CHP at Exposition and Response Rd., Sacramento. Roadway flooding reported by CHP at Watt Ave. and Arden Way, Sacramento. CHP reported roadway flooding at Fulton Ave and Arden Way, Sacramento. CHP reported flooding on on-ramp to SR 51 by Auburn Blvd. Standing water in lane, bottom of the cloverleaf was

flooded. Flooded roadways reported in Tahoe Park, Sacramento. Street flooding on Dean Way east of Wales Dr. in Folsom. Vehicle stuck in a flooded roadway on Scott Rd. and Latrobe Rd.

January 6-17, 2017 – California Highway Patrol reported heavy rain caused flooding of Highway 99 in Galt. California Highway Patrol reported heavy rain caused flooding of the southbound lane of Interstate 5 in downtown Sacramento. Stockton Blvd was impassable due to flooding. Local media shared a video of law enforcement rescuing a stranded motorist in Sloughhouse near Kiefer Blvd and Jackson Rd. Road was completely flooded.

February 12-25, 2019 – California Highway reported county roads closed due to flooding. California Highway Patrol reported road flooding with #1 lane blocked on highway 160 s and del paso boulevard on ramp. On twitter the public information officer from Metro fire of Sacramento posted about a swift water rescue that occurred on Feb 13 at 4:44 pm. on Kiefer Blvd north of Jackson Rd. On Twitter the public information officer from Metro Fire of Sacramento posted pictures of a second swift water rescue that occurred on Kiefer Blvd. north of Jackson Road. CHP reported Roseville Road north and southbound just north of Antelope Rd. closed due to flooding. Roadway flooding from arcade creek reported at Winding Way and Walnut Ave. CHP reports roadway flooding on I80 W at Truxel Rd. off-ramp. CHP reports roadway flooding with 8 inches of water affecting north and southbound Stockton Blvd north of Elsie Ave. E I80 BY Longview Dr. flooded. On ramp at I-80 and Watt Ave. completely flooded. There were 6 inches of water in lane number 1 of Capitol City Freeway.

April 5, 2020 -–California Highway Patrol reported 2 feet of water flooding between I80 W and Madison Avenue near North Highlands, CA. California Highway Patrol reported 8 inches of water flooding the roadway between Eastern Ave and Marconi Ave. California Highway Patrol reported 1 1/2 feet of water flowing across all lanes between Interstate 80 East and Auburn Boulevard near North Highlands. California Highway Patrol reported roadway flooding between Sacramentos Gold Drive and Manlove Road in Rosemont, CA. California Highway Patrol reported roadway flooding near Whitney Avenue in Carmichael, CA. California Highway Patrol reported roadway flooding between Roseville Road and Antelope Road in Antelope, CA. California Highway Patrol reported roadway flooding between Kiefer Blvd and Rosemont Drive in Rosemont, CA. California Highway Patrol reported roadway flooding between Sunrise Blvd and Wildridge Dr in Fair Oaks, CA.

FIS Events

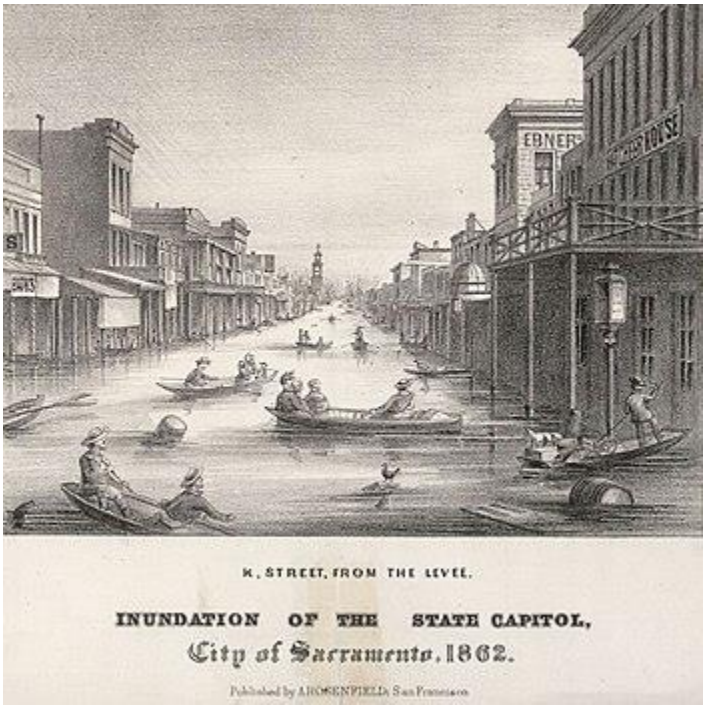
The latest Flood Insurance Study for Sacramento County was released on June 19, 2018. The following discussion is sourced from this discussion.

In urbanizing areas, flood problems are intensified because rooftops of homes and other structures, streets, driveways, parking lots, and other paved areas all decrease the amount of open land available to absorb rainfall and runoff, thus increasing the volume of water that must be carried away by streams. As indicated earlier, the northern portion of the county is urbanizing at a fairly rapid rate.

Native American legends and historical records indicate that at least nine major floods occurred in the Sacramento River basin during the 19th century. A great flood (described in Native American legend as having swamped the entire Sacramento River basin) occurred in 1805. Indians also described floods that

occurred in 1825 and 1826 as widespread in the basin. Extensive flooding in northern California took place in 1839, 1840, 1847, 1849-1850, 1852, 1861-1862, 1881, and 1890. The flood of 1861-1862 was the largest known flood in Sacramento County.

Figure 4-73 1862 Flooding



Source: Great Flood of 1862 (Wikipedia.org)

One of the earliest reports of flooding in Sacramento County was the graphic account of Professor William H. Brewer of Yale University, who described the floods of January-March 1862 in the Sacramento area:

> ***"Nearly every house and farm over this immense region is gone. There is such a body of water-250 to 300 miles long and 20 to 60 miles wide, the water ice cold and muddy--that the winds high waves which beat the farmhouses in pieces… The new Capitol is far out in the water—the Governor's house stands as in a lake— churches, public buildings, private buildings, everything is wet or in water. Not a road leading from the city is passable, business is at a dead standstill,"***

Substantial flooding in the County also occurred in 1928, 1937, 1938, 1940, 1943, 1945, 1950, 1952, 1955, 1956, 1958, 1962, 1963, 1964-1965, 1967 and 1969, 1972, 1980, 1982, 1983 and 1997. Newspaper accounts, rainfall and stream gage records and previous studies, indicate that the City of Sacramento has experienced significant flooding in 1928, 1950, 1962, 1967, 1986 and 1997.

In February 1986 a vigorous low pressure system drifted east out of the Pacific, creating a Pineapple Express that lasted through February 24 and unleashed unprecedented amounts of rain on northern California. In Sacramento, nearly 10 inches of rain fell in an 11-day period. The overwhelming floodwaters tore bridges

from their foundations and punched through levees. The Northern California flood resulted in 13 deaths, 50,000 people evacuated and over $400 million in property damage.

In 1995, heavy rains hit the Sacramento area causing wide-spread localized flooding, in particular in the Arcade, Morrison, Florin, Union and Dry Creeks.

Two years later in 1997, a series of tropical storms hit the valley, causing the Cosumnes River to crash through levees in 24 places. Most recently, the 2005/2006 event earned the name "New Year's Eve Storm" because it soaked the region and caused widespread, localized flooding during the first days on New Year's Eve 2005 through the first few days of 2006. And although this flood event was not of the magnitude of those in the past, it did cause residents to be vigilant and question their individual storm readiness (Storm Ready, 2015). Newspaper accounts, rainfall and stream gage records and previous studies, indicate that the City of Sacramento has experienced significant flooding in 1928, 1950, 1962, 1967, 1986 and 1997.

Moderate agricultural damages estimated at $104,000 were caused by the 1966-67 flooding, even though more acres were flooded (approximately 8,070 acres), particularly on Laguna Creek which again overflowed into its floodplain, than during the flooding of 1963 and 1964.

The majority of flooding in January 1969, occurred on agricultural lands in the City of Sacramento, predominantly on lands that lay west of the Union Pacific Railroad (UPRR) tracks in the Beach-Stone Lakes area. Minor flood losses (principally to farmland, crops, and improvements) were incurred east of the UPRR tracks. Floodwaters covered approximately 10,500 acres, and damages were estimated at $159,000.

Detailed flood damage surveys were not conducted after the 1973, 1983, 1986 and 1997 floods. However, it is estimated that approximately $500,000 in damages occurred in 1983. Only negligible damages occurred during the February 1986 flood. Peak flows in the last ten years may have been higher partly because of channel improvement work, enlarged channel capacity, and levee construction by local interests in that period.

The severity of flooding on all the streams studied during the July 6, 1998, restudy in the City of Sacramento, is intensified by backwater conditions between stream systems. Floodwater elevations are increased in the lower portions of tributary streams due to the backwater effect from main streams reducing hydraulic gradients and flow-storage areas. During this time, there will be a high degree of coincidental 1-percent annual chance flood flows on all the study area waterways.

The high flow of floodwaters on some channels within the City of Sacramento has a great impact (causing backwater conditions) on the hydraulic regimen of other channels. High flows on the Sacramento River generate backwater conditions on the lower reaches of the American River and the Cross Canal. The American River peak 1-percent annual chance flows induce backwater conditions in the lower reach of the Natomas East Main Drainage Canal. Coincidentally, high flows on the Natomas East Main Drainage Canal cause backwater conditions on the lower reaches of Arcade and Dry Creeks.

American River Stream Group Flooding

The FIS reviewed flood problems in the American River Stream Group. This consists of American River, Arcade Creek Brooktree Creek, Carmichael Creek, Chicken Ranch Slough, Coyle Creek, Cripple Creek,

Dry Creek, Dry Creek (near Galt), Hinkle Creek, Humbug Creek, Linda Creek, Linda Creek (South Branch), Lower Magpie Creek, Magpie Creek, Magpie Creek Diversion, Mariposa Creek, Natomas East Main Drainage Canal, Natomas East Main Drainage Canal Tributary F, Natomas East Main Drainage Canal Tributary G, Natomas East Main Drainage Canal Tributary I, and Robla Creek.

The American River near the City of Sacramento overflowed in 1928, causing extensive flooding in the River Park and Industrial Park areas on the south bank. In 1950, the American River inundated extensive areas on the north bank, including the area in the vicinity of Fulton Avenue and Fair Oaks Boulevard.

Floods on Dry Creek (American River Stream Group) have occurred with regularity since 1937. Flooding also occurred on Dry and Robla Creeks near the Natomas East Main Drainage Canal. The October 1962 floods on Dry and Robla Creeks spread from approximately 800 feet to approximately 1 mile wide. The flood of October 1962, was the largest that has been recorded at the Roseville gaging station, located on Dry Creek upstream of Sacramento County. Damage in the October 1962 flood was on the order of approximately $50,000. The resultant high water was within 2 feet of the top of the levee on the southern side of Robla Creek and along the Magpie Creek diversion channel. Floodwaters from Magpie Creek bypassed the upper portion of the diversion levee and flowed into lower Magpie Creek. Similar, less-severe floods, occurred in 1955, 1958, February 1962, 1967, 1969, 1970 and 1973.

Other creeks in the American River Stream Group have floodplain boundaries similar to that of Dry Creek. The largest flood on Arcade and Cripple Creeks occurred in October 1962, with resulting damages of approximately $10,000.

The largest recent floods on Strong Ranch and Chicken Ranch Sloughs occurred in February 1962. No damage estimates are available; however, runoff was too large for the channels and bridges, resulting in local flooding. The capacity of the American River pumping plant was exceeded for a short time, and floodwaters backed up and inundated areas in the vicinity of the nearby sewage treatment plant.

The most recent flooding on the American River occurred in February 1986. The peak flow during this flood has been estimated to exceed the current 1-percent annual chance flood peak of 115,000 cubic feet per second (cfs).

Floods on the Cosumnes River occurred in 1950, 1955, 1958, 1962 and 1964, with the events of 1955, 1958 and 1964, being most severe. In 1958, an estimated 38,000 acres of land were inundated along the Cosumnes River and the lower portions of Dry, Deer, and Laguna Creeks. In 1964, an estimated 30,000 acres of land were inundated.

The floodplain areas of Willow, Humbug, and Hinkle Creeks near the City of Folsom have little existing structural development. The current and past land uses have been agricultural and open space. A thorough search of records has not uncovered any record of past floods. No records have been kept due to the past and current land uses and short duration of flood flows. The flooding events have not been considered significant problems, and the flood damages have not been recorded.

The higher elevation tributary area of the Dry Creek watershed, near the City of Galt, subject to snowfall is too small to generate snowmelt flooding. Snowmelt during a flood-producing rainstorm would not increase runoff significantly. Due to the largely rural nature of the Dry Creek floodplain, and because flood

damage has been predominantly agricultural, historical floods have not been documented in much detail. The earliest major flood flow of record, 13,200 cfs, approximately an 11.1- percent annual chance (9-year) flood, occurred on February 2, 1945.

From high-water marks known to long-time residents of the area, an estimated flood flow of 18,700 cfs (approximately a 5.8- percent annual chance [17-year] flood) occurred in February 1936 and a flood flow estimated to be approximately 24,000 cfs (approximately a 2.9-percent annual chance [35-year] flood) occurred in March 1907.

In December 1955, a 17,000 cfs flow (approximately a 7.1-percent annual chance [14-year] flood) on Dry Creek resulted from approximately 7 inches of antecedent rainfall over the tributary drainage. Although there was no Dry Creek overflow into the City of Galt, there was flooding from Hen Creek in the west-central part of the City where water was nearly knee deep along Lois Avenue, and at the Myrtle Avenue-Palin Street and Myrtle Avenue-Oak Avenue intersections. Damage, however, was minor and floodwater receded within 1 day. On April 3, 1958, the largest flood of record, 24,000 cfs (approximately a 2.9-percent annual chance flood), occurred on Dry Creek. Although approximately 9,000 acres of land were flooded along the creek, there was no overflow into the City of Galt. Antecedent rainfall, which was 12.5 inches over a period of several days, had created very wet ground conditions that influenced the magnitude of runoff. Rainfall on January 31 and February 1, 1963, a total of approximately 32 percent of the normal annual precipitation over the Dry Creek drainage, resulted in a flow of 9,800 cfs (approximately a 20-percent annual chance [5-year] flood) on Dry Creek. A small dam at one end of the golf course, which was under construction on the south side of the City of Galt, was breached, and part of the facility was inundated for a short time. During the height of the storm, many streets in the City of Galt were submerged due to lack of adequate storm drainage. In December 1964, approximately 8,200 acres were flooded by Dry Creek; however, overflow near the City of Galt was limited to a portion of the golf course, which was caused when a low levee was overtopped. The flow recorded at the Dry Creek stream gage was 14,500 cfs (approximately a 10-percent annual chance flood). Antecedent rainfall was not significant (USACE, 1955 et cetera; The Galt Herald, 1955 et cetera).

The severity of two areas within the unincorporated areas where the high flow of floodwaters on some channels has a great impact (causing backwater conditions) on the hydraulic regimen of other channels. High flows on the Sacramento River generate backwater conditions on the lower reaches of the American River and the Cross Canal. The American River peak 1-percent annual chance flows induce backwater conditions in the lower reach of the Natomas East Main Drainage Canal.

Coincidentally, high flows on the Natomas East Main Drainage Canal cause backwater conditions on the lower reaches of Arcade and Dry Creeks. In December 1964 and January 1965, the coincidental occurrence of very high tides and heavy inflow resulted in unusually high stages on all delta waterways. Concurrent strong onshore winds generated high waves that created very perilous conditions for many islands. Several hundred acres were flooded and damages, mainly flood fighting and repair of levees and levee roads, were a little less than $1 million. In January and February 1969, high tides and adverse wave action in the delta, combined with large river inflow and rain-soaked levees, caused the flooding of several islands and the endangerment of many other islands. Approximately 11,400 acres were inundated and flood damages amounted to about $9.2 million. The levee separating Andrus Island and the San Joaquin River failed from unknown causes in June 1972, resulting in the flooding of Andrus and Brannan Islands (including the City

of Isleton). High winds had occurred prior to the break, but there had been no antecedent rainfall and the tidal cycle was not on the higher side. About 15,000 acres were inundated and flood damages for the event approximated $30 million.

The American River near the City of Sacramento overflowed in 1928, causing extensive flooding in the River Park and Industrial Park areas on the south bank.

In 1950, the American River inundated extensive areas on the north bank, including the area in the vicinity of Fulton Avenue and Fair Oaks Boulevard.

In December 1955, Arcade Creek overflowed its banks, inundating portions of Del Paso Park as well as areas upstream along Winding Way and portions of the Hagginwood District downstream. Flooding also occurred on Dry and Robla Creeks near the Natomas East Main Drainage Canal.

Floods occurred twice in 1962. The February 1962 floods caused inundation along Arcade Creek in the vicinity of Del Paso Park. The park and the Haggin Golf Course were flooded, and the floodwaters forced the closing of Roseville Road. Dry and Robla Creeks caused flooding in the vicinity of the Natomas East Main Drainage Canal where Rio Linda Boulevard was threatened. Laguna Creek spread out over its floodplain.

A severe, early season rainstorm occurred in October 1962, resulting in widespread flooding in the City of Sacramento. Arcade Creek overflowed from Marysville Road to past Del Paso Park. Six families on Verno Street had to evacuate because the flood threat was particularly severe in this area. Damages were estimated at $10,000 along Arcade Creek. Excess floodwaters from Dry Creek flowed southerly along the eastern side of the Western Pacific Railroad to Robla Creek and the Magpie Creek Diversion. The resultant high water was within 2 feet of the top of the southern levee of the diversion. Portions of floodwaters from Magpie Creek bypassed the upper portion of the diversion's levee and flowed into Lower Magpie Creek, causing flooding in the area between Dry Creek Road and Raley Boulevard. Dry and Robla Creeks again spread out over their common floodplain near the Natomas East Main Drainage Canal. An estimated $50,000 in flood-related damages was caused by the flood on Dry Creek. Many of these damages were caused in areas along Dry Creek upstream of the City of Sacramento.

Flooding in January 1967 was less severe than flooding in 1962. Arcade Creek overflowed its banks upstream of the City of Sacramento and flooding in the City was restricted to minor inundation in Del Paso Park. Flooding that occurred in February 1973 on Arcade Creek had a recurrence interval of approximately 10- percent annual chance flood. Dry and Robla Creeks, however, overflowed inside the City.

Morrison Stream Group Flooding

The FIS reviewed flood problems in the Morrison Stream Group. This consists of Cosumnes River, Cosumnes River Above Dillard Road, Cosumnes River Above State Highway 99, Cosumnes River Overflow North of Lambert Road, Elder Creek, Elk Grove Creek, Florin Creek, Gerber Creek, Laguna Creek, Laguna Creek Bypass Channel, Laguna Creek Tributary No. 1, Mather Field Main Drain, Mather Field Main Drain Tributary, Mather Field West Drain, Mather Lake Tributary, Morrison Creek, Strawberry Creek, Unionhouse Creek, And Whitehouse Creek.

Large portions of the Morrison Creek Stream Group area in Sacramento County were flooded in 1952, 1955, 1958, 1962-64, 1966-67 and 1969. During the 1955 flood, overflow from the Cosumnes and Mokelumne Rivers caused inundation of the Beach-Stone Lake area, thus creating high backwater conditions on streams of the Morrison Creek Stream Group. Damage was estimated at $213,000 in the Morrison Creek Stream Group area as a result of the 1955 floods and at $204,000 from the 1958 flood. The estimated damage for 1969 was $159,000.

Floods on the Cosumnes River occurred in 1950, 1955, 1958, 1962 and 1964, with the events of 1955, 1958 and 1964, being most severe. In 1958, an estimated 38,000 acres of land were inundated along the Cosumnes River and the lower portions of Dry, Deer, and Laguna Creeks. In 1964, an estimated 30,000 acres of land were inundated.

In October 1962, the Morrison Creek Basin was again flooded. A local newspaper called the Fruitridge-Florin area "the worst hit," with water "up to the tops of doors on cars" (Sacramento Bee, 1962). Floodwaters escaped from Morrison Creek near the Sacramento Army Depot. This overflow, along with other overflows from Morrison Creek upstream of Stockton Boulevard, caused widespread inundation of a primarily residential area east of Stockton Boulevard from the City of Sacramento corporate limits north to Fruitridge Road. The Glen Elder section east of Stockton Boulevard and south of Elder Creek Road, was the most severely flooded portion in the Morrison Creek Stream Group area. Laguna, Elder, Florin and Unionhouse Creeks, also overflowed their banks during this flood, adding to the flood problems in the area. A total of $161,000 in flood-related damages was estimated to have occurred in the entire Morrison Creek Stream Group area during the October 1962 flood.

In 1964, Morrison Creek flooded a large region west of the Western Pacific Railroad tracks and south of Meadowview Road. Laguna Creek flooded an area adjacent to the stream that extended for about six miles from near the City of Elk Grove westerly to the Union Pacific Railroad tracks. The 1964 flooding in the basin inundated about 7,700 acres and caused an estimated $156,000 in damages.

Moderate agricultural damages estimated at $104,000 were caused by the 1966-67 flooding, even though more acres were flooded (approximately 8,070 acres), particularly on Laguna Creek which again overflowed into its floodplain, than during the flooding of 1963 and 1964.

The most recent flooding occurred in February 1986. That flood had the largest peak flow recorded on Morrison Creek (slightly higher than the January 1982 peak flow). Both the 1982 and 1986 floods have recurrence intervals of approximately a 4-percent-annual-chance flood. The estimated damage for 1982 was $500,000. Flooding had also occurred in February 1973 and has a recurrence interval of approximately a 10- percent-annual-chance flood.

There are five main areas of floodwater intermingling in the Morrison Creek Stream Group basin. Between the Central California Traction Company Railroad (CCTCRR) tracks and Florin-Perkins Road, Morrison Creek overflows its south bank, and the floodwaters continue to the south for about one mile and mingle with Florin Creek overflows. Laguna Creek floodwaters overtop the creek's north bank just east of the CCTCRR tracks, flow into the east embankment of the tracks, and then continue northwesterly parallel to the embankment for about one and one-half miles and join Gerber Creek flows. Combined flood flows from Laguna and Gerber Creeks overtop the north bank of Gerber Creek just east of the CCTCRR tracks

and flow northwesterly along the east embankment of the tracks for about one mile and then unite with Elder Creek flows. Gerber Creek flood flows overtop the creek's south bank about one-half mile west of the CCTCRR tracks, extend southwesterly for about one mile and mix with Unionhouse Creek flood flows. In the western part of the basin between Franklin Boulevard and the Western Pacific Railroad tracks, floodwaters from various streams commingle.

Sacramento River and the Delta Slough

The FIS reviewed flood problems in the Sacramento River and the Delta Slough. This consists of Georgiana Slough, Sacramento River, Sevenmile Slough, Steamboat Slough, Sacramento Slough, and Three Mile.

The lower reaches/delta of the Sacramento and San Joaquin Rivers are under the influence of the tides. The most severe flood conditions in the delta would result when very high tides and large volume of stream outflow occur coincidentally, and strong onshore winds generate wave action. It should be noted that precipitation over the delta does not materially affect local flood conditions.

A fundamental flood problem in the delta results from the fact that for every square mile of land reclaimed, there is one square mile less of floodplain to contain the volume of the rising tide and outflow from the rivers of the Central Valley. Furthermore, the substructure of much of the Delta is overlain by a 20- to 50-foot thick layer of peat soil, which is ideal for agriculture but very poor as foundation or building material for levees. Peat soil dried out and exposed to air constantly oxidizes and subsides. As islands subside, water pressure in adjoining channels may become too great for levees to withstand and a section may fail. Also, levees are continually being eroded by stream outflow, tidal flow, and wave wash from winds and boat wakes. Increasing levee fill creates compression that may force underlying materials to rupture into the adjoining waterway or toward the land side of the levee. If one island is flooded and its levees are lost, the levees protecting an adjacent island becomes more vulnerable to the forces of waves and wind.

The Sacramento-San Joaquin delta area has a long history of flooding. Since construction of levees started in the early 1860s, every island has been flooded at least once due to levee overtopping or failure. Prior to 1950, most of the failures were due to levee overtopping. However, since the construction of many upstream dams, that flood factor has been reduced and now the major cause of flooding is levee instability. Approximately 12 levee failures have occurred since 1980.

In mid-January 1980, severe rainstorms over central California precipitated high river outflow through the delta, which, coinciding with gale force winds over the delta and high tides, resulted in the levee failure and flooding of two tracts (placing approximately 9,600 acres under water). Continued high inflow to the delta and wind-generated waves increased erosion on all delta levees, necessitating intensive flood fighting and the temporary curtailment of boat traffic. Then in late February 1980, three islands at the lower end of the Yolo Bypass and one additional tract were inundated.

Heavy inflow and strong winds caused by a major storm over California in late November 1982, in combination with high tides, resulted in widespread levee erosion and overtopping in the delta and the flooding of an island and a tract. A succession of intense storms continued to batter the State until March 1983, establishing rainfall records for the delta and tributary regions.

Upstream reservoir releases were larger and sooner than anticipated due to the heavy rainfall and a deep snowpack, worsening an already critical levee situation. Concurrently, extremely high tides prevailed in the delta along with wind-driven waves.

Several levee failures occurred and eight islands/tracts were under water by late March 1983. More than 16,000 acres were flooded and the estimated associated damages amounted to more than $20 million.

The lower reaches/delta of the Sacramento and San Joaquin Rivers are under the influence of the tides. The most severe flood conditions in the delta would result when very high tides and large volume of stream outflow occur coincidentally, and strong onshore winds generate wave action. It should be noted that precipitation over the delta does not materially affect local flood conditions. More information about past occurrences of flooding in the Delta can be found in the levee failure discussion in Section 4.3.14.

San Joaquin River Stream Group Flooding

The FIS reviewed flood problems in the San Joaquin River Stream Group. This consists of Delta Cross Canal, Mokelumne River, North Fork Mokelumne River, North Fork Mokelumne River Overflow Channel, San Joaquin River, and Snodgrass Slough.

Historically, flooding along the Mokelumne River has been caused by general rainstorms in late fall and winter, and by snowmelt runoff in spring and early summer. The effects of cloudburst storms on an area as large as the Mokelumne River basin is negligible.

Flooding on the detailed study reach of the Mokelumne River has occurred in 1907, 1909, 1911, 1914, 1921, 1925, 1928, 1937, 1950, 1952, 1955-1956, 1963, 1964, 1967, 1969 and 1970. The most disastrous flood was that of November 1950, which caused about $1.1 million in damages. The December 1955-January 1956 floodwaters caused an estimated $750,000 in damages. The flood of December 1964 is the largest of record on the Mokelumne River. However, due to the completion of Camanche Dam in April 1964, most damages in the later flood had been prevented. Contemporary accounts of floods on the Mokelumne River are essentially nonexistent. Streamflow recorded for the study reach of the Mokelumne River were begun in 1904.

Hazard Mitigation Planning Committee Events

February 1986 - A resident in the area noted that flooding occurred in South Sacramento County. A 35-year flood event flooded 15,000 acres, including areas around I-5. I-5 was closed for 4 weeks and was under 3' of water in areas. Substantial damages to homes and businesses in the area. No deaths or injuries were reported.

January 2017 – Sacramento County was impacted by a series of Atmospheric River and storm systems starting January 3, 2017 through January 24, 2017. These storm systems cumulatively impacted the region causing worsening damage throughout the month. Sacramento continued to respond to levee issues and emergency work and the county continued to see flooded areas even though river levels dropped slightly.

Water from storm systems, king tides, releases, and runoff into the watershed impacted several areas of Sacramento County, specifically: Rio Linda, Point Pleasant, Glanville tract, Wilton and the southern

portions of the County in which voluntary evacuations were called. Rescues took place in Point Pleasant assisting people from their homes to safe areas. Water damaged levees with breaks and overtopping. Additionally, several roadways were flooded. A private levee failure within San Joaquin County continues to cause flooding to New Hope Road through March 2017. Heavy soil saturation weakened the ground near trees and power poles and significant high winds caused numerous outages throughout the county, some lasting as long as 48 hours. Public utility crews spent excessive man hours responding to downed trees and limbs, and fire crews and equipment were completely tasked either on standby or response to downed power lines. Volunteer fire crews were brought in to supplement.

On January 25, 2017, the County was still actively engaged in emergency responses to levee erosion, boils, and repairs due to high water conditions caused by the weather systems and dam releases. Cosumnes River was flooded from levee failures at Twin Cities Road and roads in the area were closed on January 24, 2017. It took days before damage and debris assessments were completed.

The Emergency Operations Center and field crews were active throughout the month coordinating response to the storms and providing communication to the public about the risks and actions they should take to maintain their safety. Forty-six different agencies and departments came together for successful EOC operations.

February 2017 – Sacramento County was impacted by a series of Atmospheric River and storm systems starting February 2, 2017 and continuing through February 23, 2017. These storm systems followed a series of Atmospheric Rivers in January 2017 and cumulatively impacted the region causing worsening damage throughout the month. Sacramento continued to respond to levee issues and emergency work and the county continued to see flooded areas even though river levels dropped slightly.

Figure 4-74 Sacramento County 2017 Flooding

Source: CA DWR Pixel website

Water from storm systems, king tides, releases, and runoff into the watershed impacted several areas of Sacramento County, specifically: Rio Linda, Point Pleasant, Glanville tract, Wilton and the southern portions of the County in which voluntary evacuations were called. Rescues took place in Point Pleasant assisting people from their homes to safe areas. Water damaged levees with breaks and overtopping (discussed in further detail in the Past Occurrences of Section 4.3.14). Additionally, several roadways were flooded. A private levee failure within San Joaquin County continued to cause flooding to New Hope Road

through March 2017. Heavy soil saturation weakened the ground near trees and power poles and significant high winds caused numerous outages throughout the county, some lasting as long as 48 hours. Public utility crews spent excessive man hours responding to downed trees and limbs, and fire crews and equipment were completely tasked either on standby or response to downed power lines. Volunteer fire crews were brought in as a supplement.

The Sacramento County Emergency Operations Center (EOC) and field crews were active throughout the month coordinating response to the storms and providing communication to the public about the risks and actions they should take to maintain their safety. Forty-six different agencies and departments came together for successful EOC operations.

Likelihood of Future Occurrence

1% Annual Chance Flood

Occasional— The 1% annual chance flood (100-year) is the flood that has a 1 percent chance of being equaled or exceeded in any given year. This, by definition, makes the likelihood of future occurrence occasional. However, the 100-year flood could occur more than once in a relatively short period of time.

0.5% Annual Chance Flood

Unlikely—The 0.5% annual chance flood (200-year) is the flood that has a 0.5 percent chance of being equaled or exceeded in any given year. This, by definition, makes the likelihood of future occurrence unlikely.

0.2% Annual Chance Flood

Unlikely—The 0.2% annual chance flood (500-year) is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. This, by definition, makes the likelihood of future occurrence unlikely.

Climate Change and Flood

Climate change and its effect on flooding in the County has been discussed by two sources:

- 2021 Draft Sacramento County CAP
- CAS – 2014

2021 Draft Sacramento County CAP

The 2021 Draft Sacramento County CAP noted that climate change is likely to lead to changes in the frequency, intensity, and duration of extreme weather events, such as sustained periods of heavy precipitation, increased rainfall intensity during precipitation events, and increased risk of rain-on-snow events. Further, more winter-time precipitation that falls as rain instead of snow, and higher temperatures that will cause earlier snowmelt, which could produce substantial surface water flows over a short period of time and may potentially affect dams and spillways and overwhelm levee systems designed for historical

precipitation patterns. Historically, the County experienced an average of three extreme precipitation events per year. Under both the medium and high emissions scenarios, the county is expected to experience four extreme precipitation events per year by mid-century and five extreme precipitation events per year by the late century.

Increased flooding due to climate change will most adversely affect vulnerable populations living in floodplains. Low-income populations suffer higher mortality rates, and their homes sustain greater damage due to the housing stock, location, and inability to afford structural upgrades or flood insurance to mitigate the effects of flooding. Low-income households may also lack transportation and other resources to respond to or evacuate during a flood event. Race, class, ethnicity, and immigration status are also drivers of flood-related social vulnerability, as these may impose cultural and language barriers that affect emergency communications and access to post-disaster resources for recovery. Additionally, floodwater can interact with sources of pollution and distribute hazardous pollutants locally and regionally, resulting in water contamination and human health impacts.

Floods can disrupt transportation networks, cause economic losses through closure of businesses and government facilities, disrupt communications, disrupt the provision of utilities such as water and sewers, result in excessive expenditures for emergency response, and generally disrupt the normal function of a community. Roadway closures due to extended periods of flooding could prevent residents from accessing key supplies, such as food, electricity, fuel, and potable water. Flooding may also threaten ecosystem functioning and agricultural resources: unlike natural flooding regimes that deposits useful sediment resulting in increased soil fertility as well as groundwater recharge, catastrophic flooding from levee overtopping could lead to soil erosion and loss of viable cropland. It could also release sewage and hazardous materials into the environment if wastewater treatment plants are inundated, storage tanks are damaged, and pipelines severed.

Lastly, severe flooding is capable of destroying building and infrastructure such as bridges, roadways, electrical boxes, drainage systems, and levees. Extreme weather events could weaken or collapse levees in the Delta and could breach Sacramento and American river levees especially where they have not yet been upgraded or do not meet the minimum National Flood Insurance Program requirements.

CAS

According to the CAS, climate change may affect flooding in Sacramento County. While average annual rainfall may increase or decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century. It is possible that average soil moisture and runoff could decline, however, due to increasing temperature, evapotranspiration rates, and spacing between rainfall events. Reduced snowpack and increased number of intense rainfall events are likely to put additional pressure on water infrastructure which could increase the chance of flooding associated with breaches or failures of flood control structures such as levees and dams. Future precipitation projections were shown in Figure 4-31 in Section 4.3.4. Also according to the National Center for Atmospheric Research in Boulder, Colorado, Atmospheric Rivers are likely to grow more intense in coming decades, as climate changes warms the atmosphere enabling it to hold more water.

Vulnerability Assessment

Vulnerability—Extremely High

Historically, Sacramento County has always been vulnerable to flooding because of its relatively flat terrain and the number of water courses that traverse the County. Flood zones in Sacramento County are quite extensive. High water levels are a common occurrence in winter and spring months due to increased flow from stormwater runoff and snowmelt. Several areas of the County are subject to flooding by the overtopping of rivers and creeks, levee failures, and the failure of urban drainage systems that cannot accommodate large volumes of water during severe rainstorms.

River flooding is the most significant natural hazard that Sacramento County faces. Sacramento is not just at high risk of flooding, but is at high risk of catastrophic flooding. When the 100-year event is exceeded, the consequences could be great as flood depths behind levees can range up to many feet deep in some urban areas.

In addition to the major rivers, there are many streams, channels, canals, and creeks that serve the drainage needs of the County. There is significant threat of flooding in large areas of the county from several of these streams. Many of these streams are prone to rapid flooding with little notice.

According to SAFCA, Sacramento's risk of flooding is the greatest of any major city in the country. Sacramento's flood risk is exceptionally high for two reasons:

1. The cores of today's levees are often the levees built by farmers and settlers as much as 150 years ago. Early levees were not constructed to current engineering standards, and little care was given to the suitability of foundation soils. It was believed prior to 1986 that the levees containing the Sacramento River and the American River were of sufficient height and stability to protect the county from 100-year or greater storms. The storms that occurred in February 1986 demonstrated that those levees are not always sufficient.
2. The quantity of water flowing out of the Sierra Nevada Mountains during large floods appears to be increasing. Folsom Dam was designed, based on historical data, to reduce flood flows in the American River to a flow rate that could be safely contained by the downstream levees. The first storm that occurred after beginning the construction of Folsom Dam was larger than any occurring in the prior 45 years. Since that 1951 storm, Sacramento has experienced four more 'record floods' each somewhat larger than the previous. A comparative analysis run on the two periods (1905 to 1950 and 1950 to 2000) shows that a storm with one chance in 500 of occurring in any year based on the earlier period is approximately the same size as a storm with one chance in 50 of occurring using the entire 95-year period.

Historically, much of the growth in the County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Impacts

Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. A car will float in less than two feet of moving water and can be swept downstream into deeper waters. This is one reason floods kill more people trapped in vehicles than anywhere else. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures, such as dam spillways. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts from any type of flooding.

Impacts from streambank erosion include greater levee maintenance and increased risk of levee failure. Should the levees fail, the area protected by the levees would be flooded.

Health Hazards from Flooding

Certain health hazards are also common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where cattle and hogs are kept or their wastes are stored can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e. coli and other disease-causing agents.

The second type of health problems arise after most of the water has gone. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If a city or county water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Mercury in Waterways in Sacramento County

As a result of historical releases of mercury associated with gold mining in Sacramento County, as well as in areas throughout watersheds upstream of Sacramento County, mercury contamination is a significant hazard to County residents and visitors, as well as wildlife. The State Resources Agency, as well as Cal EPA and US EPA, have recognized this contamination. The Sacramento-San Joaquin Delta, the American River, Lake Natoma, and numerous water bodies that are tributaries to them, are designated through the Clean Water Act 303d listing process as impaired water bodies due to mercury levels found in fish that so high that they are hazardous both to the human population and to wildlife. Additional water bodies in and near Sacramento are likely to be added to the 303d list in the future due to mercury contamination. Fish consumption advisories developed by the State Dept. of Public Health and the Office of Environmental and Health Hazard Assessment warn people not to eat certain types of fish caught in these waters.

Various factors in the Sacramento region can affect the amount of mercury that enters the food chain and poses a hazard to human health and the environment. Some of these factors may be subject to some level of influence by human activity. Factors that affect the hazard caused by mercury include but are not limited nutrient levels, sediment transport, streambed modification, food chain and ecological effects, fish consumption practices, management of water levels, water exports and diversions, irrigation practices, salinity, oxygen concentrations, wetland restoration and management practices, flooding of Delta islands, dredging, reservoir management, stormwater and wastewater discharges and treatment processes, source control and pollution prevention activities, and levels of mercury in sediments, water bodies, and discharges.

Warning and Evacuation Procedures

Sacramento County and its incorporated communities have a variety of systems and procedures established to protect its residents and visitors to plan for, avoid, and respond to a hazard event including those associated with floods and wildfires. This includes Pre-Disaster Public Awareness and Education information which is major component in successfully reducing loss of life and property in a community when faced with a potentially catastrophic incident. Much of this information is not specific to a given hazard event and is always accessible to the public on local County and City websites. Specific warning and evacuation systems and procedures include information relative to: Flood Forecasting (e.g., California Data Exchange Center), ALERT System, Warning Systems, dam protocols, evacuation procedures, and sheltering in place. Additional information on these warning and evacuation procedures as well as post-

disaster mitigation policies and procedures can be found in Section 4.4, Capabilities, of this Risk Assessment and in the Emergency Management discussions in Appendix C.

Flood Hazard Assessment

Flooding has been frequent in the Sacramento County Planning Area and the vulnerability to flood damages is high. This section quantifies the vulnerability of the Planning Area to floods.

This risk assessment for the Sacramento County LHMP Update assessed the flood hazard specific to Sacramento County. This included an evaluation of multiple flood hazards including the Special Flood Hazard Area (SFHA) shown on the DFIRM; Repetitive Loss (RL) Areas; localized, stormwater flooding areas; other areas that have flooded in the past, but not identified on the DFIRM; other areas of shallow flooding identified through other studies and sources; levee failure flooding; dam failure flooding; and mudflow flooding especially in significant post-burn areas. This comprehensive flood risk assessment included an assessment of less-frequent flood hazards, areas likely to be flooded, and flood problems that are likely to get worse in the future as a result of changes in floodplain development and demographics, development in the watershed, and climate change. Existing studies, maps, historical data, and federal, state, and local community expertise and knowledge contributed to this current flood assessment for Sacramento County. An evaluation of the success of completed and ongoing flood control projects and associated maintenance aspects contributed to this flood hazard assessment and the resulting flood mitigation strategy for the Sacramento County Planning Area. This flood risk assessment for this LHMP Update also includes an assessment of future flooding conditions based on historic development in the floodplains and proposed future development as further described throughout this plan. The flood vulnerability assessment that follows focuses on the flood hazard based on FEMA DFIRMs.

Flood Analysis

The Sacramento County Planning Area has mapped FEMA flood hazard areas. This section of the vulnerability assessment focuses on the Sacramento County Planning Area (the seven incorporated communities and the unincorporated County). GIS was used to determine the possible impacts of flooding within the County and how the risk varies across Planning Area.

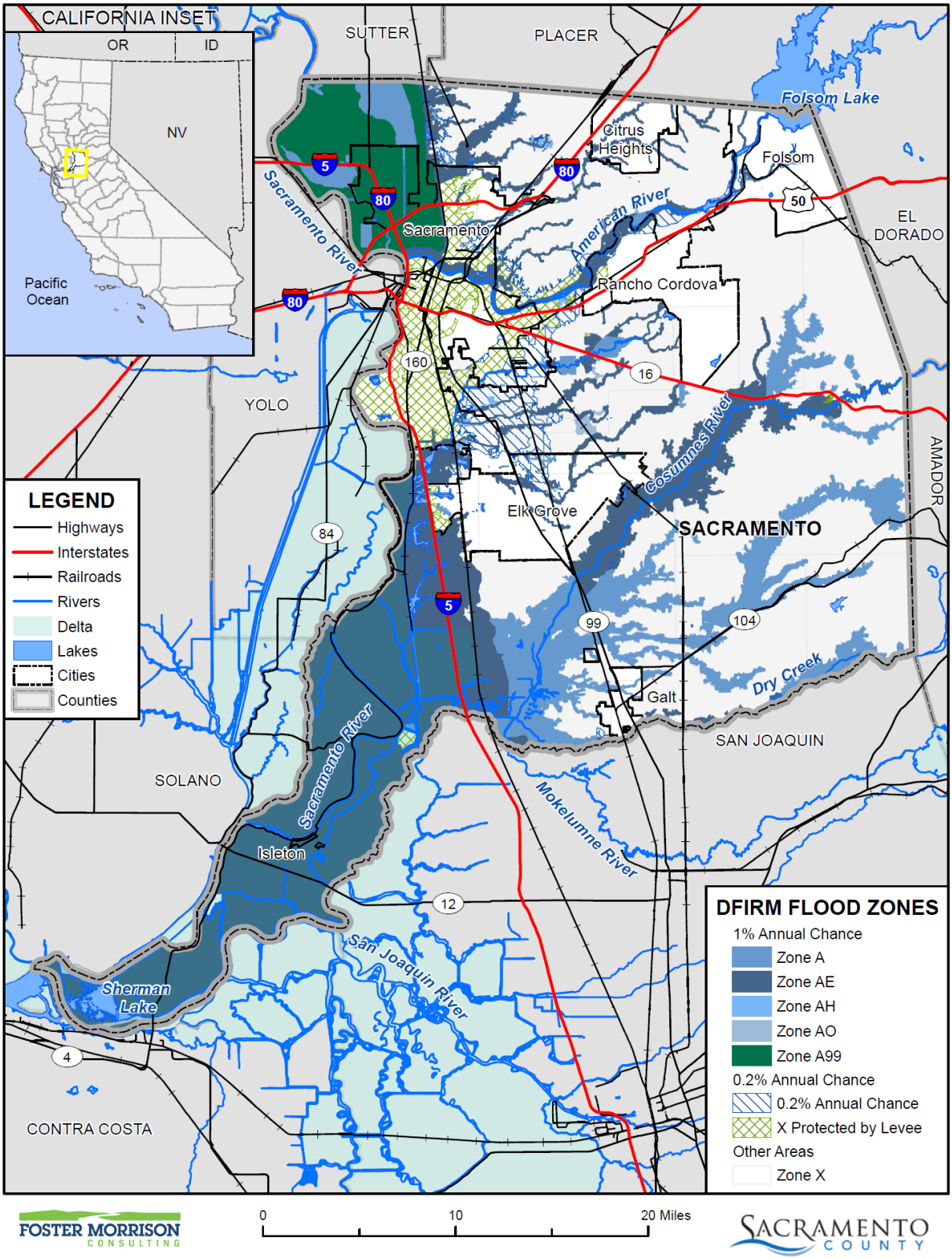
Sacramento County has a FEMA effective DFIRM dated 7/19/2018, which was obtained from the National Flood Hazard Layer to perform the flood analysis. Each of the DFIRM flood zones that begins with the letter ‘A’ depict the Special Flood Hazard Area, or the 1% annual chance flood event (commonly referred to as the 100-year flood). Table 4-71 explains the difference between DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the County. The effective DFIRM maps for the Sacramento County Planning Area are shown on Figure 4-75.

Table 4-71 Sacramento County Planning Area – DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in Unincorporated County
A	1% annual chance flooding: No base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AE	1% annual chance flooding: Base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood. Flood insurance is not mandatory but is available.	X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	X
X (unshaded)	No flood hazard	X

Source: FEMA

Figure 4-75 Sacramento County – DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Values at Risk and Flood Loss Estimates Analysis

Quantifying the values at risk and estimating losses within mapped FEMA floodplains in the County is an important element in understanding the risk and vulnerability of the Sacramento County Planning Area to the flood hazard.

Methodology

Sacramento County's 2020 Parcel and Assessor Data, obtained from Sacramento County, was used as the basis for the county inventory of parcels, values, and acres. Sacramento County has a FEMA DFIRM dated 7/19/2018 which was utilized to perform the flood analysis.

In some cases, there are parcels in multiple flood zones, such as Zone A, Zone X, or Shaded X. GIS was used to create a centroid, or point representing the center of the parcel polygon. DFIRM flood data was then overlaid on the parcel layer. For the purposes of this analysis, the flood zone that intersected a parcel centroid was assigned the flood zone for the entire parcel. The parcels were segregated and analyzed in this fashion for Sacramento County. Once completed, the parcel boundary layer was joined to the centroid layer and values were transferred based on the identification number in the Assessors database and the GIS parcel layer.

Analysis on values at risk to floods in the County is provided for Sacramento County Planning Area and the unincorporated County in the below results section.

Limitations

It also should be noted that the resulting flood analysis estimates may actually be more or less than that presented in the below tables as the County may include structures located within the 1% or 0.2% annual chance floodplain that are elevated at or above the level of the base flood elevation, according to local floodplain development requirements. Also, it is important to keep in mind that these assessed values may be well below the actual market value of improved parcels located within the floodplain due primarily to Proposition 13, and to a lesser extent, properties falling under the Williamson Act.

Flood Loss Estimate

The loss estimate for flood is based on the total of improved and contents value. Improved parcels include those with improved structure values identified in the Assessor's database. Only improved parcels and the value of their structure improvements were included in the flood loss analysis. The value of land is not included in the loss estimates as generally the land is not at loss to floods, just the value of improvements and structure contents. The land value is represented in the detailed flood tables, but are only present to show the value of the land associated with each flood zone.

The property use categories for the County (derived from zoning code descriptions) were used to develop estimated content replacement values (CRVs) that are potentially at loss from hazards, using FEMA Hazus methodologies as previously described in Section 4.3.1. The CRVs were added to the improved parcel values.

Once the potential value of affected parcels was calculated, a damage factor was applied to obtain loss estimates by flood zone. When a flood occurs, seldom does the event cause total loss of an area or building. Potential losses from flooding are related to a variety of factors including flood depth, flood velocity, building type, and construction. The percent of damage is primarily related to the flood depth. FEMA's flood benefit/cost module uses a simplified approach to model flood damage based on building type and flood depth. The values at risk in the flood analysis tables were refined by applying an average damage estimation of 20% of the total building value. The 20% damage estimate utilized FEMA's Flood Building Loss Table based on an assumed average flood depth of 2 feet. The end result of the flood hazard analysis is an inventory of the numbers, types, and values of parcels subject to the flood hazard.

The end result of the values at risk and flood loss estimates analysis is an inventory of the numbers, types, and values of parcels and estimated losses subject to the flood hazard by flood zone. Results are presented here first for the Sacramento County Planning Area and secondly for unincorporated County. Results for the incorporated jurisdictions are presented in their annexes to this Plan.

Sacramento County Planning Area

Table 4-72 and Table 4-73 contain flood analysis results for Sacramento County Planning Area. These tables show the number of parcels and values at risk to the 1% and 0.2% annual chance event for Sacramento County. Table 4-72 shows a summary of the value of improved parcels by 1% and 0.2% annual chance flood zones in the Planning Area. Table 4-73 shows the values in each flood zone by jurisdiction for the Planning Area.

Table 4-72 Sacramento County Planning Area – Count and Value of Parcels by 1% and 0.2% Flood Zone*

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard	43,527	36,296	$5,019,573,512	$12,442,434,550	$8,106,627,064	$25,568,635,272
0.2% Annual Chance Flood Hazard	137,934	129,287	$14,763,527,691	$37,854,488,676	$25,752,277,684	$78,370,294,206
Other Areas	298,904	277,302	$32,313,875,158	$77,460,831,895	$46,943,016,978	$156,717,724,312
Grand Total	**480,365**	**442,885**	**$52,096,976,361**	**$127,757,755,121**	**$80,801,921,726**	**$260,656,653,790**

Source: FEMA 7/19/2018 DFIRM, Sacramento County February Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table 4-73 Sacramento County Planning Area – Count and Value of Parcels by 1% and 0.2% Flood Zone by Property Use*

Flood Zone/ Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
City of Citrus Heights						
1% Annual Chance Flood Hazard	264	171	$16,613,142	$39,944,477	$25,347,062	$81,904,679
0.2% Annual Chance Flood Hazard	372	344	$45,438,707	$69,451,717	$42,174,438	$157,064,851
Other Areas	26,141	25,306	$2,215,185,553	$5,359,158,617	$3,077,500,176	$10,651,844,282
City of Citrus Heights Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$3,145,021,676**	**$10,890,813,812**
City of Elk Grove						
1% Annual Chance Flood Hazard	403	269	$61,274,181	$135,476,549	$92,047,967	$288,798,693
0.2% Annual Chance Flood Hazard	7,021	6,737	$785,686,811	$2,248,156,539	$1,315,971,218	$4,349,814,522
Other Areas	48,160	44,803	$5,415,550,301	$13,971,342,060	$8,031,991,292	$27,418,883,679
City of Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**
City of Folsom						
1% Annual Chance Flood Hazard	35	12	$5,281,096	$4,537,463	$2,523,630	$12,342,190
0.2% Annual Chance Flood Hazard	314	246	$77,965,503	$226,093,495	$207,922,441	$511,981,447
Other Areas	26,709	23,356	$4,355,347,245	$10,355,726,712	$6,319,092,964	$21,030,166,864
City of Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**
City of Galt						
1% Annual Chance Flood Hazard	36	9	$16,234,029	$1,836,738	$2,169,686	$20,240,454
0.2% Annual Chance Flood Hazard	2	-	$537,317	$0	$0	$537,317
Other Areas	7,948	7,439	$627,686,135	$1,727,496,106	$1,009,983,164	$3,365,165,408
City of Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**
City of Isleton						
1% Annual Chance Flood Hazard	515	329	$21,145,419	$39,144,051	$24,482,767	$84,772,235
0.2% Annual Chance Flood Hazard	-	-	$0	$0	$0	$0
Other Areas	21	9	$1,571,792	$2,124,228	$1,570,789	$5,266,809

Flood Zone/ Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
City of Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**
City of Rancho Cordova						
1% Annual Chance Flood Hazard	58	19	$6,117,986	$10,358,719	$5,179,359	$21,656,064
0.2% Annual Chance Flood Hazard	1,972	1,920	$134,045,116	$382,757,390	$199,010,254	$715,812,763
Other Areas	21,755	19,593	$2,556,793,512	$6,435,032,495	$4,794,431,555	$13,786,257,438
City of Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**
City of Sacramento						
1% Annual Chance Flood Hazard	34,612	30,884	$3,473,949,831	$10,066,624,818	$5,878,442,788	$19,419,017,610
0.2% Annual Chance Flood Hazard	90,649	84,438	$10,037,993,408	$26,076,921,127	$18,395,244,253	$54,510,159,160
Other Areas	30,329	27,574	$2,820,079,046	$7,249,889,826	$4,805,943,778	$14,875,912,816
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**
Unincorporated Sacramento County						
1% Annual Chance Flood Hazard	7,604	4,603	$1,418,957,828	$2,144,511,735	$2,076,433,805	$5,639,903,347
0.2% Annual Chance Flood Hazard	37,604	35,602	$3,681,860,829	$8,851,108,408	$5,591,955,080	$18,124,924,146
Other Areas	137,841	129,222	$14,321,661,574	$32,360,061,851	$18,902,503,260	$65,584,227,016
Unincorporated County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**
Grand Total	**480,365**	**442,885**	**$52,096,976,361**	**$127,757,755,121**	**$80,801,921,726**	**$260,656,653,790**

Source: FEMA 7/19/2018 DFIRM, Sacramento County February Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table 4-74 shows a summary table of loss estimates by 1% and 0.2% annual chance flood zone for the Sacramento County Planning Area. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all parcels located in the Planning Area) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator that a community may have more difficulties recovering from a flood. The County should keep in mind that the loss ratio could increase with additional development in the 1% and 0.2% annual chance flood zone, unless development is elevated in accordance with the local floodplain management ordinance.

Table 4-74 Sacramento County Planning Area – Flood Loss Estimate

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood Hazard	50,145	42,764	$14,555,114,540	$9,330,550,315	$23,885,664,855	$4,777,132,971	2.66%
0.2% Annual Chance Flood Hazard	179,073	167,353	$49,577,674,197	$32,468,297,758	$82,045,971,955	$16,409,194,391	9.12%
Grand Total	**229,218**	**210,117**	**$64,132,788,737**	**$41,798,848,073**	**$105,931,636,810**	**$21,186,327,362**	**11.78%**

Source: FEMA 7/19/2018 DFIRM, Sacramento County February Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to the information in Table 4-72 through Table 4-74, the Sacramento County Planning Area has 42,674 improved parcels and roughly $23.9 billion of structure and contents value in the 1% annual chance flood zone. There are an additional 167,353improved parcels and roughly $82 billion of structure and contents value in the 0.2% annual chance flood event. These values can be refined a step further. Applying the 20 percent damage factor as previously described, there is a 1% chance in any given year of a flood event causing roughly $4.78 billion in damage in the Sacramento County Planning Area. Applying the same factor, there is a 0.2% chance of a flood event causing approximately $16.4 billion in damage in the Sacramento County Planning Area. A loss ratio of 2.66 and 9.12% indicates that Sacramento County Planning Area has sizable values at risk in the floodplain, and a major flood would be difficult to recover from.

Unincorporated Sacramento County

Table 4-75, Table 4-76, and Table 4-77 contain information for unincorporated Sacramento County only. Table 4-75 is a summary table which shows improved parcels and structure values summarized by DFIRM flood type. Table 4-76 breaks down Table 4-75 and shows the number of improved parcels and associated structure and other improved values at risk to the each of the FEMA flood zones using the DFIRM data by property use type. Table 4-77 shows potential losses summarized by 1% and 0.2% annual chance flood events with loss estimates and loss ratios.

Table 4-75 Unincorporated Sacramento County – Count and Value of Parcels by 1% and 0.2% Flood Zone*

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard	7,604	4,603	$1,418,957,828	$2,144,511,735	$2,076,433,805	$5,639,903,347
0.2% Annual Chance Flood Hazard	37,604	35,602	$3,681,860,829	$8,851,108,408	$5,591,955,080	$18,124,924,146
Other Areas	137,841	129,222	$14,321,661,574	$32,360,061,851	$18,902,503,260	$65,584,227,016
Unincorporated County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**

Source: FEMA 7/19/2018 DFIRM, Sacramento County February Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table 4-76 Unincorporated Sacramento County – Count and Value of Parcels by 1% and 0.2% Flood Zone by Property Use*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	294	148	$117,680,096	$69,617,323	$69,617,323	$256,914,742
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	33	0	$7,076,362	$0	$0	$7,076,362
Miscellaneous	79	0	$283,507	$0	$0	$283,507
Office	0	0	$0	$0	$0	$0
Public/Utilities	27	0	$0	$0	$0	$0
Recreational	1	0	$21,265	$0	$0	$21,265
Residential	178	171	$24,094,856	$43,714,056	$21,857,022	$89,665,937
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	95	8	$28,605,056	$157,289	$0	$28,762,345
Zone A Total	**707**	**327**	**$177,761,142**	**$113,488,668**	**$91,474,345**	**$382,724,158**
Zone AE						
Agricultural	1,057	671	$293,917,292	$289,772,193	$289,772,193	$873,461,678
Care/Health	4	3	$1,793,658	$6,310,194	$6,310,194	$14,414,046

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Church/Welfare	25	18	$4,424,822	$39,244,048	$39,244,048	$82,912,918
Industrial	90	39	$24,329,959	$30,900,951	$46,351,426	$101,582,336
Miscellaneous	752	5	$2,930,655	$13,642	$13,642	$2,957,939
Office	39	37	$19,340,780	$33,804,422	$33,804,422	$86,949,624
Public/Utilities	185	0	$101	$0	$0	$101
Recreational	98	56	$18,802,057	$24,639,272	$24,639,272	$68,080,601
Residential	3,016	2,902	$382,804,594	$722,336,691	$361,168,372	$1,466,309,631
Retail/ Commercial	66	62	$19,915,571	$23,468,280	$23,468,280	$66,852,131
Unknown	3	2	$42,042	$139,696	$0	$181,738
Vacant	676	45	$67,388,115	$6,240,012	$0	$73,628,127
Zone AE Total	**6,011**	**3,840**	**$835,689,646**	**$1,176,869,401**	**$824,771,849**	**$2,837,330,870**
Zone AH						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	10	0	$41	$0	$0	$41
Office	1	1	$70,998	$79,191	$79,191	$229,380
Public/Utilities	1	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	58	58	$3,625,248	$9,163,336	$4,581,671	$17,370,248
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	6	0	$78,301	$0	$0	$78,301
Zone AH Total	**76**	**59**	**$3,774,588**	**$9,242,527**	**$4,660,862**	**$17,677,970**
Zone AO						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	3	3	$594,059	$3,867,671	$3,867,671	$8,329,401
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	0	0	$0	$0	$0	$0
Office	0	0	$0	$0	$0	$0
Public/Utilities	3	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Residential	67	67	$12,250,865	$12,155,741	$6,077,870	$30,484,478
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	13	0	$3,493,579	$0	$0	$3,493,579
Zone AO Total	**86**	**70**	**$16,338,503**	**$16,023,412**	**$9,945,541**	**$42,307,458**
Zone A99						
Agricultural	126	25	$48,934,916	$7,281,538	$7,281,538	$63,497,992
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	3	3	$478,455	$1,854,197	$1,854,197	$4,186,849
Industrial	182	165	$155,546,474	$658,818,056	$988,227,081	$1,802,591,615
Miscellaneous	59	0	$1,774,446	$0	$0	$1,774,446
Office	39	33	$29,933,225	$119,342,519	$119,342,519	$268,618,263
Public/Utilities	59	0	$0	$0	$0	$0
Recreational	9	5	$5,347,298	$3,102,376	$3,102,376	$11,552,050
Residential	65	59	$10,375,832	$24,803,246	$12,401,622	$47,580,703
Retail/ Commercial	12	10	$10,342,876	$13,371,875	$13,371,875	$37,086,626
Unknown	0	0	$0	$0	$0	$0
Vacant	170	7	$122,660,427	$313,920	$0	$122,974,347
Zone A99 Total	**724**	**307**	**$385,393,949**	**$828,887,727**	**$1,145,581,208**	**$2,359,862,891**
1% Annual Chance Flood Hazard Total	**7,604**	**4,603**	**$1,418,957,828**	**$2,144,511,735**	**$2,076,433,805**	**$5,639,903,347**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	11	8	$1,997,426	$1,331,266	$1,331,266	$4,659,958
Care/Health	16	16	$5,866,927	$35,732,539	$35,732,539	$77,332,005
Church/Welfare	52	48	$25,951,622	$97,486,485	$97,486,485	$220,924,592
Industrial	230	205	$135,906,539	$346,687,712	$520,031,569	$1,002,625,821
Miscellaneous	387	2	$2,876,882	$46,920	$46,920	$2,970,722
Office	90	76	$32,754,655	$90,100,564	$90,100,564	$212,955,783
Public/Utilities	37	0	$9	$0	$0	$9
Recreational	17	14	$10,084,201	$7,786,763	$7,786,763	$25,657,727
Residential	23,223	22,853	$1,652,531,551	$4,307,656,378	$2,153,828,255	$8,114,015,978
Retail/ Commercial	350	327	$239,099,068	$462,122,133	$462,122,133	$1,163,343,334

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unknown	0	0	$0	$0	$0	$0
Vacant	562	21	$93,447,636	$1,065,847	$0	$94,513,483
0.2% Annual Chance Total	**24,975**	**23,570**	**$2,200,516,516**	**$5,350,016,607**	**$3,368,466,494**	**$10,918,999,412**
X Protected by Levee						
Agricultural	7	7	$2,053,347	$1,998,179	$1,998,179	$6,049,705
Care/Health	14	9	$7,589,097	$41,048,396	$41,048,396	$89,685,889
Church/Welfare	30	26	$12,088,693	$33,980,411	$33,980,411	$80,049,515
Industrial	101	96	$28,279,980	$75,737,635	$113,606,457	$217,624,069
Miscellaneous	159	6	$667,769	$396,867	$396,867	$1,461,503
Office	193	169	$112,716,926	$310,101,549	$310,101,549	$732,920,024
Public/Utilities	38	0	$0	$0	$0	$0
Recreational	19	5	$850,517	$1,605,937	$1,605,937	$4,062,391
Residential	11,537	11,403	$1,102,912,551	$2,628,200,830	$1,314,100,401	$5,045,213,819
Retail/ Commercial	322	298	$182,671,715	$406,650,389	$406,650,389	$995,972,493
Unknown	0	0	$0	$0	$0	$0
Vacant	209	13	$31,513,718	$1,371,608	$0	$32,885,326
X Protected by Levee Total	**12,629**	**12,032**	**$1,481,344,313**	**$3,501,091,801**	**$2,223,488,586**	**$7,205,924,734**
0.2% Annual Chance Flood Hazard Total	**37,604**	**35,602**	**$3,681,860,829**	**$8,851,108,408**	**$5,591,955,080**	**$18,124,924,146**
Other Areas						
Zone X						
Agricultural	1,118	590	$337,077,580	$288,861,929	$288,861,929	$914,801,438
Care/Health	182	170	$116,650,476	$530,998,878	$530,998,878	$1,178,648,232
Church/Welfare	346	299	$102,409,722	$484,893,931	$484,893,931	$1,072,197,584
Industrial	956	730	$368,413,716	$835,793,930	$1,253,690,899	$2,457,898,526
Miscellaneous	2,272	11	$4,168,444	$236,158	$236,158	$4,640,760
Office	1,017	923	$312,137,607	$920,235,830	$920,235,830	$2,152,609,267
Public/Utilities	312	1	$1,229,093	$1,483,565	$1,483,565	$4,196,223
Recreational	78	52	$29,908,565	$77,041,207	$77,041,207	$183,990,979
Residential	125,736	124,797	$11,587,506,265	$27,697,501,005	$13,848,750,136	$53,133,757,756
Retail/ Commercial	1,498	1,400	$834,394,494	$1,496,310,727	$1,496,310,727	$3,827,015,948
Unknown	6	5	$42,958	$377,906	$0	$420,864
Vacant	4,320	244	$627,722,654	$26,326,785	$0	$654,049,439

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Zone X Total	**137,841**	**129,222**	**$14,321,661,574**	**$32,360,061,851**	**$18,902,503,260**	**$65,584,227,016**
Other Areas Total	**137,841**	**129,222**	**$14,321,661,574**	**$32,360,061,851**	**$18,902,503,260**	**$65,584,227,016**
Unincorporated Sacramento County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**

Source: FEMA 7/19/2018 DFIRM, Sacramento County February Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table 4-77 Unincorporated Sacramento County – Flood Loss Estimates

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood Hazard	7,604	4,603	$2,144,511,735	$2,076,433,805	$4,220,945,540	$844,189,108	0.47%
0.2% Annual Chance Flood Hazard	37,604	35,602	$8,851,108,408	$5,591,955,080	$14,443,063,488	$2,888,612,698	1.61%
Grand Total	**45,208**	**40,205**	**$10,995,620,143**	**$7,668,388,885**	**$18,664,009,028**	**$3,732,801,806**	**2.08%**

Source: FEMA 7/19/2018 DFIRM, Sacramento County February Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table 4-75, Table 4-76, and Table 4-77, unincorporated Sacramento County has 4,603 improved parcels and roughly $4.2 billion of structure and contents value in the 1% annual chance flood zone. The unincorporated County has 35,602 improved parcels and roughly $14.4 billion in structure and contents values in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described, there is a 1% chance in any given year of a flood event causing roughly $844.2 million in damage in the unincorporated areas of Sacramento County. Applying the same factor, there is a 0.2% chance of a flood event causing $2.8 billion in damage to the unincorporated County. A loss ratio of 0.47% and 1.61% indicates that while the unincorporated County has values at risk in the floodplain, flood losses would be somewhat limited compared to the total built environment and the community would likely be able to recover.

Flooded Acres

In addition to the centroid analysis used to obtain numbers of parcels and values at risk to flood hazards, parcel boundary analysis was performed to obtain total acres and flooded acres by flood zone for each parcel. The parcel layer was intersected with the FEMA DFIRM data to obtain the acres flooded. The following is an analysis of flooded acres in the County.

Methodology

GIS was used to calculate acres flooded by FEMA flood zones and property use categories. The Sacramento County parcel layer and FEMA DFIRM were intersected, and each segment divided by the intersection of flood zone and parcels was calculated for acres. This process was conducted for 1% and 0.2% annual chance floodplain areas, with each segment being defined by zone type (A, AE, 0.2% Annual Chance, and X) and acres. The resulting data tables with flooded acreages were then imported into a database and linked back to the original parcels, including total acres by parcel number. Once this was completed, each parcel contained acreage values for flooded acre by zone type within the parcel. In the tables below, the 1% and 0.2% annual chance flood zones are summarized and then split out by property use, their total flooded acres, total improved acres, and percent of improved acres that are flooded.

Limitations

One limitation created by this type of analysis is that improvements are uniformly found throughout the parcel, while in reality, only portions of the parcel are improved, and improvements may or may not fall within the flood zone portion of a parcel; thus, areas of improvements flooded calculated through this method may be higher or lower than those actually seen in a similar real-world event.

The following tables represent a summary and detailed analysis of total acres for each FEMA DFIRM flood zone in the Planning Area. Table 4-78 gives summary information for the Planning Area by 1% and 0.2% annual chance flood zone for the entire Sacramento County Planning Area. Table 4-79 shows the specific DFIRM flood zone designations that make up the 1% and 0.2% annual chance flood zones for the unincorporated County. Details on flooded acres by detailed flood zone for the incorporated jurisdictions in the County are shown in their respective annexes to this Plan Update. In all of these tables, the Other Areas are areas (Zone X Unshaded – areas outside mapped flood hazard areas) where there is no mapped flood hazard area.

Table 4-78 Sacramento County Planning Area – Flooded Acres Summary

Jurisdiction/ Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
City of Citrus Heights						
1% Annual Chance Flood Hazard	432	0.07%	248	0.07%	184	0.07%

Jurisdiction/ Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
0.2% Annual Chance Flood Hazard	209	0.03%	169	0.05%	40	0.01%
Other Areas	8,308	1.29%	7,352	2.04%	956	0.34%
Citrus Heights Total	**8,950**	**1.39%**	**7,770**	**2.15%**	**1,180**	**0.42%**
City of Elk Grove						
1% Annual Chance Flood Hazard	1,266	0.20%	477	0.13%	789	0.28%
0.2% Annual Chance Flood Hazard	3,176	0.49%	2,607	0.72%	569	0.20%
Other Areas	22,114	3.43%	15,912	4.41%	6,202	2.19%
Elk Grove Total	**26,556**	**4.12%**	**18,996**	**5.26%**	**7,560**	**2.67%**
City of Folsom						
1% Annual Chance Flood Hazard	340	0.05%	50	0.01%	290	0.10%
0.2% Annual Chance Flood Hazard	387	0.06%	128	0.04%	259	0.09%
Other Areas	19,395	3.01%	10,812	3.00%	8,583	3.03%
Folsom Total	**20,122**	**3.12%**	**10,990**	**3.04%**	**9,132**	**3.22%**
City of Galt						
1% Annual Chance Flood Hazard	409	0.06%	174	0.05%	235	0.08%
0.2% Annual Chance Flood Hazard	10	0.00%	1	0.00%	9	0.00%
Other Areas	3,442	0.53%	2,218	0.61%	1,224	0.43%
Galt Total	**3,861**	**0.60%**	**2,393**	**0.66%**	**1,467**	**0.52%**
City of Isleton						
1% Annual Chance Flood Hazard	220	0.03%	61	0.02%	159	0.06%
0.2% Annual Chance Flood Hazard	0	0.00%	0	0.00%	0	0.00%
Other Areas	13	0.00%	5	0.00%	9	0.00%

Jurisdiction/ Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Isleton Total	**233**	**0.04%**	**66**	**0.02%**	**168**	**0.06%**
City of Rancho Cordova						
1% Annual Chance Flood Hazard	1,149	0.18%	23	0.01%	1,125	0.40%
0.2% Annual Chance Flood Hazard	973	0.15%	660	0.18%	313	0.11%
Other Areas	19,264	2.99%	9,368	2.59%	9,896	3.49%
Rancho Cordova Total	**21,386**	**3.32%**	**10,051**	**2.78%**	**11,334**	**4.00%**
City of Sacramento						
1% Annual Chance Flood Hazard	34,002	5.28%	20,537	5.69%	13,465	4.75%
0.2% Annual Chance Flood Hazard	30,304	4.70%	21,078	5.84%	9,226	3.26%
Other Areas	9,649	1.50%	6,496	1.80%	3,154	1.11%
City of Sacramento Total	**73,956**	**11.48%**	**48,110**	**13.33%**	**25,845**	**9.12%**
Unincorporated Sacramento County						
1% Annual Chance Flood Hazard	203,042	31.51%	101,002	27.98%	102,040	36.00%
0.2% Annual Chance Flood Hazard	20,807	3.23%	16,406	4.54%	4,402	1.55%
Other Areas	265,505	41.20%	145,219	40.23%	120,287	42.44%
Unincorporated Sacramento County Total	**489,355**	**75.94%**	**262,627**	**72.75%**	**226,728**	**80.00%**
Grand Total	644,418	100.00%	361,003	100.00%	283,415	100.00%

Source: FEMA 7/19/2018 DFIRM

*Percentage of each jurisdiction in the flooded area

Table 4-79 Unincorporated Sacramento County – Flooded Acres by Detailed DFIRM Flood Zones and Property Use

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	38,793.2	6.02%	21,781.9	6.03%	17,011.3	6.00%
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	0.3	0.00%	0.3	0.00%	0	0.00%
Industrial	1,000.3	0.16%	0.3	0.00%	1,000.0	0.35%
Miscellaneous	927.9	0.14%	0	0.00%	927.9	0.33%
Office	0	0.00%	0	0.00%	0	0.00%
Public/Utilities	1,792.0	0.28%	0	0.00%	1,792.0	0.63%
Recreational	11.6	0.00%	0.5	0.00%	11.2	0.00%
Residential	1,652.4	0.26%	1,395.1	0.39%	257.3	0.09%
Retail/ Commercial	0.2	0.00%	0.2	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	4,589.6	0.71%	114.5	0.03%	4,475.1	1.58%
Zone A Total	**48,767.6**	**7.57%**	**23,292.8**	**6.45%**	**25,474.8**	**8.99%**
Zone AE						
Agricultural	92,965.3	14.43%	64,095.4	17.75%	28,869.9	10.19%
Care/Health	15.0	0.00%	13.3	0.00%	1.7	0.00%
Church/Welfare	103.2	0.02%	85.6	0.02%	17.6	0.01%
Industrial	1,561.4	0.24%	328.5	0.09%	1,232.9	0.44%
Miscellaneous	11,048.8	1.71%	45.8	0.01%	11,003.0	3.88%
Office	85.4	0.01%	65.4	0.02%	19.9	0.01%
Public/Utilities	3,627.9	0.56%			3,627.9	1.28%
Recreational	867.7	0.13%	507.9	0.14%	359.8	0.13%
Residential	8,245.2	1.28%	8,044.3	2.23%	200.9	0.07%
Retail/ Commercial	103.9	0.02%	98.7	0.03%	5.2	0.00%
Unknown	0.9	0.00%	0.5	0.00%	0.4	0.00%
Vacant	18,100.7	2.81%	550.3	0.15%	17,550.4	6.19%
Zone AE Total	**136,725.2**	**21.22%**	**73,835.7**	**20.45%**	**62,889.6**	**22.19%**
Zone AH						
Agricultural	0	0.00%	0	0.00%	0	0.00%
Care/Health	0	0.00%	0	0.00%	0	0.00%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Church/Welfare	0.0	0.00%	0.0	0.00%	0	0.00%
Industrial	0	0.00%	0	0.00%	0	0.00%
Miscellaneous	109.2	0.02%	0	0.00%	109.2	0.04%
Office	0.3	0.00%	0.3	0.00%	0	0.00%
Public/Utilities	2.9	0.00%	0	0.00%	2.9	0.00%
Recreational	0	0.00%	0	0.00%	0	0.00%
Residential	27.5	0.00%	27.5	0.01%	0.1	0.00%
Retail/ Commercial	4.1	0.00%	4.1	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	5.4	0.00%	0	0.00%	5.4	0.00%
Zone AH Total	**149.4**	**0.02%**	**31.9**	**0.01%**	**117.6**	**0.04%**
Zone AO						
Agricultural	0	0.00%	0	0.00%	0	0.00%
Care/Health	1.3	0.00%	1.3	0.00%	0	0.00%
Church/Welfare	13.7	0.00%	12.5	0.00%	1.2	0.00%
Industrial	14.7	0.00%	0	0.00%	14.7	0.01%
Miscellaneous	10.1	0.00%	0	0.00%	10.1	0.00%
Office	10.1	0.00%	0	0.00%	10.1	0.00%
Public/Utilities	10.8	0.00%	0	0.00%	10.8	0.00%
Recreational	0	0.00%	0	0.00%	0	0.00%
Residential	288.9	0.04%	288.1	0.08%	0.8	0.00%
Retail/ Commercial	0	0.00%	0	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	96.7	0.02%	2.9	0.00%	93.8	0.03%
Zone AO Total	**446.4**	**0.07%**	**304.9**	**0.08%**	**141.5**	**0.05%**
Zone A99						
Agricultural	7,207.9	1.12%	2,092.0	0.58%	5,115.9	1.81%
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	2.4	0.00%	2.4	0.00%	0	0.00%
Industrial	1,571.9	0.24%	816.5	0.23%	755.4	0.27%
Miscellaneous	772.3	0.12%	0	0.00%	772.3	0.27%
Office	136.9	0.02%	105.0	0.03%	31.9	0.01%
Public/Utilities	3,297.6	0.51%	0	0.00%	3,297.6	1.16%
Recreational	283.4	0.04%	129.5	0.04%	154.0	0.05%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Residential	377.5	0.06%	336.4	0.09%	41.1	0.01%
Retail/ Commercial	30.0	0.00%	28.9	0.01%	1.1	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	3,273.8	0.51%	26.4	0.01%	3,247.4	1.15%
Zone A99 Total	**16,953.6**	**2.63%**	**3,537.0**	**0.98%**	**13,416.7**	**4.73%**
1% Annual Chance Flood Hazard Total	**203,042.2**	**31.51%**	**101,002.2**	**27.98%**	**102,040.1**	**36.00%**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	518.6	0.08%	385.6	0.11%	133.0	0.05%
Care/Health	30.4	0.00%	30.4	0.01%	0	0.00%
Church/Welfare	195.2	0.03%	164.8	0.05%	30.4	0.01%
Industrial	1,020.4	0.16%	778.6	0.22%	241.8	0.09%
Miscellaneous	1,106.1	0.17%	0.2	0.00%	1,105.9	0.39%
Office	185.9	0.03%	126.1	0.03%	59.8	0.02%
Public/Utilities	274.9	0.04%			274.9	0.10%
Recreational	180.2	0.03%	89.0	0.02%	91.2	0.03%
Residential	7,022.1	1.09%	6,754.6	1.87%	267.5	0.09%
Retail/ Commercial	633.2	0.10%	615.8	0.17%	17.4	0.01%
Unknown	0.0	0.00%	0.0	0.00%	0	0.00%
Vacant	1,292.6	0.20%	93.6	0.03%	1,199.1	0.42%
0.2% Annual Chance Total	**12,459.7**	**1.93%**	**9,038.7**	**2.50%**	**3,421.0**	**1.21%**
X Protected by Levee						
Agricultural	376.9	0.06%	376.9	0.10%	0	0.00%
Care/Health	29.9	0.00%	20.3	0.01%	9.6	0.00%
Church/Welfare	96.1	0.01%	71.0	0.02%	25.1	0.01%
Industrial	470.6	0.07%	466.5	0.13%	4.1	0.00%
Miscellaneous	211.4	0.03%	0.4	0.00%	211.0	0.07%
Office	340.7	0.05%	266.9	0.07%	73.7	0.03%
Public/Utilities	221.6	0.03%			221.6	0.08%
Recreational	132.8	0.02%	32.1	0.01%	100.8	0.04%
Residential	5,924.3	0.92%	5,825.5	1.61%	98.8	0.03%
Retail/ Commercial	317.8	0.05%	298.3	0.08%	19.6	0.01%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	225.8	0.04%	9.5	0.00%	216.3	0.08%
X Protected by Levee Total	**8,347.8**	**1.30%**	**7,367.3**	**2.04%**	**980.6**	**0.35%**
0.2% Annual Chance Flood Hazard Total	**20,807.5**	**3.23%**	**16,405.9**	**4.54%**	**4,401.5**	**1.55%**
Other Areas						
Zone X						
Agricultural	130,322.9	20.22%	54,752.1	15.17%	75,570.8	26.66%
Care/Health	505.2	0.08%	481.0	0.13%	24.2	0.01%
Church/Welfare	1,170.2	0.18%	931.1	0.26%	239.2	0.08%
Industrial	14,696.6	2.28%	7,590.6	2.10%	7,106.0	2.51%
Miscellaneous	8,311.5	1.29%	3.0	0.00%	8,308.4	2.93%
Office	1,657.6	0.26%	1,134.3	0.31%	523.3	0.18%
Public/Utilities	2,694.5	0.42%	3.3	0.00%	2,691.2	0.95%
Recreational	2,349.6	0.36%	908.3	0.25%	1,441.3	0.51%
Residential	77,637.3	12.05%	76,023.4	21.06%	1,613.9	0.57%
Retail/ Commercial	1,911.0	0.30%	1,811.3	0.50%	99.7	0.04%
Unknown	1.3	0.00%	0.3	0.00%	1.0	0.00%
Vacant	24,247.8	3.76%	1,580.1	0.44%	22,667.7	8.00%
Zone X Total	**265,505.5**	**41.20%**	**145,218.8**	**40.23%**	**120,286.7**	**42.44%**
Other Areas Total	**265,505.5**	**41.20%**	**145,218.8**	**40.23%**	**120,286.7**	**42.44%**
Unincorporated Sacramento County Total	**489,355.2**	**75.94%**	**262,626.9**	**72.75%**	**226,728.3**	**80.00%**

Source: FEMA 7/19/2018 DFIRM

Insurance Coverage, Claims Paid, and Repetitive Losses

Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures located within a 100-year floodplain – a requirement that affects nearly all mortgages financed through commercial lending institutions. Flood insurance is also recommended for all structures protected by levees, even if not mapped within a floodplain.

Unincorporated Sacramento County joined the NFIP on March 15, 1979. The County participates in the CRS, and is one of the very few Class 2 communities in the United States. NFIP insurance data provided by DWR indicates that as of March 24, 2020, there were 7,497 policies in force in the unincorporated County, resulting in $2,169,765,000 of insurance in force. Of these policies, 6,878 are for residential and 619 are for non-residential properties. There have been 1,747 closed paid losses totaling $24,741,813.70. Of these losses,1,178 were parcels in A zones and 544 parcels were in B, C, or X zone, with 25 claim unknown. Of the 1,747 claims, 1,352 claims were associated with pre-FIRM structures and 370 with post-FIRM structures, with 25 claims unknown. There have been 390 repetitive loss (RL) structures, and 1 severe repetitive loss (SRL) structure in the County with 606 paid losses totaling $14,987,148.49. Of these RL buildings, 187 are in the A zones and 103 are in the B, C, or X zone. The NFIP considers a property a Repetitive Loss Property if two or more flood insurance claims of more than $1,000 have been paid within any 10-year period since 1978. A severe repetitive loss property is defined by the NFIP as a residential property with at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000.

There have been 137 substantial damage claims since 1978.

Based on this analysis of insurance coverage, unincorporated County has values at risk to the 1% and 0.2% annual chance and greater floods. Of the 4,603 improved parcels within the 1% annual chance flood zone, 2,815 (or 61.2 percent) of those parcels maintain flood insurance. This can be seen on Table 4-80.

Table 4-80 Sacramento County Planning Area – Percentage of Policy Holders to Improved Parcels in the 1% Annual Chance Floodplain

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Citrus Heights	171	130	76.0%
City of Elk Grove	269	33	12.3%
City of Folsom	12	21	100.0%
City of Galt	9	3	33.3%
City of Isleton	329	107	32.5%
City of Rancho Cordova	19	13	68.4%
City of Sacramento	30,884	26,596	86.1%
Unincorporated County	4,603	2,815	61.2%

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data

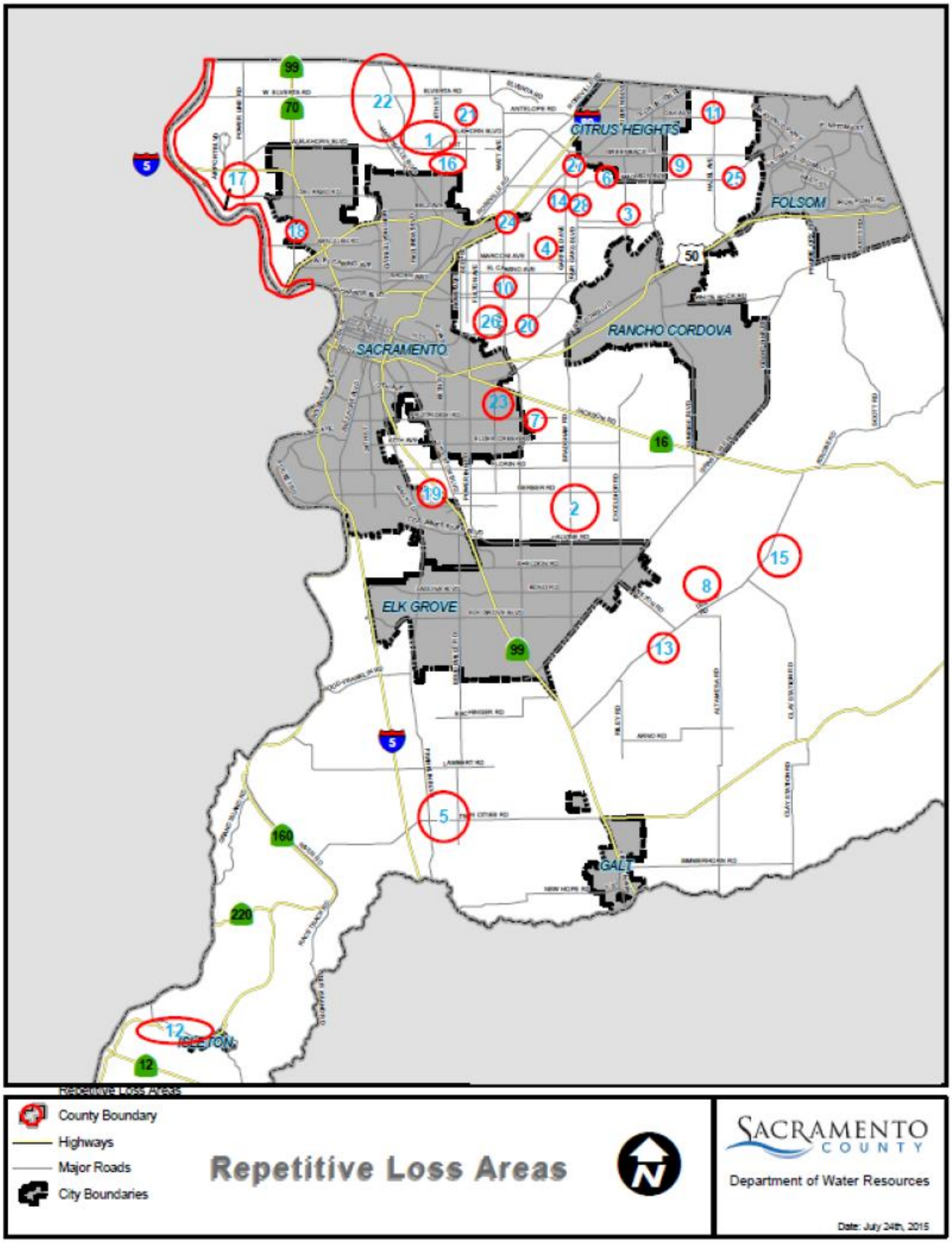
In 2012, the Biggert-Waters Flood Insurance Reform Act (BW-12) was passed putting into motion substantial annual increases to flood insurance costs until premiums are rated based on the elevation certificate. The unfortunate oversite in this is that when a levee does not meet FEMA levee accreditation standards of 44 CFR §65.10, the premiums don't recognize that there is a levee system that has stood the test of time. Instead, the DFIRMs map the floodplain into the SFHA and flood insurance premiums are rated as if there were no levees present. Consequently, whether one believes the flood hazard to be of

concern, the cost of flood insurance administered by FEMA under the current NFIP has made the cost of insurance out of reach of many local homeowners.

2015 Repetitive Loss Analysis and 2021 Repetitive Loss Annual Progress Report

Unincorporated Sacramento County's vulnerability to flooding can be seen in the number of Repetitive Loss properties as detailed above. The Repetitive Loss properties can further be grouped into Repetitive Loss Areas (RLAs). A RLA consists of Repetitive Loss Properties and the surrounding properties that experience the same or similar flooding conditions, whether or not the buildings on those surrounding properties have been damaged by flooding. Figure 4-76 shows the 28 RLAs in Sacramento County based on an analysis of the location of the RL properties for the July 2015 Repetitive Loss Area Analysis (RLAA) Report. Due to the storms of 2017, there were eight structures added to the repetitive loss list and two areas added to the RLAA. Thus the 2021 RLAA Annual Progress Report details the now 30 repetitive loss areas with 108 repetitive unmitigated flood loss structures, as listed by FEMA as of May 31, 2018. However, included in the list there are 3 houses that have been mitigated, thus the current number of unmitigated repetitive loss structures is 105. Considering that some of the structures are multi-unit residential, it may be appropriate to say that there are 139 unmitigated homes on the repetitive flood loss list. The Sacramento County Department of Water Resources Floodplain Management Section annually reaches out to property owners and is happy to seek FEMA grants to assist with the cost of mitigation. Successes include FEMA recognition of 42 mitigated repetitive loss structures and there are 3 more that will be added to the mitigated list in September 2021 as well as several more that will be added in coming years. Much greater detail can be found in the July 2015 RLAA Report, and the 2021 Annual Progress Report, as shown in Appendix G.

Figure 4-76 Unincorporated Sacramento County – Repetitive Loss Areas



Population at Risk

A separate analysis was performed to determine populations that reside in flood zones. Using GIS, the DFIRM Flood dataset was overlayed on the improved residential parcel data. Those parcel centroids that intersect a flood zone were counted and multiplied by the Census Bureau average household size; and tabulated by flood zone (see Table 4-81). According to this analysis, there is a population of 91,746 in the 1% annual chance flood zone, and 107,282 in the 0.2% annual chance flood zone for the entire Sacramento County Planning Area. Of these, in unincorporated Sacramento County, there is a population of 1,613 and 6 respectively in the 1% and 0.2% annual chance floodplains.

Table 4-81 Sacramento County Planning Area – Residential Population at Risk to 1% and 0.2% Annual Chance Flooding

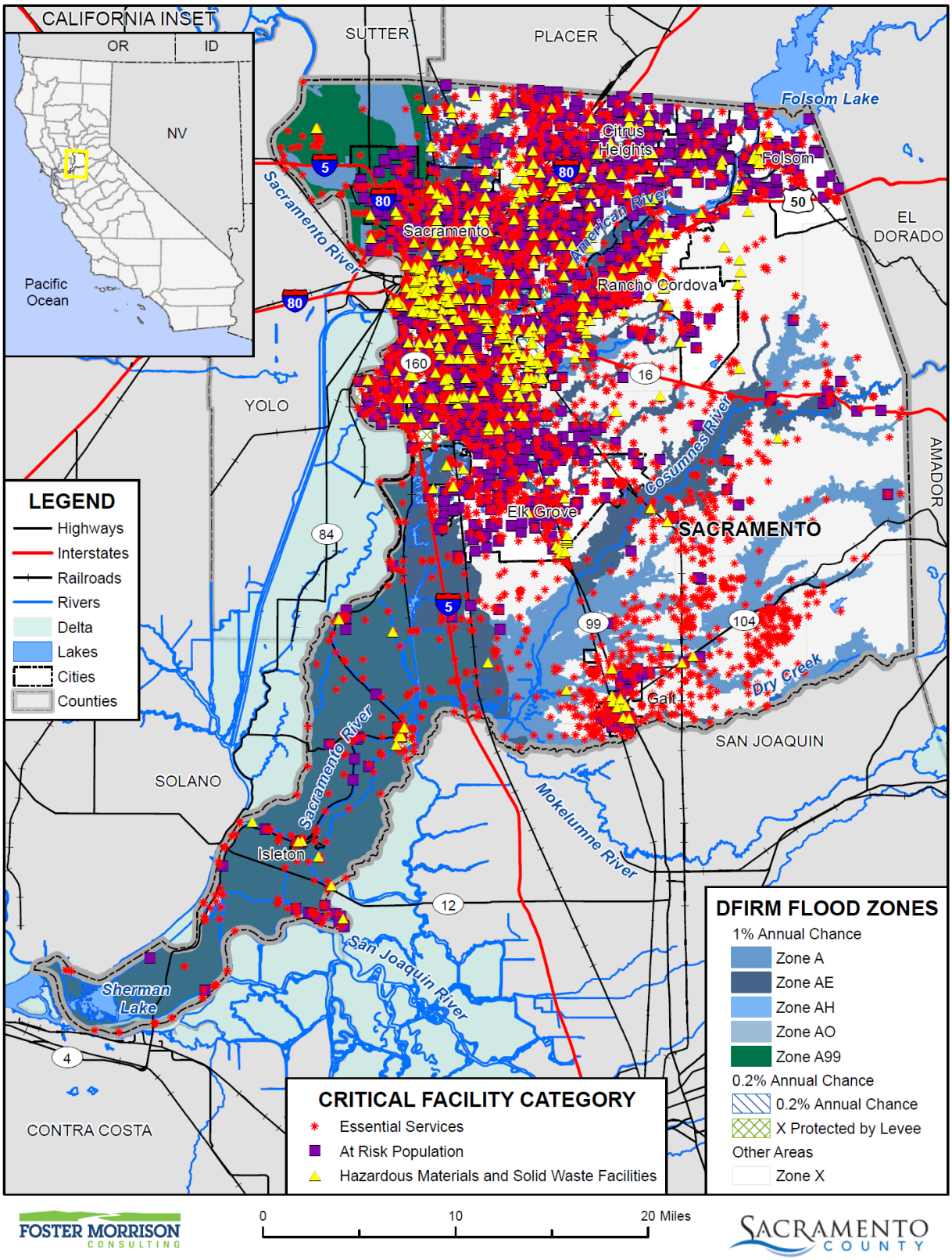
Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Citrus Heights	160	406	329	836
City of Sacramento	30,360	80,757	10,361	27,560
Elk Grove	254	813	4,033	12,906
Folsom	10	26	197	518
Galt	4	13	0	0
Isleton	254	701	0	0
Rancho Cordova	19	41	1,116	2,388
Unincorporated Sacramento County	3,257	8,989	22,853	63,074
Total	**34,318**	**91,746**	**38,889**	**107,282**

Source: FEMA DFIRM 7/19/2018, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Rancho Cordova (2.14): and unincorporated Sacramento County (2.76)
*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

Critical Facilities at Risk

A separate analysis was performed on the critical facility inventory in Sacramento County and all jurisdictions to determine critical facilities in the 1% and 0.2 annual chance flood zones. Using GIS, the DFIRM flood zones were overlayed on the critical facility GIS layer. Figure 4-77 shows critical facilities, as well as the DFIRM flood zones. Table 4-82 summarizes the critical facilities in the County by DFIRM flood zone. Table 4-83 details critical facilities by facility type and count for the unincorporated County. Details of critical facility definition, type, name and address by flood zone are listed in Appendix F.

Figure 4-77 Sacramento County Planning Area– Critical Facilities in DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 4-82 Sacramento County Planning Area– Summary of Critical Facilities in DFIRM Flood Zones

Jurisdiction / Flood Zone	Facility Count
Citrus Heights	
1% Annual Chance Flood Hazard	1
0.2% Annual Chance Flood Hazard	11
Other Areas	184
Citrus Heights Total	**196**
City of Sacramento	
1% Annual Chance Flood Hazard	288
0.2% Annual Chance Flood Hazard	1,544
Other Areas	545
City of Sacramento Total	**2,377**
Elk Grove	
1% Annual Chance Flood Hazard	4
0.2% Annual Chance Flood Hazard	54
Other Areas	449
Elk Grove Total	**507**
Folsom	
1% Annual Chance Flood Hazard	6
0.2% Annual Chance Flood Hazard	1
Other Areas	244
Folsom Total	**251**
Galt	
1% Annual Chance Flood Hazard	1
Other Areas	159
Galt Total	**160**
Isleton	
1% Annual Chance Flood Hazard	15
Other Areas	1
Isleton Total	**16**
Rancho Cordova	
1% Annual Chance Flood Hazard	3
0.2% Annual Chance Flood Hazard	11
Other Areas	384
Rancho Cordova Total	**398**

Jurisdiction / Flood Zone	Facility Count
Unincorporated Sacramento County	
1% Annual Chance Flood Hazard	778
0.2% Annual Chance Flood Hazard	492
Other Areas	2,410
Unincorporated Sacramento County Total	**3,680**
Grand Total	**7,585**

Source: Sacramento County GIS, FEMA 7/19/2018 DFIRM

Table 4-83 Unincorporated Sacramento County – Critical Facilities in DFIRM Flood Zones by Facility Category

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
1% Annual Chance Flood Hazard		
Essential Services Facilities	Airport	1
	Bridge	48
	Cellular Tower	8
	Emergency Evacuation Center	4
	EMS Stations	5
	Fire Station	7
	Law Enforcement	4
	Microwave Service Towers	284
	Port Facilities	46
	Power Plants	6
	Pump Station	2
	Sewage Treatment Plant	2
	State Government Buildings	1
	Water Well	279
	Total	**697**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	1
	Community Center	1
	Day Care Center	2
	Mobile Home Parks	22
	Places of Worship	19
	School	14
	Total	**59**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	1

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
	Leaky Underground Storage Tank	17
	Solid Waste Facility	3
	Total	**22**
1% Annual Chance Flood Hazard Total		**778**
0.2% Annual Chance Flood Hazard		
Essential Services Facilities	Cellular Tower	2
	Emergency Evacuation Center	12
	EMS Stations	8
	FDIC Insured Banks	15
	Fire Station	8
	Law Enforcement	5
	Microwave Service Towers	69
	Power Plants	3
	Public Transit Stations	4
	Pump Station	3
	State Government Buildings	1
	Water Well	124
	Total	**254**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	7
	Day Care Center	38
	Mobile Home Parks	13
	Places of Worship	88
	School	50
	Total	**196**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	9
	Leaky Underground Storage Tank	32
	Solid Waste Facility	1
	Total	**42**
0.2% Annual Chance Flood Hazard Total		**492**
Other Areas		
Essential Services Facilities	Airport	2
	Bridge	3
	Cellular Tower	13
	Emergency Evacuation Center	38
	EMS Stations	36
	FDIC Insured Banks	43

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
	Fire Station	42
	Hospital or Urgent Care	4
	Law Enforcement	17
	Microwave Service Towers	665
	Power Plants	31
	Public Transit Stations	3
	Pump Station	2
	Sandbag Site	3
	Sewage Treatment Plant	2
	State Government Buildings	1
	Water Well	696
	Total	**1,601**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	4
	Community Center	3
	Day Care Center	100
	Mobile Home Parks	30
	Places of Worship	307
	School	253
	Total	**697**
Hazardous Materials and Solid Waste Facilities Total	EPA ER FRP Facility	1
	EPA ER TRI Facility	13
	EPA ER TSCA Facility	1
	Leaky Underground Storage Tank	78
	Solid Waste Facility	18
	Waste Transfer Station	1
		112
Other Areas Total		**2,410**
Unincorporated Sacramento County Total		**3,680**

Source: Sacramento County GIS, FEMA 7/19/2018 DFIRM

Overall Community Impact

Floods and their impacts vary by location and severity of any given flood event and will likely only affect certain areas of the County during specific times. Natural areas, such as wetlands and riparian areas within the floodplain, often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters. Preserving and protecting these areas and associated functions are a vital component of sound floodplain management

practices for Sacramento County. Based on the risk assessment, it is evident that floods will continue to have potentially devastating economic impacts to certain areas of the County. However, many of the floods in the County are minor, localized flood events that are more of a nuisance than a disaster. Impacts that are not quantified, but can be anticipated in large future events, include:

- Injury and loss of life;
- Commercial and residential structural and property damage;
- Disruption of and damage to public infrastructure and services;
- Health hazards associated with mold and mildew, contamination of drinking water, etc.;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) to the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.
- Impact on the overall mental health of the community.

Future Development and Future Flood Conditions

This section provides an analysis of the flood hazard and proposed future development within the County based on FEMA DFIRMs and also discusses considerations in evaluating future flooding conditions.

Future Development: General Considerations

Communities that participate in the NFIP adopt regulations and codes that govern development in special flood hazard areas and enforce those requirements through their local floodplain management ordinances through the issuance of permits. Sacramento County's floodplain management ordinance provides standards for development, subdivision of land, construction of buildings, and improvements and repairs to buildings that meet the minimum requirements of the NFIP.

The International Residential Code (IRC) and International Building Code (IBC), by reference to ASCE 24, include requirements that govern the design and construction of buildings and structures in flood hazard areas. FEMA has determined that the flood provisions of the I-Codes are consistent with the requirements of the NFIP (the I-Code requirements shown either meet or exceed NFIP requirements). ASCE 24, a design standard developed by the American Society of Civil Engineers, expands on the minimum NFIP requirements with more specificity, additional requirements, and some limitations.

With the adoption of the 2015, and later, International Codes, communities will be moving towards a more stringent approach to regulatory floodplain management, beyond the minimum requirements of the NFIP. The adoption and enforcement of disaster-resistant building codes is a core community action to promote effective mitigation. When communities ensure that new buildings and infrastructure are designed and constructed in accordance with national building codes and construction standards, they significantly increase local resilience now and in the future. With continued advancements in building codes, local ordinances should be reviewed and updated to meet and exceed standards as practicable to protect new development from future flood events and to further promote disaster resiliency.

One of the most effective ways to reduce vulnerability to potential flood damage is through careful land use planning that fully considers applicable flood management information and practices. Master planning will also be necessary to assure that open channel flood flow conveyances serving the smaller internal streams and drainage areas are adequately prepared to accommodate the flows. Preservation and maintenance of natural and riparian areas should also be an ongoing priority to realize the flood control benefits of the natural and beneficial functions of these areas. Also to be considered in reducing flooding in areas of existing and future development is to promote implementation of stormwater program elements and erosion and sediment controls, including the clearing of vegetation from natural and man-made drains that are critical to flood protection. Both native and invasive species can clog drains, and reduce flows of floodwaters, which slow that natural drainage process and can exacerbate flooding.

California's 2007 flood legislation (Senate Bill 5) directly linked system-wide flood management planning to local land use planning, requiring local jurisdictions to demonstrate an urban level of flood protection before approving new development in urban and urbanizing areas. "Urban level of flood protection" means the level of protection necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year (California Government Code Section 65007). DWR has been developing criteria to guide local jurisdiction compliance with the new requirements. In addition to developing criteria to help local jurisdictions in their land use planning, DWR is preparing criteria for use in the design of levees protecting urban and urbanizing areas. DWR is also working with local partners to develop guidance related to nonurban flood protection levels.

Once these standards become effective, cities and counties within the Sacramento-San Joaquin Valley cannot enter into development agreements or issue a permit to construct a new structure in areas located within a flood hazard zone unless the following is established:

- Find that existing facilities protect urban and urbanizing areas to a 1-in 200 chance of flooding in any given year or the FEMA standard of flood protection in non-urbanized areas, or
- Find that the local flood management agency has made adequate progress on the construction of the flood protection system to provide the required level of protection, or
- Impose conditions on the development agreement that will provide the required level of protection.

Future Development and Streambank Erosion

Planned developments should take erosion risk areas into account during the construction of new homes and commercial properties. Erosion to streambanks may increase as development increases the amount of impervious surface that would normally hold or slow rainwaters. The County will continue to enforce the zoning and subdivision ordinances that are discussed in Section 4.4.1.

GIS Analysis

Sacramento County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the seven future development projects were mapped. For the flood analysis of future development areas, the parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point and linked to the

Assessor's data. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each FEMA flood zone. DFIRM flood zones and future development areas are shown on Figure 4-78 and parcels and acreages in those areas are shown in Table 4-84.

Figure 4-78 Unincorporated Sacramento county – Future Development and DFIRM Flood Zones

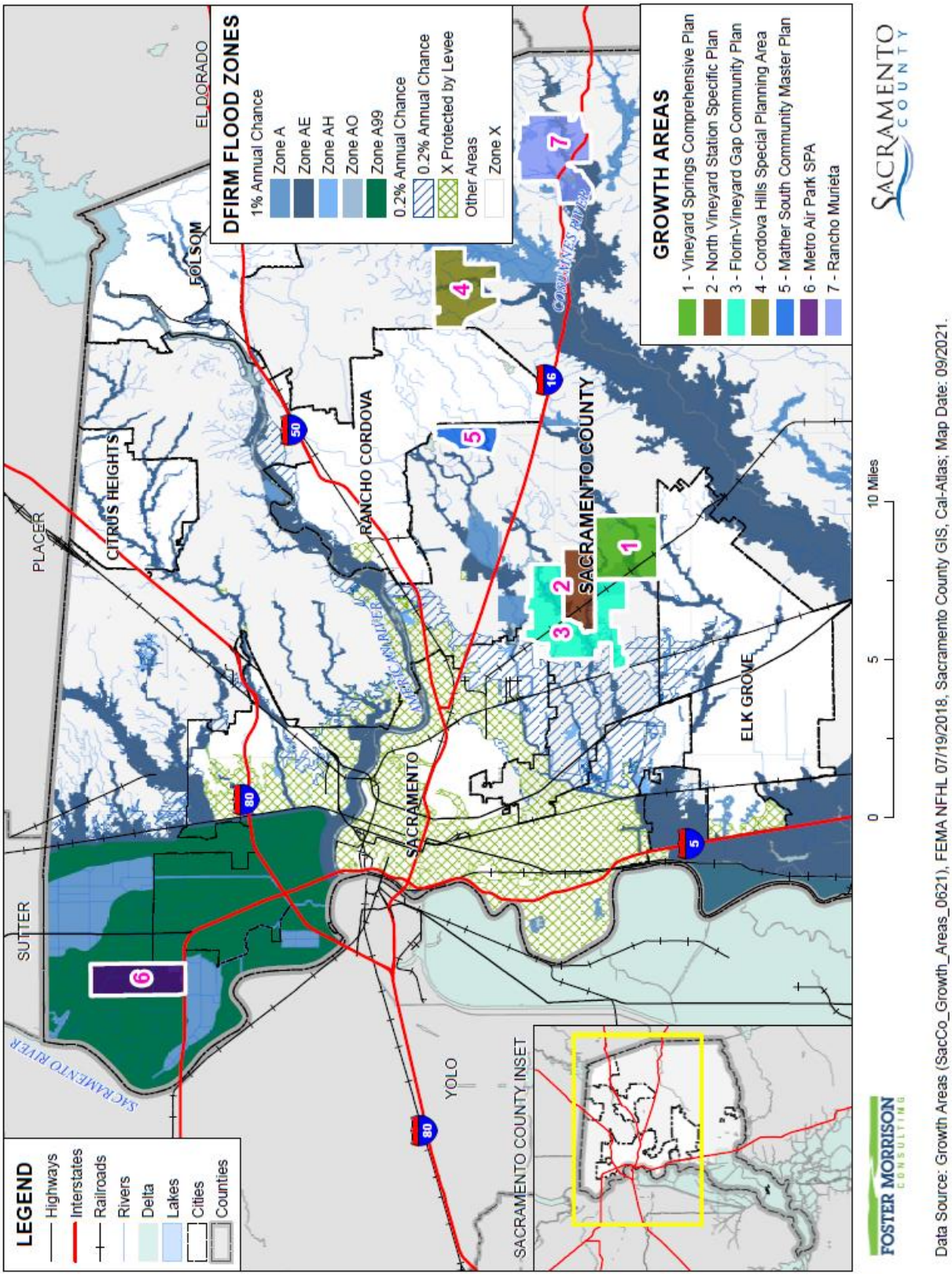


Table 4-84 Unincorporated Sacramento County – Future Development in FEMA DFIRM Flood Zones

Flood Zone/Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
1% Annual Chance Flood Hazard			
Zone A			
Metro Air Park SPA	6	0	36
Rancho Murieta	3	0	84
Zone A Total	**9**	**0**	**120**
Zone AE			
Florin-Vineyard Gap Community Plan	70	39	374
North Vineyard Station Specific Plan	40	11	127
Rancho Murieta	8	1	562
Vineyard Springs Comprehensive Plan	58	43	241
Zone AE Total	**176**	**94**	**1,305**
Zone AH			
North Vineyard Station Specific Plan	1	0	12
Zone AH Total	**1**	**0**	**12**
Zone AO			
Florin-Vineyard Gap Community Plan	40	33	186
North Vineyard Station Specific Plan	2	1	15
Vineyard Springs Comprehensive Plan	42	34	185
Zone AO Total	**84**	**68**	**387**
Zone A99			
Metro Air Park SPA	68	4	1,771
Zone A99 Total	**68**	**4**	**1,771**
1% Annual Chance Flood Hazard Total	**338**	**166**	**3,595**
0.2% Annual Chance Flood Hazard			
Florin-Vineyard Gap Community Plan	329	295	499
North Vineyard Station Specific Plan	14	7	33
Rancho Murieta	120	114	368
Vineyard Springs Comprehensive Plan	23	19	41
0.2% Annual Chance Total	**486**	**435**	**941**
X Protected by Levee			
Rancho Murieta	178	132	64
X Protected by Levee Total	**178**	**132**	**64**
0.2% Annual Chance Flood Hazard Total	**664**	**567**	**1,006**
Other Areas			
Zone X			

Flood Zone/Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Cordova Hills Special Planning Area	14	0	2,406
Florin-Vineyard Gap Community Plan	597	454	2,640
Mather South Community Master Plan	4	0	1,007
North Vineyard Station Specific Plan	1,793	1,447	1,309
Rancho Murieta	2,634	2,345	2,145
Vineyard Springs Comprehensive Plan	2,661	2,495	1,886
Zone X Total	**7,703**	**6,741**	**11,393**
Other Areas Total	**7,703**	**6,741**	**11,393**
Grand Total	**8,705**	**7,474**	**15,994**

Source: Sacramento County, FEMA 7/19/2018 DFIRM

Future Flood Conditions: The Effects of Climate Change

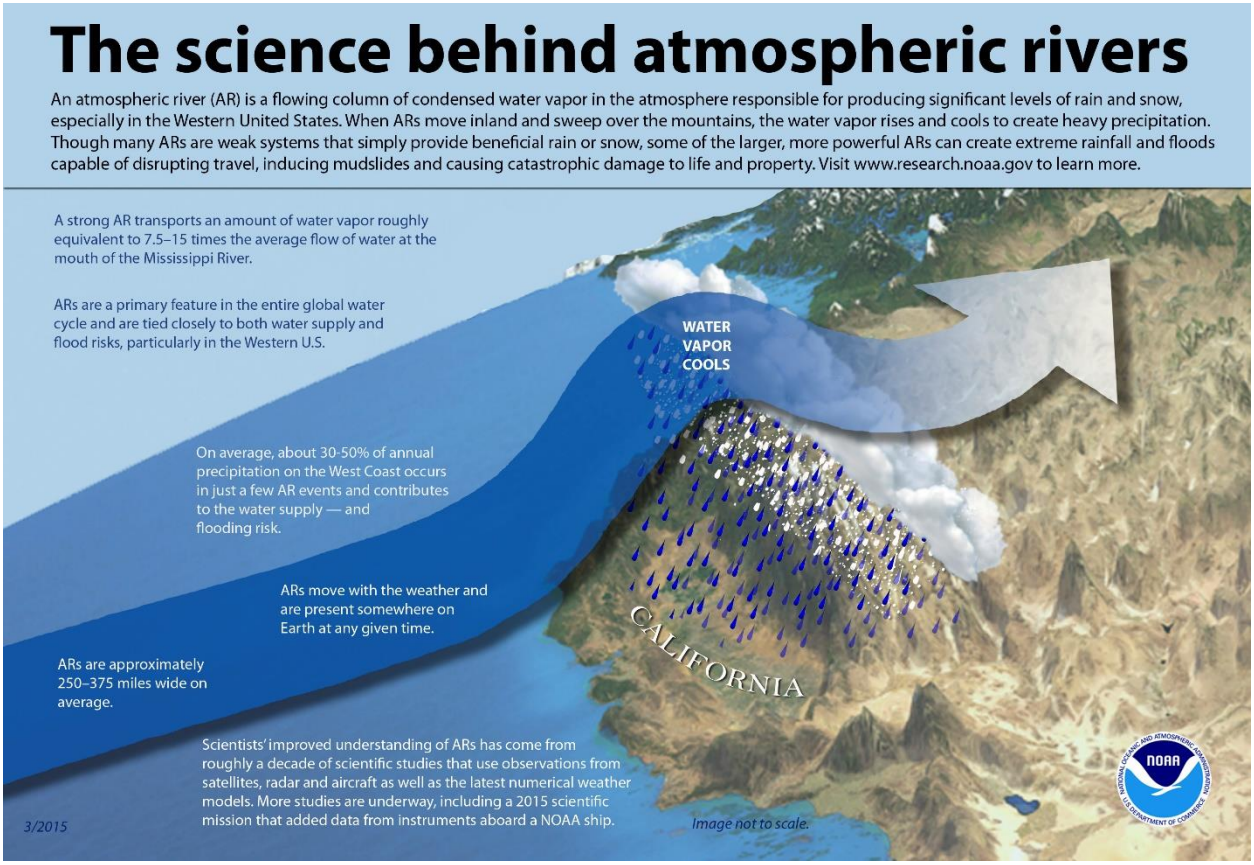
The effects of climate change on future flood conditions should also be considered. While the risk and associated short and long-term impacts of climate change are uncertain, experts in this field tend to agree that among the most significant impacts include those resulting from increased heat and precipitation events that cause increased frequency and magnitude of flooding. Changes associated with climate change and flooding could be significant given the higher elevations in the County where winter snow could turn to more significant rain events. Increases in damaging flood events will cause greater property damage, public health and safety concerns displacement, and loss of life. In addition, an increase in the magnitude and severity of flood events can lead to potential contamination of potable water and contamination of food crops given the agricultural industry in the County. Displacement of residents can include both temporary and long-term displacement, increase in insurance rates or restriction of coverage in vulnerable areas.

Sacramento County will continue to study the risk and vulnerability associated with future flood conditions, both in terms of future growth areas and other considerations such as climate change, as they evaluate and implement their flood mitigation and adaptation strategy for the Sacramento County Planning Area.

Future Flood Conditions: Atmospheric Rivers

Sacramento County and the rest of Northern California can be affected by a phenomenon known as an atmospheric river. According to the NOAA, atmospheric rivers are relatively long, narrow regions in the atmosphere – like rivers in the sky – that transport most of the water vapor outside of the tropics. These columns of vapor move with the weather, carrying an amount of water vapor roughly equivalent to the average flow of water at the mouth of the Mississippi River. When the atmospheric rivers make landfall, they often release this water vapor in the form of rain or snow. This can be seen in Figure 4-79.

Figure 4-79 Atmospheric Rivers



Source: NOAA

Although atmospheric rivers come in many shapes and sizes, those that contain the largest amounts of water vapor and the strongest winds can create extreme rainfall and floods, often by stalling over watersheds vulnerable to flooding. These events can disrupt travel, induce mudslides and cause catastrophic damage to life and property. A well-known example is the "Pineapple Express," a strong atmospheric river that is capable of bringing moisture from the tropics near Hawaii over to the U.S. West Coast.

Not all atmospheric rivers cause damage; most are weak systems that often provide beneficial rain or snow that is crucial to the water supply. Atmospheric rivers are a key feature in the global water cycle and are closely tied to both water supply and flood risks — particularly in the western United States.

While atmospheric rivers are responsible for great quantities of rain that can produce flooding, they also contribute to beneficial increases in snowpack. A series of atmospheric rivers fueled the strong winter storms that battered the U.S. West Coast from western Washington to southern California from Dec. 10–22, 2010, producing 11 to 25 inches of rain in certain areas. These rivers also contributed to the snowpack in the Sierras, which received 75 percent of its annual snow by Dec. 22, the first full day of winter.

Future Flood Conditions: ARkStorm Scenario

Also to be considered in evaluating potential "worst case" future flood conditions, is the ARkStorm Scenario. Although much attention in California's focuses on the "Big One" as a high magnitude earthquake, there is the risk of another significant event in California – a massive, statewide winter storm. The last such storms occurred in the 19th century, outside the memory of current emergency managers, officials, and communities. However, massive storms are a recurring feature of the state, the source of rare but inevitable disasters. The USGS Multi Hazards Demonstration Project's (MHDP) developed a product called ARkStorm, which addressed massive U.S. West Coast storms analogous to those that devastated California in 1861-1862. Over the last decade, scientists have determined that the largest storms in California are the product of phenomena called Atmospheric Rivers, and so the MHDP storm scenario is called the ARkStorm, for Atmospheric River 1000 (a measure of the storm's size).

Scientific studies of offshore deposits in northern and southern California indicate that storms of this magnitude and larger have occurred about as often as large earthquakes on the southern San Andreas Fault. Such storms are projected to become more frequent and intense as a result of climate change. This scientific effort resulted in a plausible flood hazard scenario to be used as a planning and preparation tool by hazard mitigation and emergency response agencies.

For the ARkStorm Scenario, experts designed a large, scientifically realistic meteorological event followed by an examination of the secondary hazards (e.g., landslides and flooding), physical damages to the intense winter storms of 1861-62 that left California's Central Valley impassible. Storms far larger than the ARkStorm, dubbed megastorms, have also hit California at least six times in the last two millennia.

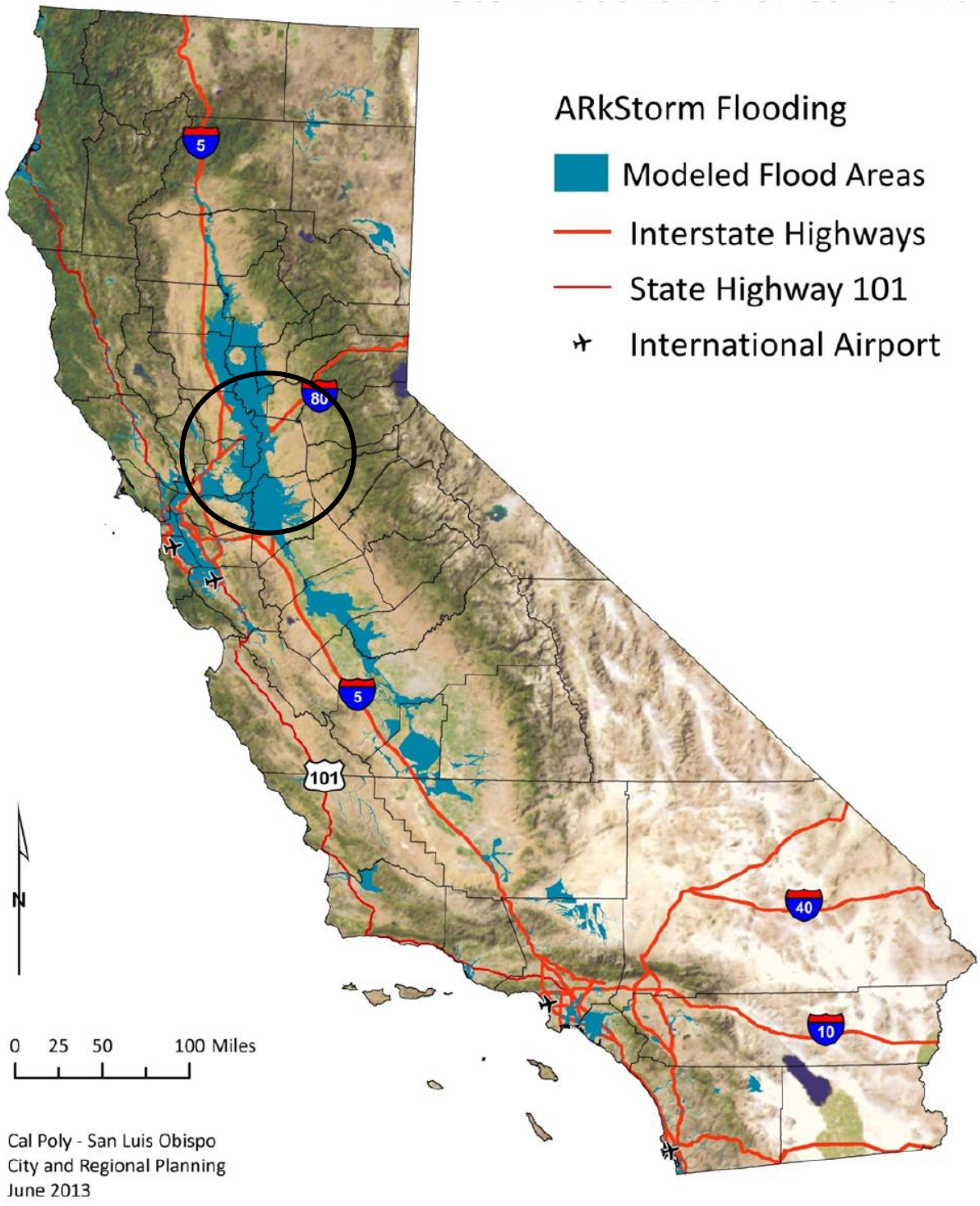
The ARkStorm produces precipitation in many places exceeding levels experienced on average every 500 to 1,000 years. Extensive flooding in many cases overwhelms the state's flood protection system, which is at best designed to resist 100- to 200-year runoffs (many flood protection systems in the state were designed for smaller runoff events). The Central Valley experiences widespread flooding. Serious flooding also occurs in Orange County, Los Angeles County, San Diego, the San Francisco Bay Area, and other coastal communities. In some places, winds reach hurricane speeds, as high as 125 miles per hour. Hundreds of landslides occur, damaging roads, highways, and homes. Property damage exceeds $300 billion, most of it from flooding. Agricultural losses and other costs to repair lifelines, dewater flooded islands, and repair damage from landslides brings the total direct property loss to nearly $400 billion, of which only $20 to $30 billion would be recoverable through public and commercial insurance. Power, water, sewer, and other lifelines experience damage that takes weeks or months to restore. Flooding evacuation could involve over one million residents in the inland region and Delta counties.

A storm of ARkStorm's magnitude has important implications: 1) it raises serious questions about the ability of existing national, state, and local disaster policy to handle an event of this magnitude; 2) it emphasizes the choice between paying now to mitigate, or paying a lot more later to recover; 3) innovative financing solutions are likely to be needed to avoid fiscal crisis and adequately fund response and recovery costs; 4) responders and government managers at all levels could be encouraged to conduct self-assessments and devise table-top exercises to exercise their ability to address a similar event; 5) the scenario can be a reference point for application of FEMA and Cal OES guidance connecting federal, state, and local natural hazards mapping and mitigation planning under the NFIP and Disaster Mitigation Act of 2000; and 6)

common messages to educate the public about the risk of such an extreme event could be developed and consistently communicated to facilitate policy formulation and transformation.

Figure 4-80 depicts an ARkStorm modeled scenario showing the potential for flooding primarily in the Central Valley as the result of a large storm. In Sacramento County, the modeled scenario suggests the County could be inundated on the western portion of the County and in the Delta in this ARkStorm model scenario.

Figure 4-80 Projected ARkStorm Flooding in California



Source: USGS ArkStorm

4.3.12. Flood: Localized Flooding

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

Flooding occurs in areas other than the FEMA mapped floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration. Flooding is more severe when previous rainfall has created saturated ground conditions. Urban storm drainpipes and pump stations have a finite capacity. When rainfall exceeds this capacity, or the system is clogged, water accumulates in the street until it reaches a level of overland release. This type of flooding may occur when intense storms occur over areas of development.

Location and Extent

According to Sacramento County, numerous parcels and roads throughout the County not included in the FEMA 1% and 0.2% annual chance floodplains are subject to flooding in heavy rains. In addition to flooding, damage to these areas during heavy storms includes pavement deterioration, washouts, mudslides, debris areas, and downed trees. The frequency and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff.

Table 4-85 identifies the number of parcels and roads by watersheds affected by localized flooding throughout the unincorporated County. Parcels were identified by the County based on those parcels historically affected by localized flooding issues. Affected roads are estimated based on those roads fully within 50 feet of a parcel with historical flooding problems. The Watershed Management Plan included as Appendix H to this LHMP Update also addresses these flood prone areas falling outside of the established 1% and 0.2% annual chance floodplains.

Table 4-85 Unincorporated Sacramento County Localized Flooding Areas

Watershed	# of Parcels Affected	# of Road Segments Affected
Alder Creek	18	82
American River	4	9
Antelope Creek	19	60
Arcade Creek	724	348
Arcade Creek South Branch	74	75
Arkansas Creek	15	4
Badger Creek	115	45

Watershed	# of Parcels Affected	# of Road Segments Affected
Beach Stone Lake	37	31
Bear Slough	0	0
Boyd Creek	0	0
Brooktree Creek	8	7
Browns Creek	12	1
Buffalo Creek	100	681
Carmichael Creek	460	270
Carson Creek	30	5
Chicken Ranch Slough	512	285
Cordova Coloma Stream Group	0	0
Cosumnes River	277	264
Courtland	0	0
Coyle Creek	138	60
Coyote Creek	47	5
Crevis Creek	17	8
Cripple Creek	53	50
Date Creek	51	38
Deadman's Gulch	136	68
Deer Creek	42	27
Diablo Creek	238	108
Dry Creek	241	161
Dry Creek South	68	38
East Antelope	37	58
East Natomas	224	98
Elder Creek	59	63
Elk Grove Creek	1	1
Fair Oaks Stream Group	1082	628
Florin Creek	1300	274
Frye Creek	15	9
Gerber Creek	19	47
Griffith Creek	103	25
Grizzly Slough	1	0
Hadselville Creek	55	15
Hagginbottom	587	178
Hagginwood Creek	202	82
Hen Creek	74	34
Hood	0	0

Watershed	# of Parcels Affected	# of Road Segments Affected
Laguna Creek	127	104
Laguna Creek South	68	41
Linda Creek	395	179
Little Deer Creek	2	1
Magpie Creek	230	470
Manlove	70	33
Mariposa Creek	0	0
Mayhew Slough	69	72
Minnesota Creek	246	155
Morrison Creek	802	274
Natomas Basin	16	5
Negro Slough	59	24
NEMDC Trib 1	91	26
NEMDC Trib 2	170	55
NEMDC Trib 3	186	106
North Delta	0	0
North Fork Badger Creek	98	65
Robla Creek	664	259
Rolling Draw Creek	8	10
San Juan Creek	51	27
Sierra Branch	167	95
Sierra Creek	93	210
Skunk Creek	60	45
Slate Creek	0	0
Strawberry Creek	165	83
Strong Ranch Slough	837	348
Sunrise Creek	0	0
Unionhouse Creek	626	161
Verde Cruz Creek	109	93
Whitehouse Creek	0	0
Willow Creek Middle	0	0
Willow Creek South	22	11
Total	**12,626**	**7,194**

Source: Sacramento County, 2021

Past Occurrences

Disaster Declarations

There are no identified state or federal disaster declarations for localized flooding, as shown in Table 4-4. However, localized flooding was likely an issue during previous declarations for severe storms, heavy rains and floods.

NCDC Events

The past occurrences of localized flooding are included in the 1% and 0.2% annual chance flood hazard profile in Section 4.3.12.

Hazard Mitigation Planning Committee Events

The Planning Team for the County noted the following localized flooding events that have occurred in the County since 2011.

- **Mar 24**, 2011 – High winds & 1 – 1.5" rain. 90 service calls, most for plugged drains. 1 structure flooded.
- **Nov 30, 2012** – Dec 3. – High winds & 4" -6" rain. 800 service calls w/ 474 drainage service requests. 24 Mobile homes flooded at Auburn Blvd. & 15 other structures Countywide.
- **February 10, 2014** - 2.5" – 4.5" rain. 72 drainage service calls.
- **Dec 2 – 4, 2014** – 1.1 -5.5" rain. 321 drainage service calls. No structural flooding. Watt Ave. and Roseville Rd. number 1 lane flooded with 2 feet of water due to clogged drain. Roadway flooding in Sacramento on southbound Highway 99 near Sacramentoville Rd. Water was as deep as car doors and traffic was backed up. I-80 at Watt Ave. Eastbound Underpass had significant flooding due to heavy rain and pump failure. This resulted in major traffic backup, lasting several hours during evening rush hour.
- **Dec 11 -12, 2014** – 2.3" – 3.5" rain. 179 drainage service calls.
- **Feb 5 – 9, 2015** – 1"-3" rain. 47 drainage service calls.
- **January 5th & 19th, 2016** – A cool winter storm brought moderate rain, 1-2 inches across the Valley, with ponding on roads and small stream rises. There was roadway flooding with partial lane blockage reported on I80 and also on US Highway 50.
- **January and February 2017** – Heavy rains caused multiple areas of localized flooding in both unincorporated Sacramento County, as well as in cities in the County.
- **January 17, 2019** – Stockton Blvd was impassable due to flooding. Local media shared a video of law enforcement rescuing a stranded motorist in Sloughhouse near Kiefer Blvd and Jackson Rd. Road was completely flooded. Areas of the County received up to 2.3 inches of rainfall.
- **February 25, 2019** – CHP reported Roseville Road north and southbound just north of Antelope Rd. closed due to flooding, roadway flooding from arcade creek reported at Winding Way and Walnut Ave, roadway flooding on I80 W at Truxel Rd. off-ramp, and roadway flooding with 8 inches of water affecting north and southbound Stockton Blvd north of Elsie Ave. The rainfall record (2/25/19 10am to 2/27/19 10am) shows 2.6 to 2.7 inches of rainfall in 24 hours
- **April 5, 2020** – California Highway Patrol reported 2 feet of water flooding between I80 W and Madison Avenue near North Highlands, CA, 8 inches of water flooding the roadway between Eastern

Ave and Marconi Ave, 1 1/2 feet of water flowing across all lanes between Interstate 80 East and Auburn Boulevard near North Highlands, roadway flooding between Sutters Gold Drive and Manlove Road in Rosemont, CA, roadway flooding near Whitney Avenue in Carmichael, CA, roadway flooding between Roseville Road and Antelope Road in Antelope, CA, roadway flooding between Kiefer Blvd and Rosemont Drive in Rosemont, C, and roadway flooding between Sunrise Blvd and Wildridge Dr in Fair Oaks, CA. Several rain gauges recorded intense rainfall over a short duration, some reaching 20 to 80 year storm return frequency for 1 hour intensity.

Likelihood of Future Occurrence

Highly Likely— With respect to the localized, stormwater flood issues, the potential for flooding may increase as storm water is channelized due to land development. Such changes can create localized flooding problems in and outside of natural floodplains by altering or confining natural drainage channels. Urban storm drainage systems have a finite capacity. When rainfall exceeds this capacity or systems clog, water accumulates in the street until it reaches a level of overland release. With increasing urbanization of the Sacramento County Planning Area, combined with older infrastructure, this type of flooding will continue to occur during heavy rains. Based on historical data, localized, stormwater flooding events less severe than a 1% annual chance flood and those outside of the floodplain occur frequently (on an annual basis) during periods of heavy rains.

Climate Change and Localized Flood

While it is uncertain exactly how climate change will affect flooding events in Sacramento County, and to what extent, any increase in flooding is highly likely to have serious ramifications, because the area is already considerably vulnerable. Even if average annual rainfall may decrease slightly, the intensity of individual rainfall events is likely to increase during the 21st century, increasing the likelihood of overwhelming stormwater systems built to historical rainfall averages. This makes localized flooding more likely.

Vulnerability Assessment

Vulnerability—Medium

Historically, the Sacramento County Planning Area has been at risk to flooding primarily during the winter and spring months when stream systems in the County swell with heavy rainfall. Localized flooding also occurs throughout the Planning Area at various times throughout the year with several areas of primary concern unique to each community. Sacramento County tracks localized flooding areas as shown above.

Impacts

Localized flooding can cause damage to roads, infrastructure and utilities, as well as to buildings in the County. Temporary road closures due to localized flooding can be a significant issue in the County. In addition to flooding and road closures, damage to these areas during heavy storms includes, pavement deterioration, washouts, landslides/mudslides, debris areas, and downed trees. Impacts to property and life safety from localized flooding would be more limited. Local community service districts have seen infiltration and inflow into sewer systems during heavy rain and localized flooding events.

Values at Risk

Areas in Sacramento County vulnerable to localized flooding were identified by the County and analysis was performed for the 2011 and 2016 Plan Update. That analysis was updated here, using 2021 mean values of structures in the County. Parcel and road segments vulnerable to these areas were tabulated by watershed, and are shown in Table 4-85 above. Road segments were initially selected if they were within 50 feet of an affected parcel. For the purposes of this analysis, parcels and road segments that overlapped watershed boundaries were counted for each of the watersheds. Parcels and road segments that intersect the 1% or.2% annual flood events (see DFIRM flood analysis, Section 4.3.10) were eliminated from these counts. It is important to note that localized flooding may also occur within those DFIRM zones, making this analysis a conservative approach.

There are 12,626 parcels affected by localized flooding (and outside of the DFIRM flood zones) in Sacramento County, as shown above in Table 4-85. According to the County Assessor data, the mean (average) structure value of improved residential parcels county-wide is $386,000 (it was $295,000 in 2016 and $158,665 in 2010). Assuming that the parcels listed in Table 4-85 are improved residential parcels, there is a total structure value of $4.87 billion at risk to localized flooding. Assuming contents value is 50% of residential structure value, there is a total value of $7.3 billion at risk. Applying the 20% loss due to flooding, the loss estimate for the Planning Area is $1.46 billion. Total values at risk are shown in Table 4-86. Total population at risk to localized flooding is 34,848 (based on Census 2020 household factor of 2.76).

Table 4-86 Sacramento County Planning Area – Vulnerability to Localized Flooding

Parcel Count	Improved Value/Parcel*	Structure Value	Contents Value	Total Value	Loss Estimate
12,626	$386,000	$4,873,636,000	$2,436,818,000	$7,310,454,000	$1,462,090,800

Source: Sacramento County, 2021

*mean value of an improved residential structure

Future Development

The risk of stormwater/localized flooding to future development can be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding or choosing not to develop in areas that often are subject to localized flooding will reduce future risks of losses due to stormwater/localized flooding.

4.3.13. Landslide/Mudslide/Debris Flows

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

According to the California Geological Survey (CGS), landslides refer to a wide variety of processes that result in the perceptible downward and outward movement of soil, rock, and vegetation under gravitational influence. Common names for landslide types include slump, rockslide, debris slide, lateral spreading, debris avalanche, earth flow, and soil creep. Landslides may be triggered by both natural and human-induced changes in the environment that result in slope instability.

The susceptibility of an area to landslides depends on many variables including steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage areas. Landslide events can be determined by the composition of materials and the speed of movement. A rockfall is dry and fast while a debris flow is wet and fast. Regardless of the speed of the slide, the materials within the slide, or the amount of water present in the movement, landslides are a serious natural hazard. Another type of landslide, debris flows, also occur in some areas of the County. These debris flows generally occur in the immediate vicinity of existing drainage swales or steep ravines. Debris flows occur when near surface soil in or near steeply sloping drainage swales becomes saturated during unusually heavy precipitation and begins to flow downslope at a rapid rate. Debris flows also occur in post-wildfire burn areas.

Landslides often accompany or follow other natural hazard events, such as floods, wildfires, or earthquakes. A discussion on the effects of wildfire on landslides and debris flows is included in the wildfire profile in Section 4.3.16. Landslides can occur slowly or very suddenly and can damage and destroy structures, roads, utilities, and forested areas, and can cause injuries and death.

Soil erosion is another common form of soil instability. Erosion is a function of soil type, slope, rainfall intensity, and groundcover. It accounts for a loss in many dollars of valuable soil, is aesthetically displeasing, and often induces even greater rates of erosion and sedimentation. Sedimentation is simply the accumulation of soil as a result of erosion. Construction activities often contribute greatly to erosion and sedimentation. Besides being a pollutant in its own right, sediment acts as a transport medium for other pollutants, especially nutrients, pesticides, and heavy metals, which adhere to the eroded soil particles. As the sediment drains into watercourses, the combination of these pollutants adversely affects water quality.

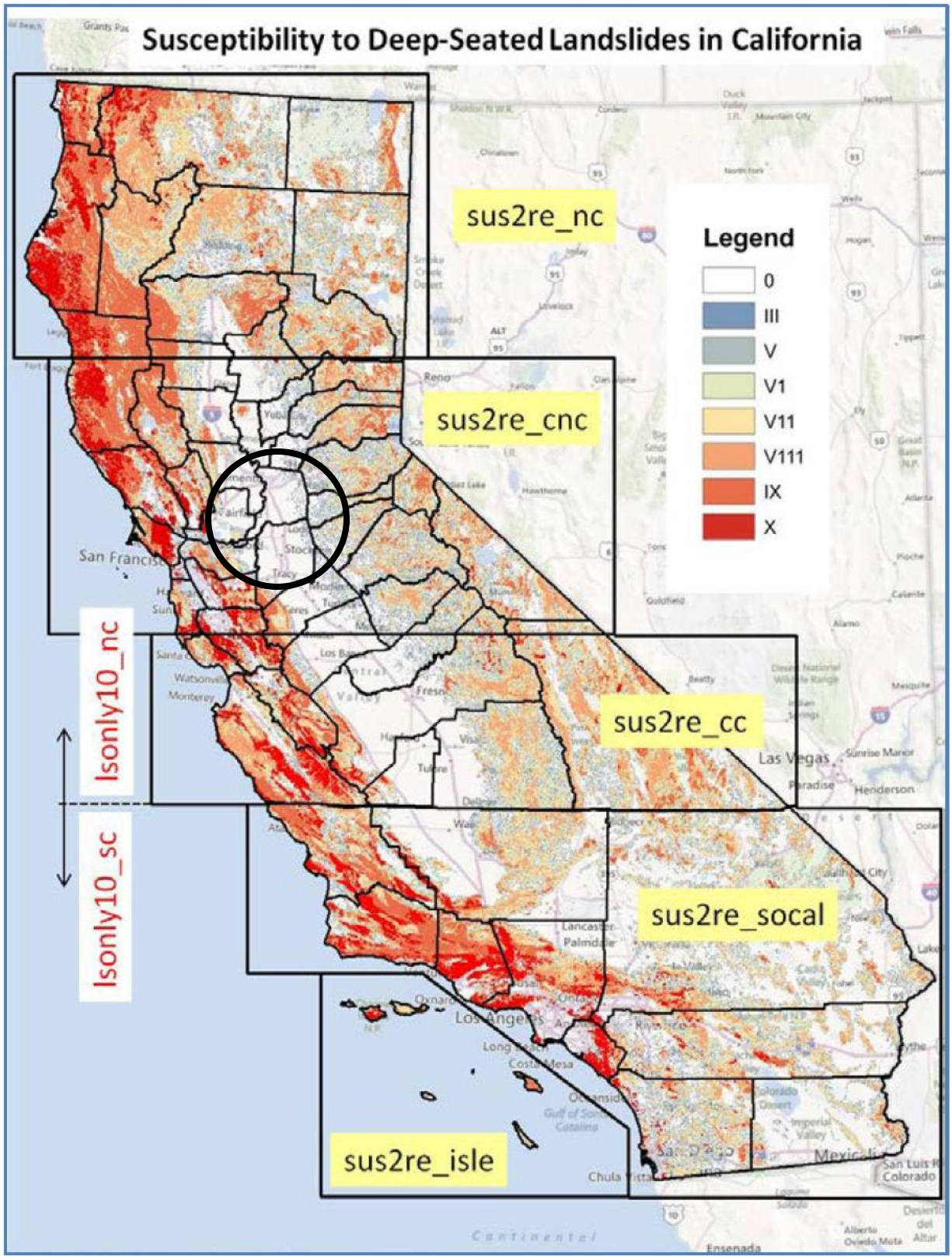
Location and Extent

The Sacramento County General Plan Background Report describes areas in the County that are particularly prone to landslides. In Sacramento County, only a narrow strip along the eastern boundary, from the Placer County line to the Cosumnes River, is considered to have landslide potential. However, future slides on these slopes are expected to be minor in nature and do not pose a large-scale threat to life or property. The American River Bluffs downstream from Folsom and in Fair Oaks and Carmichael are considered stable and are generally not subject to fracture or landslides.

Landslides, or ground failure, are dependent on slope, geology, rainfall, excavation or seismic activity. Mud slides are often caused by heavy rainfall. Areas that have recently been subject to wildfire are susceptible to mud slides. The CGS maps areas of landslide susceptibility. Figure 4-81 shows the CGS Landslide

Susceptibility areas in the County. most likely to generate landslides. The map uses detailed information on the location of past landslides, the location and relative strength of rock units, and steepness of slope to estimate susceptibility to deep-seated landsliding (0 to X, low to high).

Figure 4-81 Deep-seated Landslides, Landslide Susceptibility, Landslide Hazard



Source: CGS, 2011

The legend on Figure 4-81 shows the measurement system that the CGS uses to show the possible magnitude of landslides. It is a combination of slope class and rock strength. The speed of onset of landslide is often short, especially in post-wildfire burn scar areas, but it can also take years for a slope to fail. Landslide duration is usually short, though digging out and repairing landslide areas can take some time.

Past Occurrences

Disaster Declaration History

There have been no disaster declarations associated with landslides in Sacramento County, as shown in Table 4-4.

NCDC Events

The NCDC contains no records for landslides in Sacramento County.

Hazard Mitigation Planning Committee Events

No landslide incidents were reported since the 2016 Plan Update.

Likelihood of Future Occurrence

Unlikely – The topography of the majority of Sacramento County is relatively flat and not subject to landslide. In Sacramento County, only a narrow strip along the eastern boundary, from the Placer County line to the Cosumnes River, is considered to have landslide potential. However, future slides on these slopes are expected to be minor in nature and do not pose a large-scale threat to life or property. The American River Bluffs downstream from Folsom and in Fair Oaks and Carmichael are considered stable and are generally not subject to fracture or landslides; most land movement in this area is attributed to natural processes. This small portion, coupled with a lack of previous occurrences, equates to a likelihood of future occurrence of unlikely.

Climate Change and Landslide and Debris Flows

According to the CAS, climate change may result in precipitation extremes (i.e., wetter wet periods and drier dry periods). More information on precipitation increases can be found in Section 4.3.4. While total average annual rainfall may decrease only slightly, rainfall is predicted to occur in fewer, more intense precipitation events. The combination of a generally drier climate in the future, which will increase the chance of drought and wildfires, and the occasional extreme downpour is likely to cause more mudslides, landslides, and debris flows. However, with the lack of sloped areas in the County, increase in landslides due to climate change will be limited.

Vulnerability Assessment

Vulnerability—Low

Landslides in Sacramento County include a wide variety of processes resulting in downward and outward movement of soil, rock, and vegetation. Although landslides are primarily associated with slopes greater than 15 percent, they can also occur in relatively flat areas and as cut-and-fill failures, river bluff failures, lateral spreading landslides, collapse of wine-waste piles, failures associated with quarries, and open-pit mines.

Although this hazard also includes related issues such as mudslides and debris flows, available mapped hazard data was limited to landslides; thus, the remainder of this section is focused on the landslide vulnerability.

Impacts

Impacts from landslides in the County can vary greatly. In unpopulated areas, landslides have little effect. However, if landslides occur in populated areas, damages can be sustained by buildings, critical facilities, infrastructure, and injuries, and in extreme cases deaths, can occur. Landslide can affect ingress and egress routes.

Future Development

Although new growth and development corridors could fall in the area affected by moderate risk of landslide, given the small chance of a major landslide and the building codes and erosion ordinance in effect, development in the landslide areas will continue to occur.

4.3.14. Levee Failure

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

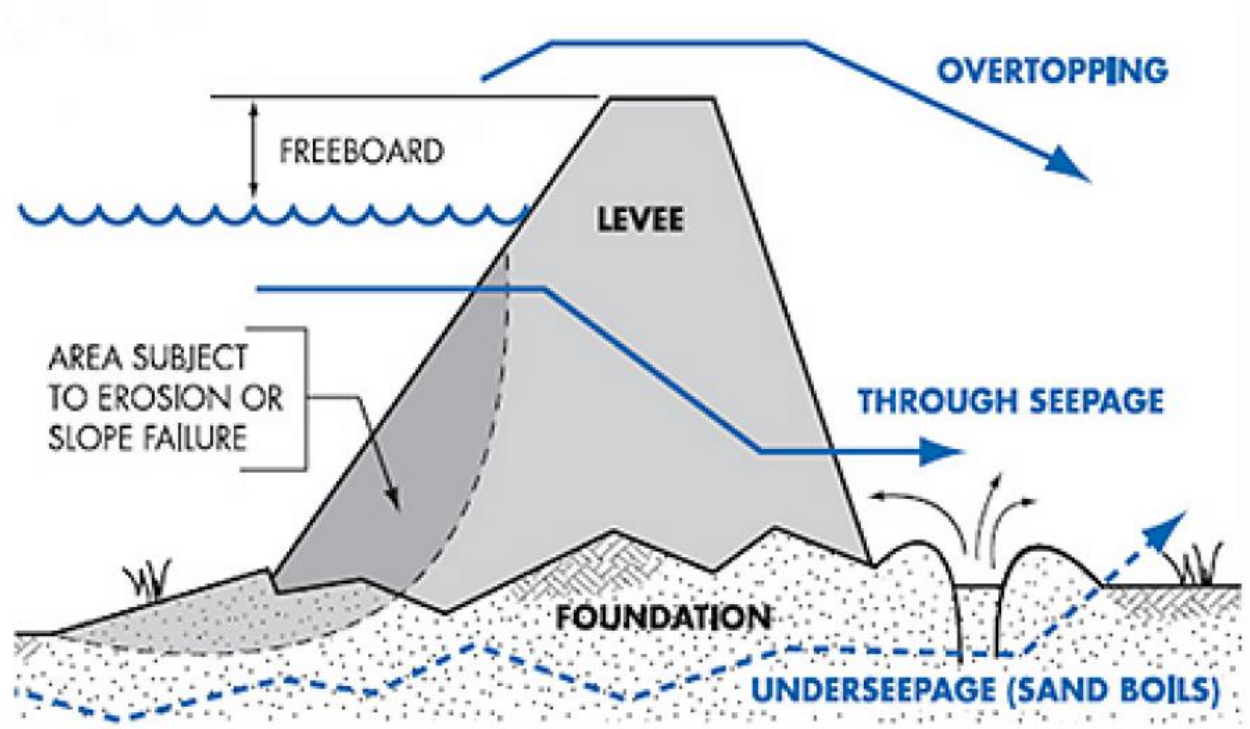
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made. A natural levee is formed when sediment settles on the streambank, raising the level of the land around the stream.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or

overtopping can create severe flooding and high-water velocities. It is important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

In addition to overtopping, levee systems can fail or be compromised in a variety of ways. Under-seepage refers to water flowing under the levee through the levee foundation materials, often emanating from the bottom of the landside slope and ground surface and extending landward from the landside toe of the levee. Through-seepage refers to water flowing through the levee prism directly, often emanating from the landside slope of the levee. Both conditions can lead to failure by several mechanisms, including excessive water pressures causing foundation heave and slope instabilities, slow progressing internal erosion, and piping leading to levee slumping. Rodents can burrow into and compromise the levee system. Erosion can also lead to levee failure. Figure 4-82 depicts many causes of levee failure.

Figure 4-82 Potential Causes of Levee Failure

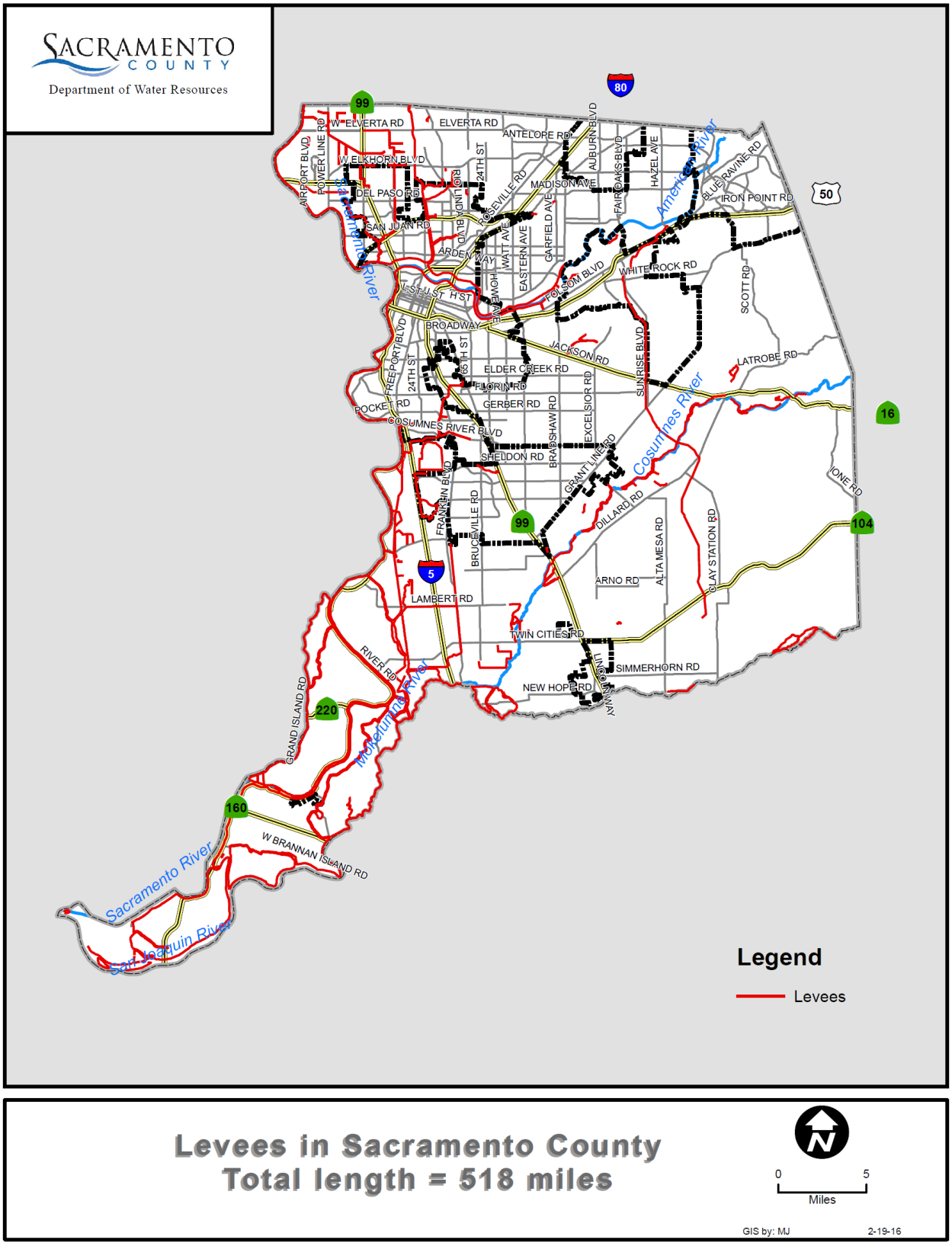


Source: USACE

Location and Extent

Approximately 150 years ago, the levees of the Sacramento-San Joaquin Delta were raised to prevent flooding on what remains some of the most fertile farmland in the nation. While the peat soils were excellent for agriculture, they do not create strong foundations for levee barriers meant to contain a constant flow of river water. Nevertheless, it was these native soils that were primarily used to create the levee system. Sacramento County's levee system can be seen in Figure 4-83.

Figure 4-83 Sacramento Planning Area – Levee Map



There is not a scientific scale or measurement system in place for levee failure. It us usually measured in area covered and depth of flooding. Maps showing inundation depths due to a levee failure in the County do not exist. The speed of onset is slow as the river rises, but if a levee fails the warning times are short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. Geographical X Protected by Levee extent from the FEMA DFIRMs is shown in Table 4-87.

Table 4-87 Sacramento County Planning Area – Geographical Flood Hazard Extents in FEMA X Protected by Levee DFIRM Flood Zones

X Protected by Levee/ Jurisdiction	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
Citrus Heights	0	0.00%	0	0.00%	0	0.00%
City of Sacramento	24,355	69.85%	16,745	64.25%	7,610	86.43%
Elk Grove	1,966	5.64%	1,774	6.81%	192	2.18%
Folsom	0	0.00%	0	0.00%	0	0.00%
Galt	0	0.00%	0	0.00%	0	0.00%
Isleton	0	0.00%	0	0.00%	0	0.00%
Rancho Cordova	197	0.56%	175	0.67%	22	0.25%
Unincorporated Sacramento County	8,348	23.94%	7,367	28.27%	981	11.14%
Grand Total	**34,865**	**100.00%**	**26,061**	**100.00%**	**8,804**	**100.00%**

Source: 7/19/2018 DFIRM

Past Occurrences

Disaster Declaration History

There have been two federal and two state disasters declarations related to levee failure in Sacramento County, as shown on Table 4-88. Also it is important to note that many of the flood disaster declarations included in Section ??? also may include flooding associated with levee breach or failure events.

Table 4-88 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Levee Break	2	1972, 1980	2	1972, 1980

Source: Cal OES, FEMA

NCDC Events

There have been no NCDC levee failure events in Sacramento County.

FIS Events

The FIS reported the following regarding levee failure flooding:

> ***Past flooding in the City of Isleton area has been due to levee failures caused by the separate or coincidental occurrence of very high tides and high stream outflow through the delta region, or from unexplained levee failures apparently not related from high tides and/or high stream outflow can reasonably be expected, such failures cannot be reliably predicted. A detailed field inspection of levees protecting Andrus, Brannan and Twitchell Islands, was made to determine levee conditions insofar as it is possible to do so without subsurface exploration. The report on the inspection identifies problem areas susceptible to failure and requires exploratory borings and testing of core materials to definitively determine levee stability (USACE, 1976). Because 2-percent annual chance flooding would overtop levees, stability analysis was deemed unnecessary, and this study is concerned only with levee overtopping and disintegration of levee sections subsequent to overtoppings.***
>
> ***The Delta has a long history of flooding, but little definitive data on specific flood events are available. Andrus, Brannan and Twitchell Islands, have all experienced historical floods. Large areas of the delta were inundated during floods, and it is probable that the City of Isleton was damaged or seriously threatened.***
>
> ***The 1950 and 1955 floods were outstanding in peak outflows through the delta and several islands were flooded. The City of Isleton, however, was not affected. In December 1965 and January 1965, the coincidental occurrence of very high tides and heavy inflow resulted in unusually high stages on all delta waterways. Concurrent strong onshore winds generated high waves that created very perilous conditions for many islands. Levees protecting Twitchell Island were seriously threatened by erosion and overtopping, but a massive flood fighting effort prevented overflow, destruction of levees and inundation of the City of Isleton.***
>
> ***In December 1964 and January 1965, the coincidental occurrence of very high tides and heavy inflow resulted in unusually high stages on all delta waterways. Concurrent strong onshore winds generated high waves that created very perilous conditions for many islands. Several hundred acres were flooded and damages, mainly flood fighting and repair of levees and levee roads, were a little less than $1 million. In January and February 1969, high tides and adverse wave action in the delta, combined with large river inflow and rain-soaked levees, caused the flooding of several islands and the endangerment of many other islands. Approximately 11,400 acres were inundated and flood damages***

amounted to about $9.2 million. The levee separating Andrus Island and the San Joaquin River failed from unknown causes in June 1972, resulting in the flooding of Andrus and Brannan Islands (including the City of Isleton). High winds had occurred prior to the break, but there had been no antecedent rainfall and the tidal cycle was not on the higher side. About 15,000 acres were inundated and flood damages for the event approximated $30 million.

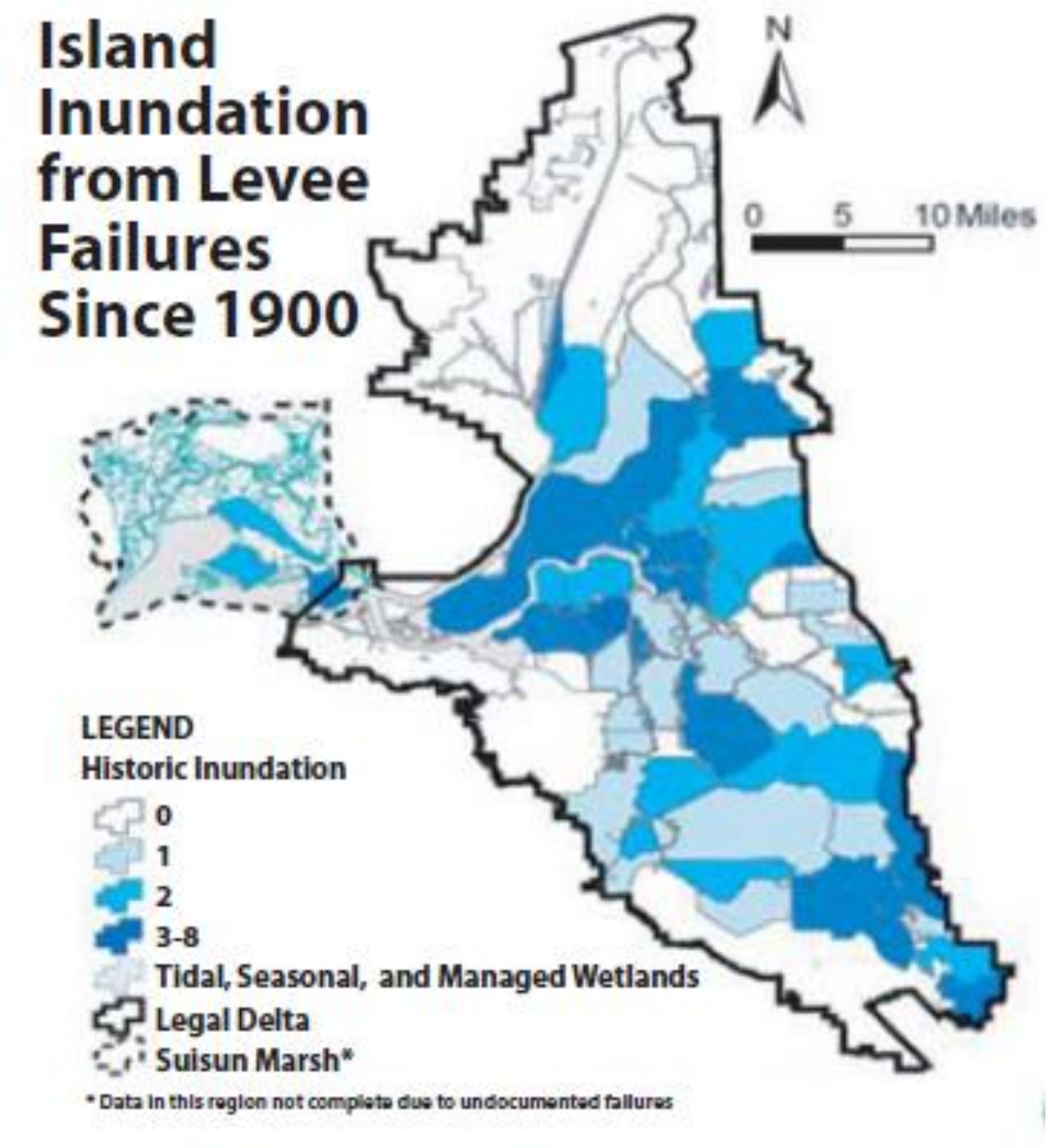
The most devastating and recent flooding of the City of Isleton resulted from failure of a levee at the southern end of Andrus Island. The levee failed from unknown causes during the night of June 21, 1972. There had not been any antecedent rainfall and the tidal cycle was not on the higher side, but high winds had been occurring prior to the break. Approximately 200,000 acre-feet of water from the San Joaquin River inundated Andrus and Brannan Islands. Activities to fight floods to protect the City of Isleton proved to be a losing battle, and almost all of the City was flooded. The entire population was evacuated, with some residents not being able to return to their homes for 4 months. Approximately one-half of the housing units in the City were damaged or destroyed. Damage from the flood event on the islands and in the City of Isleton totaled approximately $30 million.

Due to the size of the delta region, and the complexity of its stream and tidal regimen, flood frequency varies from location to location. In general, the 1950, 1955 and 1964 tidal stages in the central delta, had frequencies of 10, 30 and 5 years, respectively. Stage during the 1955 and 1964 flood periods was strongly influenced by onshore winds. The 1972 flood event cannot be assigned a frequency because the levee failure that caused the flooding cannot be attributed to tidal stage or streamflow conditions.

Hazard Mitigation Planning Committee Events

There have been about 100 levee failures and over 165 levee breaches since the early 1900. However, most of these failures occurred in the Delta area and are not specific to portions of the Delta located inside of Sacramento County. Only 17 failures and 20 breaches occurred after 1990 due to overall improvements in the levee systems throughout the Delta. These historic numbers are not representative of future occurrences within the County. Figure 4-84 shows the levee failures since 1900.

Figure 4-84 Island Inundation from Levee Failures from 1900-Present



Some islands have been flooded and recovered multiple times. A few islands, such as Franks Tract in San Joaquin County, have never been recovered. Some of the more major levee breaks in Sacramento County are detailed below.

June 21, 1972 – A levee in the Brannan-Andrus Levee Maintenance District broke. 35% of the City of Isleton was inundated. A national disaster was declared June 27, and the breach was closed on July 26. Estimated damages in 2011 dollars were $234 million. The USACE repaired the break.

February 19, 1986 – Heavy rains and flooding affected Sacramento County and the surrounding area. 6 months of precipitation fell in 10 days in mid-February. High water content caused multiple levee failures. Two levee breaks in the same general area occurred on the 8,800 acre Tyler Island in Sacramento County. These two levee breaks were approximately 300 feet in length (see Figure 4-85). A FEMA disaster declaration was declared on February 21. The approximate cost to repair the breaks was $6 million in 2011 dollars. Details on damages to structures and crops on the islands was not available.

Figure 4-85 1986 Tyler Island Levee Breach

Source: California Department of Water Resources

December 1996 was one of the wettest Decembers on record. Watersheds in the Sierra Nevada were already saturated by the time three subtropical storms added more than 30 inches of rain in late December 1996 and Early January 1997. The third and most severe of these storms lasted from December 31, 1996 through January 2, 1997. Rain in the Sierra Nevada caused record flows that stressed the flood management

system to capacity in the Sacramento River Basin and overwhelmed the system in the San Joaquin River Basin. Levee failures due to breaks or overtopping in the Sacramento River Basin resulted in extensive damages. In the San Joaquin River Basin, dozens of levees failed throughout the river system and produced widespread flooding. The Sacramento-San Joaquin River Delta also experienced several levee breaks and levee overtopping. Affected Delta islands within Sacramento County included McCormack-Williamson Tract, Dead Horse Island and Glanville Tract.

January 11, 2017 – After atmospheric river rains struck Sacramento County and the surrounding area, flooding occurred. Independent reports from San Joaquin and Sacramento County Sheriff Deputies identified a breach in the Mokelumne River. A private levee failure within San Joaquin County continued to cause flooding to New Hope Road through March 2017.

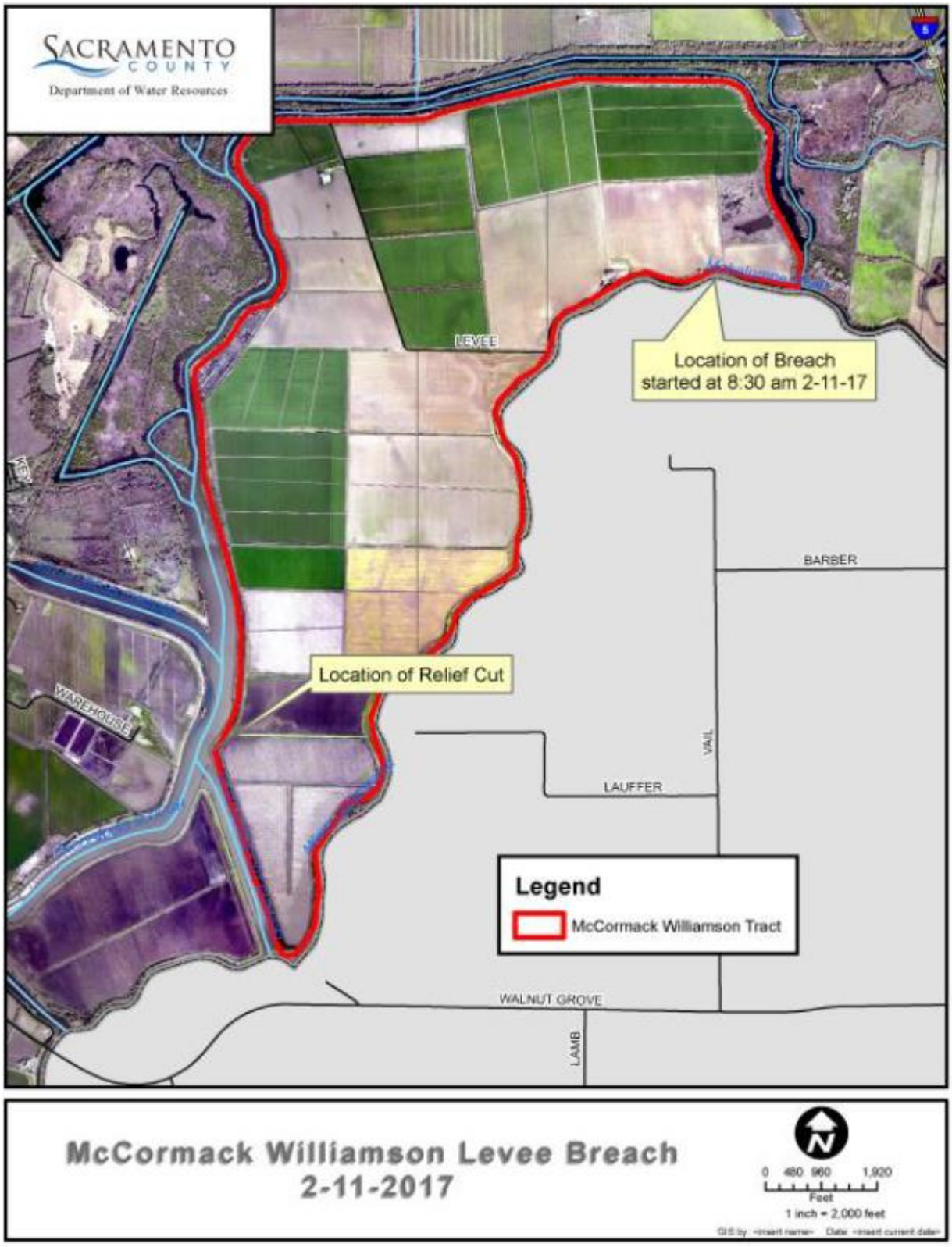
Figure 4-86 New Hope Levee Break

Source: 2017 January Winter Storms After Action Report

February 11, 2017 – The McCormack Williamson Tract levee overtopped and failed starting at 8:30 am. The levee failed at River Mile 28 near the northeast section of the tract (see Figure 4-87). According to the RD, at the time, it could have taken at least 9 hours for the Island to fill. The RD was planning to helicopter in equipment to construct a relief cut at the southwest end of the Island. The relief cut was intended to mitigate a surge of water into the Mokelumne River/ Snodgrass Slough that would result when the downstream levee breaks. A surge had the potential to impact several of the levees in the area that protect Tyler Island, Dead Horse Island and East Walnut Grove. The RDs had staged equipment and supplies in the event of a flood fight. Tyler Island RD monitored a small levee seepage problem along the North Fork of the Mokelumne at Sta 46000. The RD had planned to work on the repair starting that Monday when the

tides were lower and all repair equipment/ material was in place. Beyond that, Tyler Island was experiencing higher waters due to the McCormack Williamson relief cut and had continuous levee patrols.

Figure 4-87 Sacramento County – McCormack Williamson Levee Breach



Source: 2017 February Winter Storm After Action Report from Sacramento County OES

February 12, 2017 – Road closures included 21 distinct areas throughout the southern portion of the county. RD800 reported significant damage to their levees and were able to conduct damage assessments. Results of those assessments were provided to the EOC along with any other resource requests. SMUD also reported that they had 6 homes without power in Point Pleasant area. Power was de-energized to those homes due to flooding. The Snodgrass Slough Levee was inspected for seepage and water continued to overtop Lambert Road flowing north toward Point Pleasant.

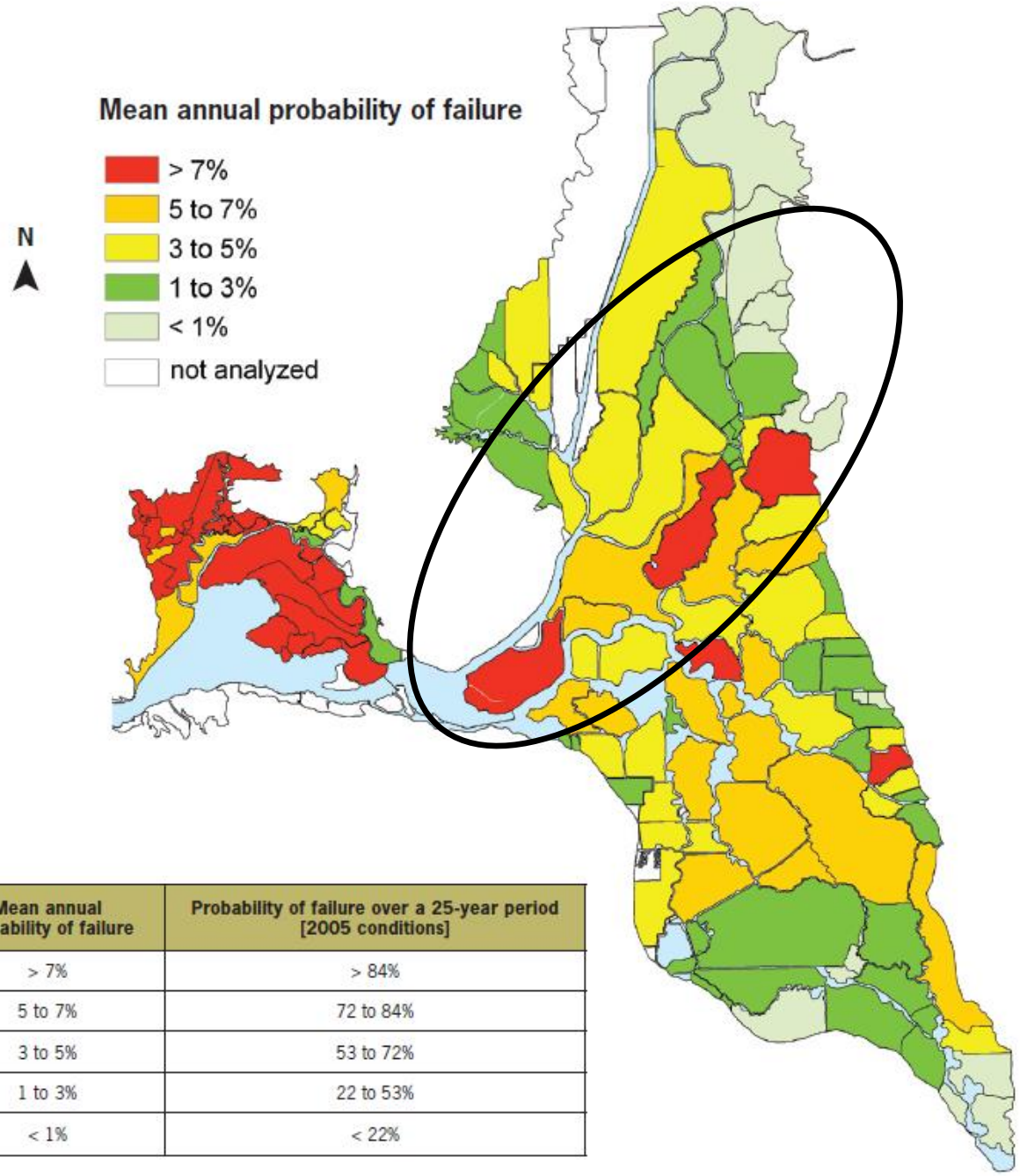
February 13, 2017 – Mandatory evacuations were ordered due to a compromised levee at Tyler Island Bridge Road. Land between Mokelumne and Georgiana Slough had been evacuated; 645 contacts within the Sacramento Alert system. Walnut Grove was under an advisory for the possibility of an evacuation and rock was brought in by barge crane to begin repairs on the levee. Advance plans for a relief cut were identified should the levee have failed.

February 18, 2017 – The United States Coast Guard Auxiliary provided photos of a levee with scouring in the Pearson Tract. Contacts to MBK Engineers were made regarding identifying the issue and making the necessary repair.

Likelihood of Future Occurrence

Occasional – Due to the high number of past events, increasing subsidence, and the deteriorating conditions of the levees in Sacramento, future levee failures will occur occasionally. This can be seen for the Delta area in Figure 4-88. However, it is important to note that numerous levee improvement projects are ongoing throughout the Sacramento County area, which will make the future occurrence of levee failure less likely.

Figure 4-88 Estimated Frequency of Levee Overtopping Under Current Conditions



Mean annual probability of failure	Probability of failure over a 25-year period [2005 conditions]
> 7%	> 84%
5 to 7%	72 to 84%
3 to 5%	53 to 72%
1 to 3%	22 to 53%
< 1%	< 22%

Source: Delta Risk Management Strategy

Climate Change and Levee Failure

Though a decrease in flood frequency in California is a predicted consequence of climate change, the floods are expected to be longer and more severe. Mechanisms whereby climate change leads to an elevated flood risk include more extreme precipitation events and shifts in the seasonal timing of river flows. This threat may be particularly significant because recent estimates indicate the additional force exerted upon the

levees is equivalent to the square of the water level rise. These extremes are most likely to occur during storm events, leading to more severe damage from waves and floods, thus possibly leading to more levee failure events.

More information on climate change and flooding can be found in Section 4.3.11.

Vulnerability Assessment

Vulnerability—Extremely High

Levee failure flooding can occur as the result of partial or complete collapse of an impoundment, and often results from prolonged rainfall and resulting higher water elevations in the river. The primary danger associated with dam or levee failure is the high velocity flooding of those properties downstream of the breach. Impacts from this include property damage, critical facility damage, and life safety issues. A levee failure can range from a small, uncontrolled release to a catastrophic failure. Vulnerability to levee failures is generally confined to the areas subject to inundation downstream of a flood protection facility. Secondary losses would include loss of the multi-use functions of the facility and associated revenues that accompany those functions.

Impacts

There are three primary risks to levee integrity in Sacramento County:

- Earthquake failure
- High water failure
- Dry weather failure

Earthquake Failure

Seismic risk in the Delta Region is characterized as moderate-to-high because of many active faults in the San Francisco Bay Area. Figure 4-60 in Section 4.3.9 Earthquake, illustrates the locations of faults in and near the San Francisco Bay Area and the Delta Region. Area seismic activity during the last 100 years is significantly less than what was experienced during the 1800s and the first part of the 1900s. Seismic experts predict increased seismic activity in the future similar to that which occurred up to the first part of the 1900s. Seismic risk to levees stems from the risk of liquefaction. Liquefaction is discussed as a stand-alone hazard in Section 4.3.10. A more in depth discussion may be found there.

High Water Failure

The primary threats to Delta levees are high water surface elevations from floods or high tides, wave action due to high winds or boat wakes, and rodent damage, either as individual actions or in combination. High water levels can be produced by storm events, spring snowmelt, and/or releases from upstream reservoirs. Levees can become vulnerable to through and underseepage, as well as overtopping. Levees that may have structural issues involving poor foundations, inadequate geometry or other geotechnical issues can be at a higher risk of failure from any of the primary threats.

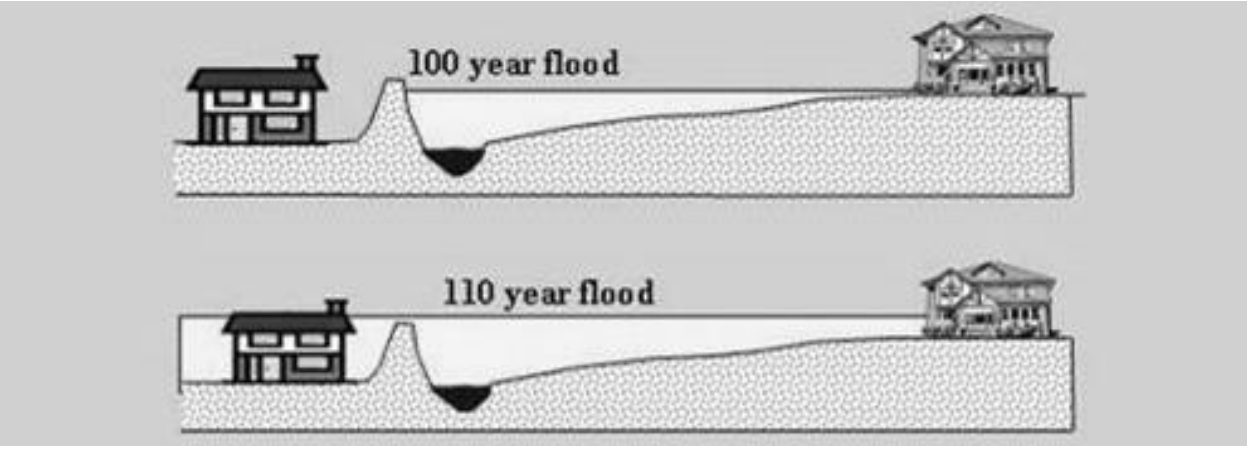
Under-seepage refers to water flowing under the levee through the levee foundation materials, often emanating from the bottom of the landside slope and ground surface and extending landward from the landside toe of the levee. Through-seepage refers to water flowing through the levee prism directly, often emanating from the landside slope of the levee. Both conditions can lead to failure by several mechanisms, including excessive water pressures causing foundation heave and slope instabilities, slow progressing internal erosion, and piping leading to levee slumping. Delta levee may seep 'clear water' indicating that material is not being removed from the levee or levee foundation. Inspections are the primary means by which this is inspected.

Levees are vulnerable to high-water conditions not only while the river stages are high, but also when water levels fall at a rapid rate (rapid withdrawal). Rapid withdrawal is common when upstream releases from a reservoir stop or are reduced at a rapid rate. This sudden release in pressure from the waterside levee slopes can cause levees to slough.

Rivers that are not controlled by an upstream reservoir, such as the Cosumnes River, may be more vulnerable to overtopping.

Overtopping failure occurs when the flood water level rises above the crest of a levee. As shown in Figure 4-89, overtopping of levees can cause greater damage than a traditional flood due to the often lower topography behind the levee.

Figure 4-89 Flooding from Levee Overtopping



Source: Levees in History: The Levee Challenge. Dr. Gerald E. Galloway, Jr., P.E., Ph.D., Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR.

Most levee failures in the Delta Region have occurred during winter storms and related high water conditions, often in conjunction with high tides and strong winds.

Dry Weather Failures

Dry weather, or sunny-day, failures are levee breaches that are not flood or seismic related. These failures typically occur between the end of the late snowmelt from the Sierras, in late May, and the beginning of the rainy season, in early October. Sunny-day failures are addressed separately from flood-induced failures to differentiate between winter and summer events. Aside from seismic events, factors that can cause levee

failures in the Sacramento–San Joaquin River Delta (Delta) in the summer period are different than the factors that can cause winter failures.

Burrowing animal activities and pre-existing weaknesses in the levees and foundation are the key weak links leading to levee failures. This is the case regardless of whether the failures occur during a high-tide condition or not. Most practicing engineers, scientists, and maintenance personnel in the Delta and Suisun Marsh believe that rodents are prolific in the Delta and use levees for burrowing. As a result, they cause undue weaknesses by creating a maze of internal and interconnected galleries of tunnels. Under-seepage and through-levee seepage are slow processes that tend to work through time by removing fines from levee and foundation material during episodes of high river levels.

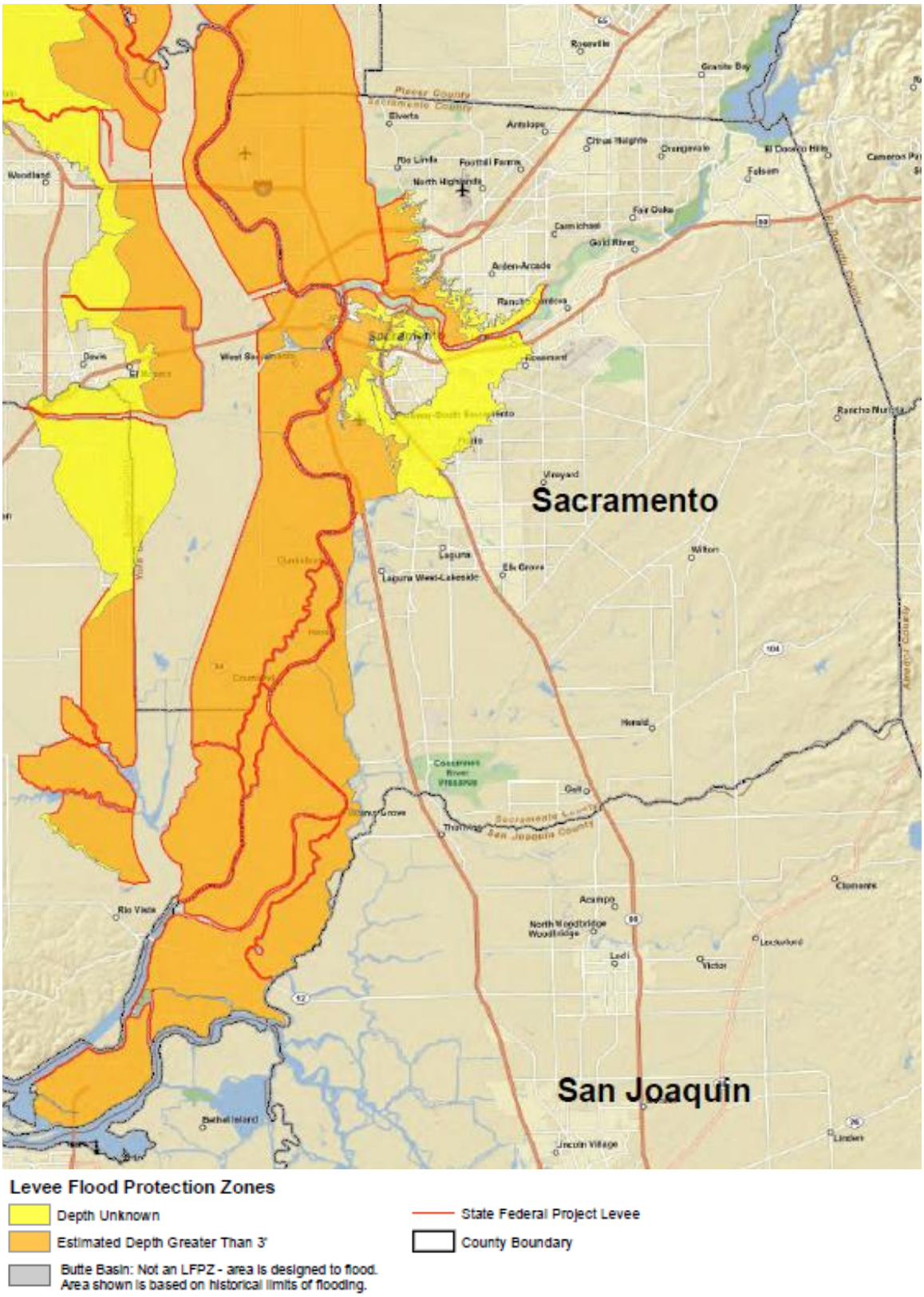
Streambank Erosion

In addition to the above levee failure causes, streambank erosion can cause levees to fail. When flood waters are high, there is greater erosive capabilities of water. In addition, high winds during times of flooding can cause additional erosive pressures on levees. Streambank erosion was discussed in more detail in Section 4.3.11.

Levee Flood Protection Zones (LFPZ) Maps

LFPZ maps represent floodplain areas protected by Central Valley State-Federal Project Levees. Under Water Code Section 9110(b), "LFPZ" means the area, as determined by the Central Valley Flood Protection Board or DWR, that is protected by a project levee. These maps were developed based on the best available information as required by Assembly Bill 156. This Bill requires DWR to prepare LFPZ maps to identify the areas where flood levels would be more than three feet deep if a project levee were to fail. DWR delineated the LFPZs by estimating the maximum area that may be flooded if a project levee fails with flows at maximum capacity that may reasonably be conveyed. DWR is using information from several sources, including FEMA floodplain maps, FEMA Q3 data, USACE's 2002 Sacramento and San Joaquin River Basins Comprehensive Study, and local project levee studies. Using this data, DWR is implementing a multi-year program to evaluate and delineate detailed floodplains for areas protected by project levees. This effort includes new topography, hydrology, hydraulic models, and floodplain maps. This information will be used to update the initial LFPZ maps. Figure 4-90 is the most recent LFPZ map for the Sacramento County Planning Area.

Figure 4-90 Sacramento County - Levee Flood Protection Zones



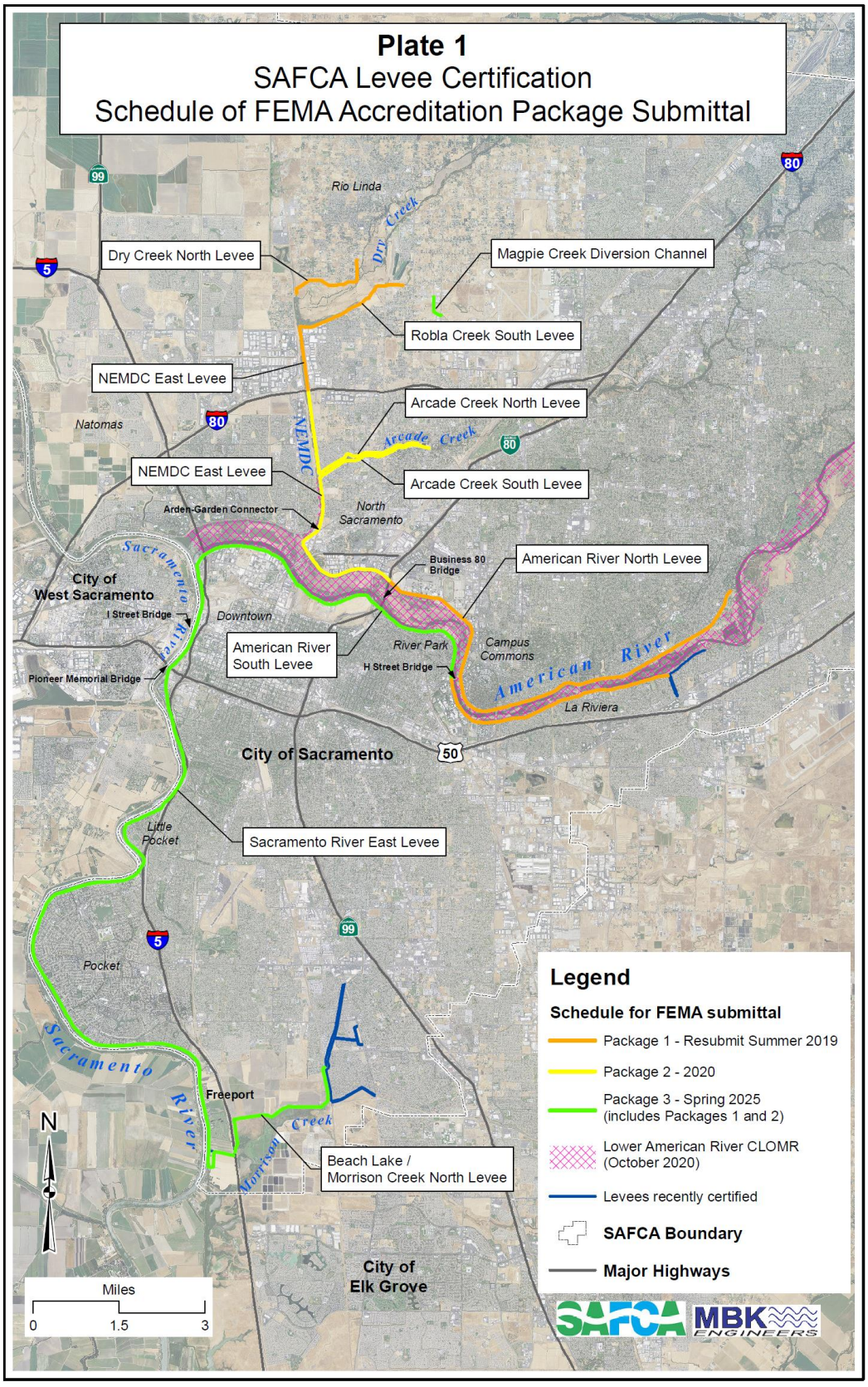
Source: California Department of Water. Retrieved 2/5/2021

Vulnerability Analysis

Unincorporated Sacramento County and its incorporated jurisdictions have mapped flood hazard areas. This includes areas protected by levees. GIS was used to determine the the areas protected by levee within the County, and how the risk varies across the Planning Area. The following methodology was followed in determining improved parcel counts and values at risk in X Protected by Levee areas. This analysis was performed based on the most current 2018 DFIRMs which still reflect some levees as providing 100-year level of protection. According to the County, with the exception of areas undergoing levee improvements to certify levees to the 100-year and 200-year level of protection; all levees have since been decertified as not providing a 100-year level of protection, so this analysis is based solely on the information presented in the DFIRMs. Thus, this analysis reflects a moment in time and while it does provide information on areas developed behind levees, the X Protected by Levee flood zone will continue to change as these projects are completed and new levee certifications obtained.

The County noted that the Sacramento Area Flood Control Agency is working on FEMA certification of levees. A submission schedule for leveed areas in the County is shown on Figure 4-91.

Figure 4-91 Sacramento County – Schedule of FEMA Accreditation for Levees



It also should be noted that while this analysis shows areas protected by a certified levee based on the most current DFIRMs, the levee risk within the Sacramento County Planning Area is actually greater behind all the levees that are not certified as providing a certain level of protection. Thus, it could be inferred that all the other areas built behind levees are actually more at risk then the areas protected by a certified levee.

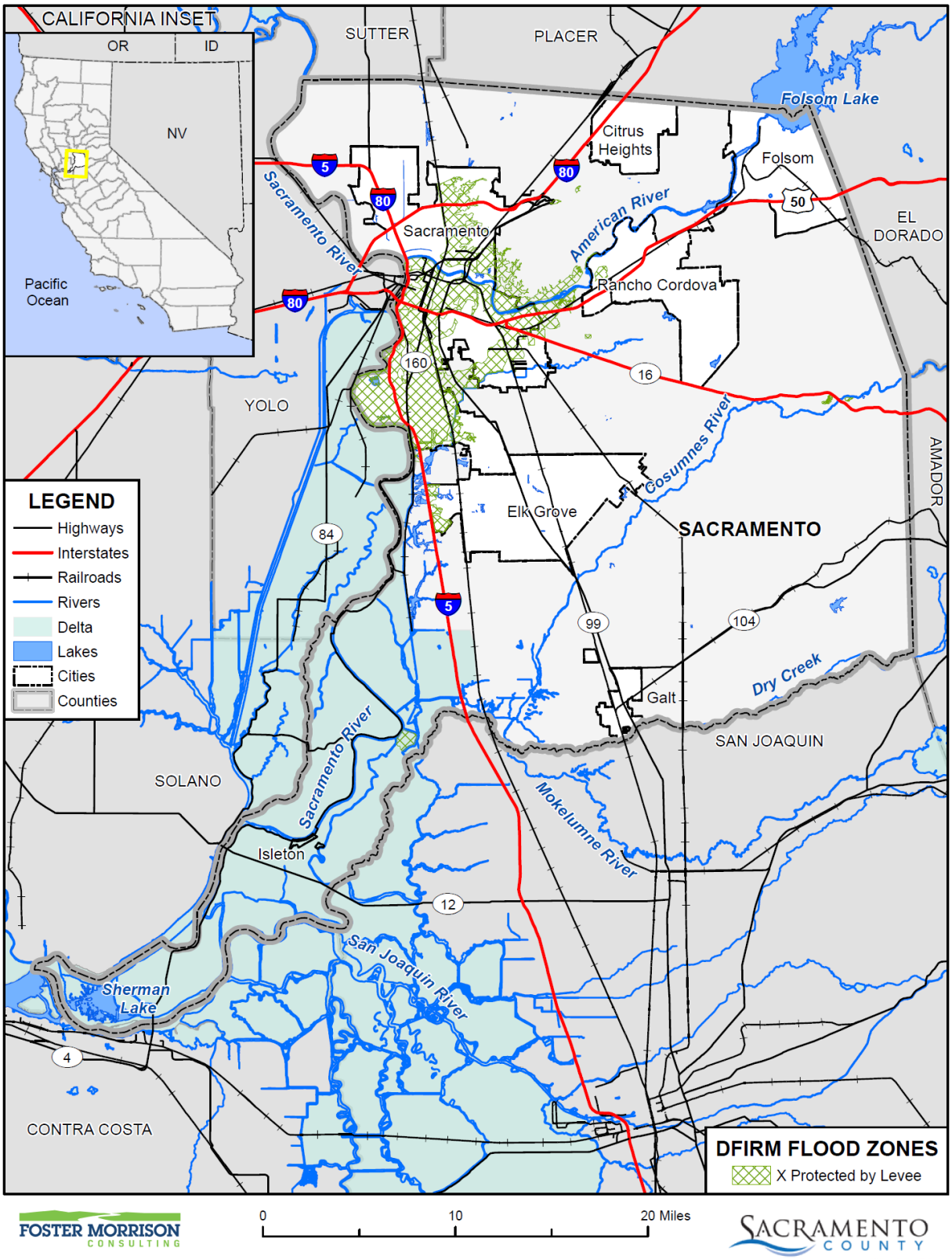
Methodology

Quantifying the values at risk and estimating losses within mapped FEMA X Protected by Levee DFIRM floodplains in the County is an important element in understanding the risk and vulnerability of the Sacramento County Planning Area to the levee hazard. The methodology and limitations for this analysis are the same as those found in the flood vulnerability in Section 4.3.11 above.

The end result of the values at risk and flood loss estimates analysis is an inventory of the numbers, types, and values of parcels and estimated losses subject to the flood hazard by flood zone. Results are presented here first for the Sacramento County Planning Area and secondly for unincorporated County. Results for the incorporated jurisdictions are presented in their annexes to this Plan.

Figure 4-92 contains flood analysis results for area protected by a levee (i.e. designation of X Protected by Levee) for the entire Sacramento County Planning Area. Note this analysis is based on the current 2018 DFIRMs in effect and is best available information, but may not reflect the most current levee certification status for the Sacramento County Planning Area. It should also be noted that the X Protected by Levee Zone shows only those areas protected by levees from the 1% annual chance flood. There are large areas of the County and the Delta at risk to flooding outside of the X Protected by Levee areas.

Figure 4-92 Sacramento County DFIRM X Protected by Levee Areas



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Values at Risk and X Protected by Levee Areas

Sacramento County Planning Area

Table 4-89 contains DFIRM X Protected by Levee analysis results for the entire Sacramento County Planning Area. This includes unincorporated Sacramento County and the incorporated jurisdictions. This table shows the number of parcels and assets at risk in levee protected areas. Table 4-89 shows the value of improved parcels by jurisdiction. It should be noted that the X Protected by Levee Zone shows only those areas protected by levees from the 1% annual chance flood. There are large areas of the County and the Delta at risk to flooding outside of the X Protected by Levee areas.

Table 4-89 Sacramento County Planning Area – Count and Value of Parcels* in X Protected by Levee DFIRM Flood Zone

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Citrus Heights	0	0	$0	$0	$0	$0
Elk Grove	2,764	2,652	$339,935,388	$1,026,035,692	$609,999,906	$1,975,970,955
Folsom	0	0	$0	$0	$0	$0
Galt	0	0	$0	$0	$	$0
Isleton	0	0	$0	$0	$0	$0
Rancho Cordova	827	796	$57,421,834	$169,663,044	$85,780,542	$312,865,432
City of Sacramento	78,765	73,364	$9,114,550,673	$22,956,197,204	$15,639,035,020	$47,709,783,168
Unincorporated Sacramento County	12,629	12,032	$1,481,344,313	$3,501,091,801	$2,223,488,586	$7,205,924,734
Total	**94,985**	**88,844**	**$10,993,252,208**	**$27,652,987,741**	**$17,948,304,148**	**$57,204,544,289**

Source: FEMA 7/19/2018 DFIRM, Sacramento County February Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

Unincorporated Sacramento County

Table 4-90 contains the X Protected by Levee analysis results for unincorporated Sacramento County. These tables show the number of parcels and assets at risk in X Protected by Levee areas. Table 4-90 shows the value of improved parcels by land use. Information on DFIRM X Protected by Levee flood zones and property use for each jurisdiction in the County are shown in their respective annexes to this Plan Update.

Table 4-90 Unincorporated Sacramento County – Count and Value of Parcels by in X Protected by Levee DFIRM Flood Zone by Property Use*

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	7	7	$2,053,347	$1,998,179	$1,998,179	$6,049,705
Care/Health	14	9	$7,589,097	$41,048,396	$41,048,396	$89,685,889
Church/Welfare	30	26	$12,088,693	$33,980,411	$33,980,411	$80,049,515
Industrial	101	96	$28,279,980	$75,737,635	$113,606,457	$217,624,069
Miscellaneous	159	6	$667,769	$396,867	$396,867	$1,461,503
Office	193	169	$112,716,926	$310,101,549	$310,101,549	$732,920,024
Public/Utilities	38	0	$0	$0	$0	$0
Recreational	19	5	$850,517	$1,605,937	$1,605,937	$4,062,391
Residential	11,537	11,403	$1,102,912,551	$2,628,200,830	$1,314,100,401	$5,045,213,819
Retail/ Commercial	322	298	$182,671,715	$406,650,389	$406,650,389	$995,972,493
Unknown	0	0	$0	$0	$0	$0
Vacant	209	13	$31,513,718	$1,371,608	$0	$32,885,326
X Protected by Levee Total	**12,629**	**12,032**	**$1,481,344,313**	**$3,501,091,801**	**$2,223,488,586**	**$7,205,924,734**

Source: FEMA 7/19/2018 DFIRM, Sacramento County February Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

Populations at Risk

A separate analysis was performed to determine populations that reside in the X Protected by Levee flood zone. Using GIS, the DFIRM Flood dataset was overlayed on the improved residential parcel data. Those parcel centroids that intersect the X Protected by Levee flood zone were counted and multiplied by the Census Bureau average household size; and tabulated by flood zone (see Table 4-91). According to this analysis, there is a population of 226,619 in the X Protected by Levee flood zone for the entire Sacramento County Planning Area. In unincorporated Sacramento County, there is a population of 31,472.

Table 4-91 Sacramento County Planning Area – Populations at Risk in X Protected by Levee DFIRM Flood Zone

Jurisdiction	Improved Residential Parcels*	Population at Risk
Citrus Heights	0	0
City of Sacramento	69,537	184,968
Elk Grove	2,567	8,214
Folsom	0	0
Galt	0	0

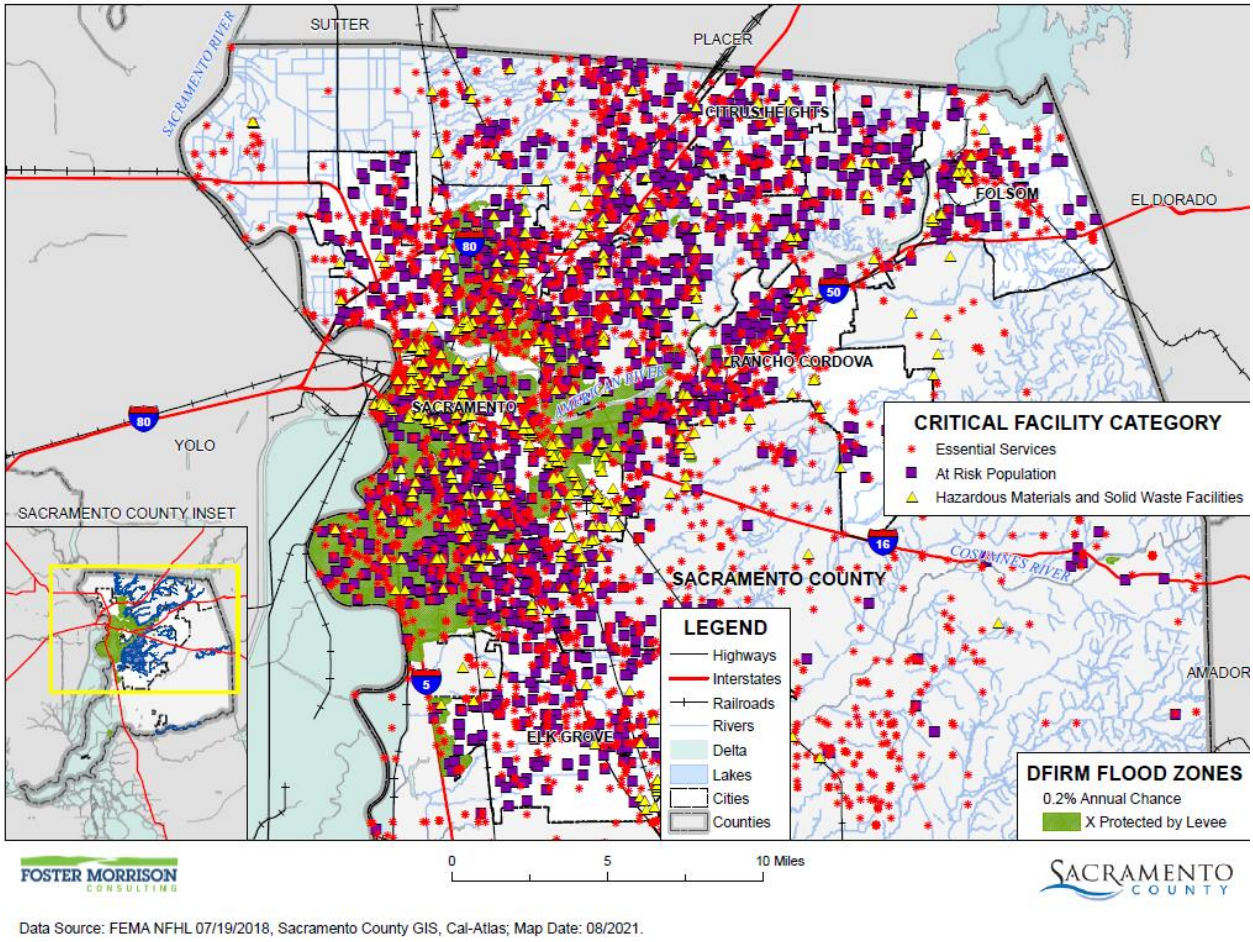
Jurisdiction	Improved Residential Parcels*	Population at Risk
Isleton	0	0
Rancho Cordova	792	1,965
Unincorporated Sacramento County	11,403	31,472
Total	**84,299**	**226,619**

Source: FEMA DFIRM 7/19/2018, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Rancho Cordova (2.14): and unincorporated Sacramento County (2.76)
*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

Critical Facilities at Risk

A separate analysis was performed on the critical facility inventory in Sacramento County and all jurisdictions to determine critical facilities in the 1% and 0.2 annual chance flood zones. Using GIS, the DFIRM X Protected by Levee flood zones were overlayed on the critical facility GIS layer. Figure 4-93 shows critical facilities, as well as the DFIRM flood zones. Table 4-92 summarizes the critical facilities in the County by DFIRM X Protected by Levee flood zone. Table 4-93 details critical facilities by facility type and count for the unincorporated County. Details of critical facility definition, type, name and address by flood zone are listed in Appendix F.

Figure 4-93 Sacramento County Planning Area– Critical Facilities in DFIRM X Protected by Levee Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 4-92 Sacramento County Planning Area– Summary of Critical Facilities in DFIRM Flood Zones

Jurisdiction Critical Facility Category	Facility Count
Citrus Heights	
Essential Services Facilities	0
At Risk Population Facilities	0
Hazardous Materials and Solid Waste Facilities	0
Total	**0**
Elk Grove	
Essential Services Facilities	11
At Risk Population Facilities	7
Hazardous Materials and Solid Waste Facilities	1
Total	**19**

Jurisdiction Critical Facility Category	Facility Count
Galt	
Essential Services Facilities	0
At Risk Population Facilities	0
Hazardous Materials and Solid Waste Facilities	0
Total	**0**
Isleton	
Essential Services Facilities	0
At Risk Population Facilities	0
Hazardous Materials and Solid Waste Facilities	0
Total	**0**
Rancho Cordova	
Essential Services Facilities	0
At Risk Population Facilities	0
Hazardous Materials and Solid Waste Facilities	0
Total	**0**
City of Sacramento	
Essential Services Facilities	729
At Risk Population Facilities	481
Hazardous Materials and Solid Waste Facilities	151
Total	**1,361**
Unincorporated Sacramento County	
Essential Services Facilities	98
At Risk Population Facilities	81
Hazardous Materials and Solid Waste Facilities Total	20
Total	**199**

Source: Sacramento County GIS, FEMA 7/19/2018 DFIRM

Table 4-93 Unincorporated Sacramento County – Critical Facilities in DFIRM X Protected by Levee Flood Zones by Facility Category

Critical Facility Category	Critical Facility Type	Facility Count
Essential Services Facilities	Emergency Evacuation Center	7
	EMS Stations	3
	FDIC Insured Banks	9
	Fire Station	4
	Law Enforcement	2
	Microwave Service Towers	28
	Power Plants	1

Critical Facility Category	Critical Facility Type	Facility Count
	Public Transit Stations	4
	Pump Station	2
	State Government Buildings	1
	Water Well	37
	Total	**98**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	7
	Day Care Center	15
	Mobile Home Parks	3
	Places of Worship	32
	School	24
	Total	**81**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	4
	Leaky Underground Storage Tank	16
	Total	**20**
X Protected by Levee Total		**199**

Source: Sacramento County GIS, FEMA 7/19/2018 DFIRM

Overall Community Impact

Levee failures and their impacts would vary by location and severity of any given levee failure or breach event and will likely only affect certain areas of the County during specific times. Based on the number of levees located throughout the County and population in leveed areas, future levee failure events would have potentially devastating economic impacts to the County. Impacts that are not quantified, but can be anticipated in large future events, include:

- Commercial and residential structural and property damage;
- Costs incurred due to post-flood clean up and repair of buildings and infrastructure;
- Damage to roads/bridges resulting in loss of mobility;
- Decreased revenue due to loss of income, sales, tourism, and property taxes;
- Deterioration of homes and neighborhoods as floods recur;
- Disruption of and damage to public infrastructure and services;
- Health hazards associated with mold and mildew, contamination of drinking water, etc.;
- Impact on the overall mental health of the community;
- Injury and loss of life, including first responders rescuing those who did not evacuate or are stranded;
- Loss of historical or unique artifacts;
- Loss of jobs due to businesses closing or cutting back on operating hours;
- Loss of programs or services that are cut to pay for flood recovery;
- Mental health and family impacts, including increased occurrence of suicides and divorce
- Negative impact on commercial and residential property values;
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed; and

- Significant economic impact (jobs, sales, tax revenue) to the community.

Future Development

SB 5 and levee improvement projects are underway in the County that will provide 200-year level of protection for urbanizing areas, as well as levee improvement projects to provide 100-year level in non-urban areas. These improvements will allow development in leveed areas to continue. For those areas where 100 and 200 cannot be met to certify these levees, then development standards associated with their Flood Ordinance will apply.

GIS Analysis

Sacramento County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the seven future development projects were mapped. For the flood analysis of future development areas, the parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point and linked to the Assessor's data. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each FEMA flood zone. DFIRM X Protected by Levee flood zones and future development areas are shown on Figure 4-94 and parcels and acreages in those areas are shown in Table 4-94.

Figure 4-94 Unincorporated Sacramento County – Future Development in DFIRM X Protected by Levee Flood Zones

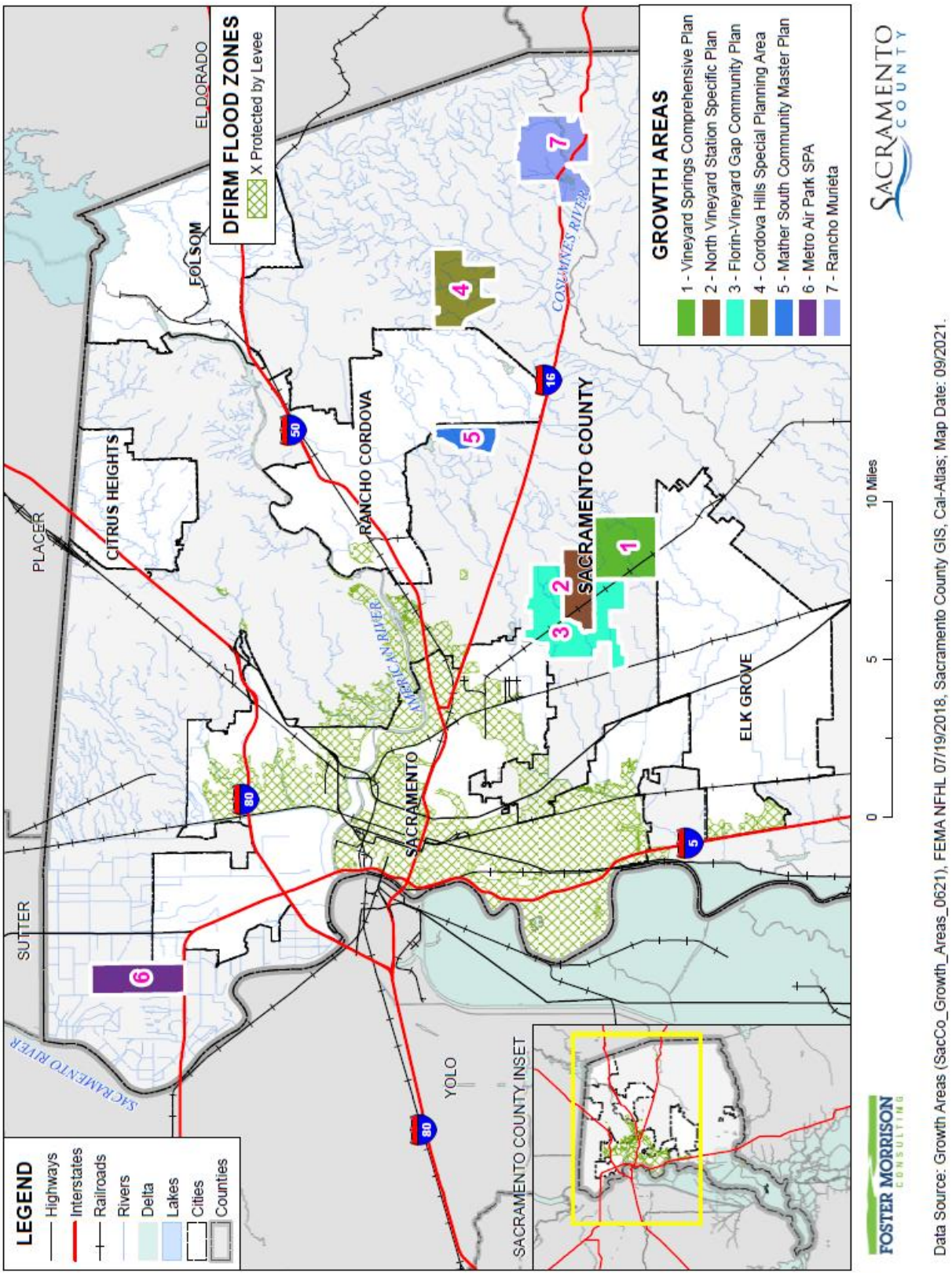


Table 4-94 Unincorporated Sacramento County – Future Development in FEMA DFIRM X Protected by Levee Flood Zones

Flood Zone/Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
X Protected by Levee			
Rancho Murieta	178	132	64
X Protected by Levee Total	**178**	**132**	**64**

Source: Sacramento County, FEMA 7/19/2018 DFIRM

4.3.15. Pandemic

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity.

A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control (CDC) and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning, preparation, and response. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the County is at risk, as pandemic is a regional, national, or international event. The speed of onset of pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

Disaster Declaration History

There has been one state and federal disaster declaration due to pandemic, as shown in Table 4-95.

Table 4-95 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

NCDC Events

The NCDC does not track pandemic.

WHO Events

The 20th century saw three outbreaks of pandemic flu.

- The **1918-1919 Influenza Pandemic (H1N1),** (aka the Spanish Flu**),** is the catastrophe against which all modern pandemics are measured. It is estimated that approximately 20 to 40 percent of the worldwide population became ill and that over 50 million people died. Approximately 675,000 deaths from the flu occurred in the U.S. alone.
- The **February 1957-1958 Influenza Pandemic (H2N2)** (aka the Asian Flu) was first identified in the Far East. Immunity to this strain was rare in people less than 65 years of age, and a pandemic was predicted. In preparation, vaccine production began in late May 1957, and health officials increased surveillance for flu outbreaks. Unlike the virus that caused the 1918 pandemic, the 1957 pandemic virus was quickly identified, due to advances in scientific technology. Vaccine was available in limited supply by August 1957. The virus came to the U.S. quietly, with a series of small outbreaks over the summer of 1957. When U.S. children went back to school in the fall, they spread the disease in classrooms and brought it home to their families. Infection rates were highest among school children, young adults, and pregnant women in October 1957. Most influenza-and pneumonia-related deaths occurred between September 1957 and March 1958. The elderly had the highest rates of death. By December 1957, the worst seemed to be over. However, during January and February 1958, there was another wave of illness among the elderly. This is an example of the potential "second wave" of infections that can develop during a pandemic. The disease infects one group of people first, infections appear to decrease and then infections increase in a different part of the population. Although the Asian flu pandemic was not as devastating as the 1918-1919 flu, about 69,800 people in the U.S. died.
- The **1968 Influenza Pandemic (H3N2)** was first detected in Hong Kong (aka the Hong Kong Flu). The first cases in the U.S. were detected as early as September of that year, but illness did not become widespread in the U.S. until December. Deaths from this virus peaked in December 1968 and January 1969. Those over the age of 65 were most likely to die. The same virus returned in 1970 and 1972. The number of deaths between September 1968 and March 1969 for this pandemic was 33,800, making it the mildest pandemic in the 20th century.

To date, the 21st century has seen two acknowledged pandemics.

- **2009 Swine Flu (H1N1)**— 2009 H1N1 (sometimes called "swine flu") was a new influenza virus causing illness in people. This virus was originally referred to as "swine flu" because laboratory testing showed that many of the genes in this new virus were very similar to influenza viruses that normally occur in pigs (swine) in North America. But further study showed that this virus was very different

from what normally circulates in North American pigs. It had two genes from flu viruses that normally circulate in pigs in Europe and Asia and bird (avian) genes and human genes. Scientists call this a "quadruple reassortant" virus. This virus spread from person-to-person worldwide, probably in much the same way that regular seasonal influenza viruses spread. On June 11, 2009, the WHO signaled that a pandemic of 2009 H1N1 flu was underway. It was first detected in the United States in early 2009 and spread to the world later that year. About 70 percent of people who were hospitalized with this 2009 H1N1 virus had one or more medical conditions previously recognized as placing people at "high risk" of serious seasonal flu-related complications. This included pregnancy, diabetes, heart disease, asthma, and kidney disease. Young children were also at high risk of serious complications from 2009 H1N1, just as they are from seasonal flu. And while people 65 and older were the least likely to be infected with 2009 H1N1 flu, if they got sick, they were also at "high risk" of developing serious complications from their illness. Some studies estimated that 11 to 21 percent of the global population at the time—or around 700 million to 1.4 billion people (of a total 6.8 billion)—contracted the illness. This was more than the number of people infected by the Spanish flu pandemic, but only resulted in about 150,000 to 575,000 fatalities for the 2009 pandemic. A follow-up study done in September 2010 showed that the risk of serious illness resulting from the 2009 H1N1 flu was no higher than that of the yearly seasonal flu. For comparison, the WHO estimates that 250,000 to 500,000 people die of seasonal flu annually.

- **2019/2020** COVID 19 – During the creation of this LHMP Update, the world was under various forms of lockdown due to COVID-19 (known also as coronavirus). Coronaviruses are a large family of viruses which may cause illness in animals or humans. In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The most recently discovered coronavirus causes coronavirus disease COVID-19. COVID-19 is the infectious disease caused by the most recently discovered coronavirus. This new virus and disease were unknown before the outbreak began in Wuhan, China, in December 2019. The most common symptoms of COVID-19 are fever, tiredness, and dry cough. Some patients may have aches and pains, nasal congestion, runny nose, sore throat or diarrhea. These symptoms are usually mild and begin gradually. Some people become infected but do not develop any symptoms and do not feel unwell. Most people (about 80%) recover from the disease without needing special treatment. Around 1 out of every 6 people who gets COVID-19 becomes seriously ill and develops difficulty breathing. Older people, and those with underlying medical problems like high blood pressure, heart problems or diabetes, are more likely to develop serious illness. People with fever, cough and difficulty breathing should seek medical attention. As of the beginning of December 2020, there had been roughly 60 million cases worldwide, with 1.4 million deaths.

Hazard Mitigation Planning Committee Events

As of mid-May 2021, there were 105,234 cases of Covid-19, with 1,693 deaths due to Covid.

Likelihood of Future Occurrence

Likely – The calculation for future occurrence of pandemic must first be considered in light of circumstances. The diseases are naturally occurring in the populations that reside in the County. In addition, this Plan is not examining the pandemic potential of these diseases, but instead examines when

these diseases manifest in severe injury or fatalities among humans. Given these assumptions and the five outbreaks since 1900, the likelihood of future occurrence is considered likely.

Climate Change and Pandemic

According to the WHO, there are three categories of research into the linkages between climatic conditions and infectious disease transmission. The first examines evidence from the recent past of associations between climate variability and infectious disease occurrence. The second looks at early indicators of already-emerging infectious disease impacts of long-term climate change. The third uses the above evidence to create predictive models to estimate the future burden of infectious disease under projected climate change scenarios. Based on this type of assessment, there is much evidence of associations between climatic conditions and infectious diseases. Likewise, changes in infectious disease transmission patterns are a likely major consequence of climate change.

Vulnerability Assessment

Vulnerability—High

Pandemic has and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat pandemic flu. Constant surveillance regarding current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent spread of pandemic flu by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the County. Pandemic can have varying levels of impact to the citizens of the County, depending on the nature of the pandemic.

Impacts

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently) and unemployment rose significantly. Economic impacts were significant. Supply chains for food can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

Future Development

Future development is not expected to be significantly impacted by this hazard, though population growth in the County could increase exposure to a pandemic, and increase the ability of each disease to be transmitted among the population of the County. If the median age of County residents continues to increase, vulnerability to pandemic diseases may increase, due to the fact that these diseases are often more deadly to senior citizens.

4.3.16. Subsidence

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

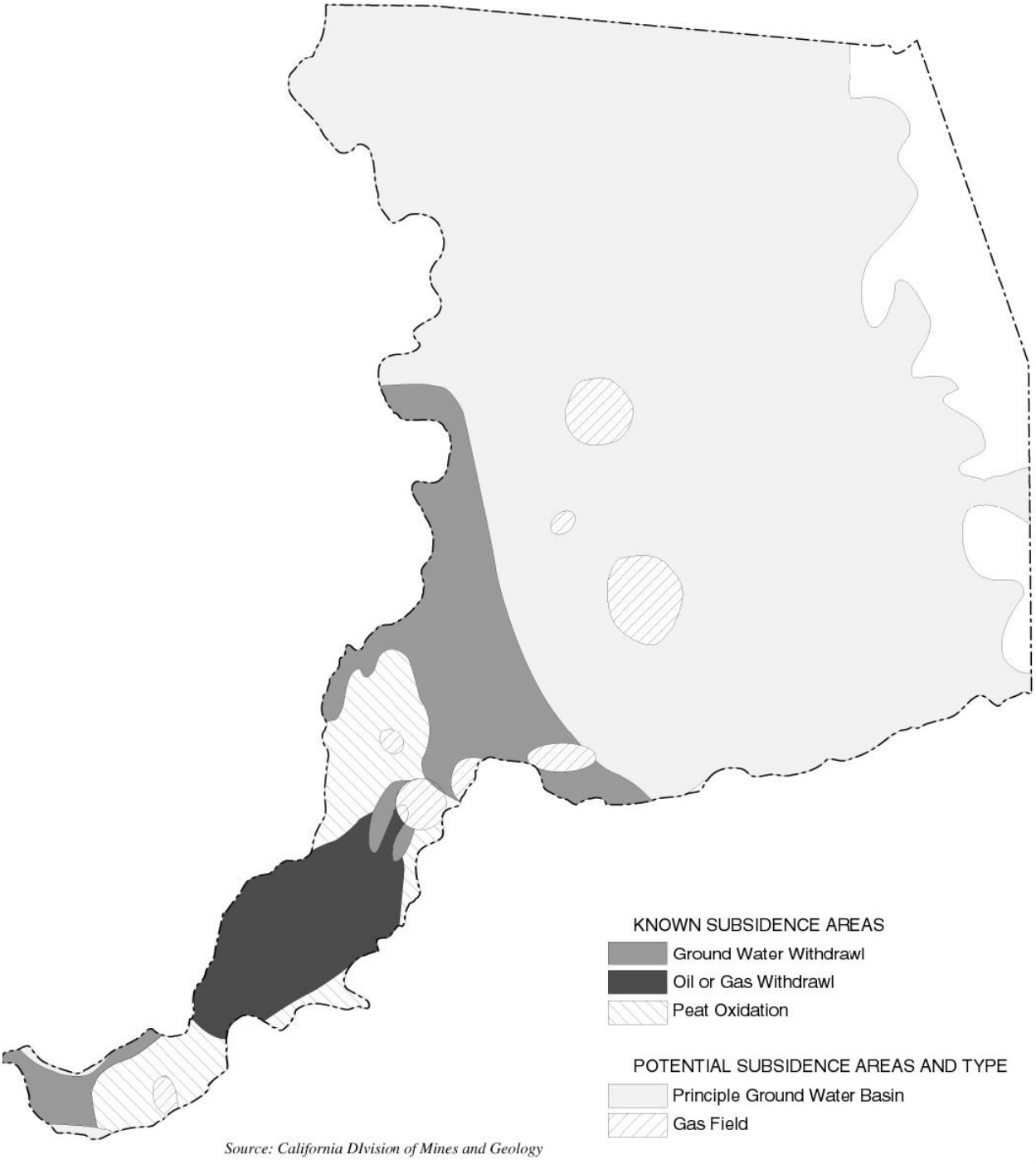
Subsidence is the gradual settling or sinking of the earth's surface over manmade or natural underground voids with little or no horizontal motion. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances.

Location and Extent

In Sacramento County, the Delta in the southeast portion of the County is highly at risk to subsidence

These areas are shown in Figure 4-95. There is no scientific scale used to measure subsidence. Subsidence is measured in inches or feet of elevation over time Speed of onset of subsidence is slow, with rates of change of often less than 1" to 2" per year. The duration of subsidence is long, as it is rare for subsidence to be reversed.

Figure 4-95 Known and Potential Subsidence Areas in Sacramento County



Source: Sacramento County General Plan Background Report, 2011

Past Occurrences

Disaster Declaration History

There have been no disaster declarations related to subsidence in Sacramento County.

NCDC Events

The NCDC database shows no past occurrences of subsidence.

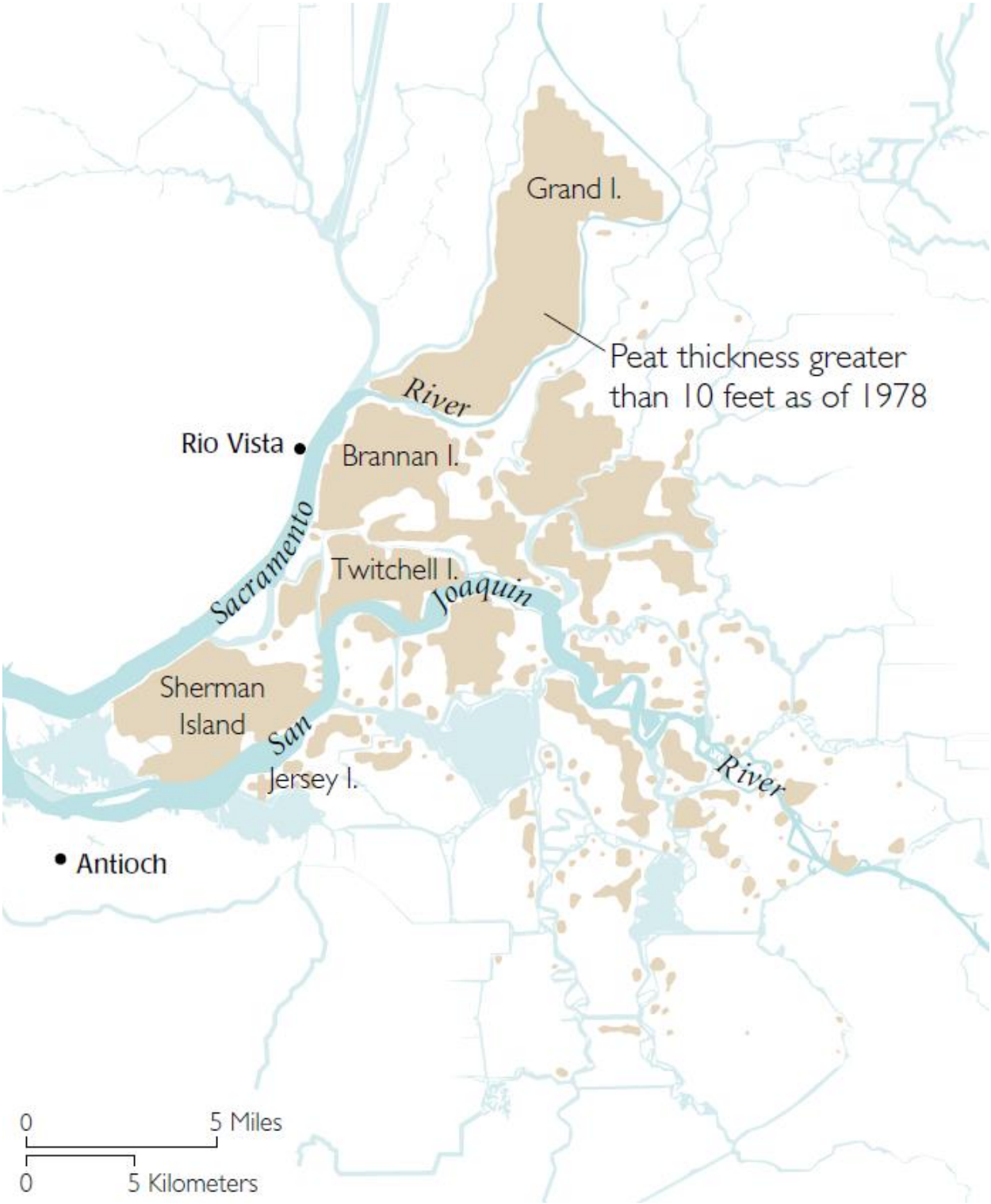
Hazard Mitigation Planning Committee Events

Subsidence has been occurring since the late 1800s, when the land in the Delta region first was converted to farmland. Reclamation projects continued, and by the 1930s the levee system was complete. The best evidence for long-term rates of subsidence comes from two sources—measurements of the exposure of transmission-line foundations on Sherman and Jersey Islands in the western Delta and repeated leveling surveys on Mildred and Bacon Islands and Lower Jones Tract in the southern Delta. The transmission lines in the western Delta were installed in 1910 and 1952. They are founded on pylons driven down to a solid substrate, so that comparison of the original foundation exposure with the current exposure allows estimates of soil loss. The southern Delta transect was surveyed 21 times between 1922 and 1981; in 1983 further surveys were precluded when Mildred Island flooded. Both data sets indicate long-term average subsidence rates of 1 to 3 inches per year, but also suggest a decline in the rate of subsidence over time, probably due to a decreased proportion of readily oxidizable peat in the near surface. In fact, rates of elevation loss measured at three selected sites in 1990 to 1992 were less than 0.4 inches per year, consistent with the inferred slowing of subsidence. However, all of these sites were near island edges, and likely underestimate the average island-wide elevation loss.

Likelihood of Future Occurrences

Highly Likely—Subsidence in the Delta has been a historical problem, occurring on an annual basis. Although changes in farming techniques and improved land use practices have slowed levels of subsidence, subsidence continues to occur. This is unlikely to change in the near future. Areas with peat thickness over 10 feet have a great potential for continued subsidence. These areas are shown in Figure 4-96.

Figure 4-96 Peat Thickness Estimates



Source: California Department of Water Resources, 1998

Climate Change and Subsidence

Climate change may further contribute to subsidence in the County, by increasing evapotranspiration rates for agriculture and other vegetation and by increasing periods of drought, both of which can increase demand for water, accelerate groundwater pumping and the drilling of new groundwater wells and lead to further lowering of the groundwater table and increasing subsidence.

Vulnerability Assessment

Vulnerability—Medium

Historically, the County has been at risk from subsidence, primarily in the Delta region in the southeast portion of the County.

The Delta, located at the confluence of the Sacramento and San Joaquin Rivers, is blanketed by peat and peaty alluvium deposited where streams, originating in the Sierra Nevada, Coast Ranges, and southern Cascade Range, enter the San Francisco Bay system. In the late-1800s, large-scale agricultural development in the Delta required levee-building to prevent frequent flooding. The leveed marshland tracts then had to be drained, cleared of wetland vegetation, and tilled. Levees and drainage systems were largely complete by 1930 and the Delta had taken on its current appearance, with most of its 1,150-squaremile area reclaimed for agricultural use. Today the Delta includes about 57 islands or tracts that are imperfectly protected from flooding by more than 1,100 miles of levees. In the Delta, subsidence affects the islands as well as the levees.

Sacramento County is affected by five types of subsidence. They are:

- compaction of unconsolidated soils by earthquake shaking (liquefaction)
- compaction by heavy structures
- the erosion of peat soils
- peat oxidation
- fluid withdrawal

While subsidence of Delta lands has been reported to be a major risk to Delta levees, subsidence is limited or non-existent under and adjacent to the levees as those areas have consolidated over the last fifty years and oxidation of the peat foundations is limited because it is not farmed.

Sacramento County's five types of subsidence is discussed below.

Compaction of Unconsolidated Soils by Earthquake Shaking (Liquefaction)

Compaction of unconsolidated soils by earthquake shaking is also known as liquefaction. Liquefaction is profiled as a separate hazard in Section 4.3.10. Refer to that section for more detail.

Compaction by Heavy Structures

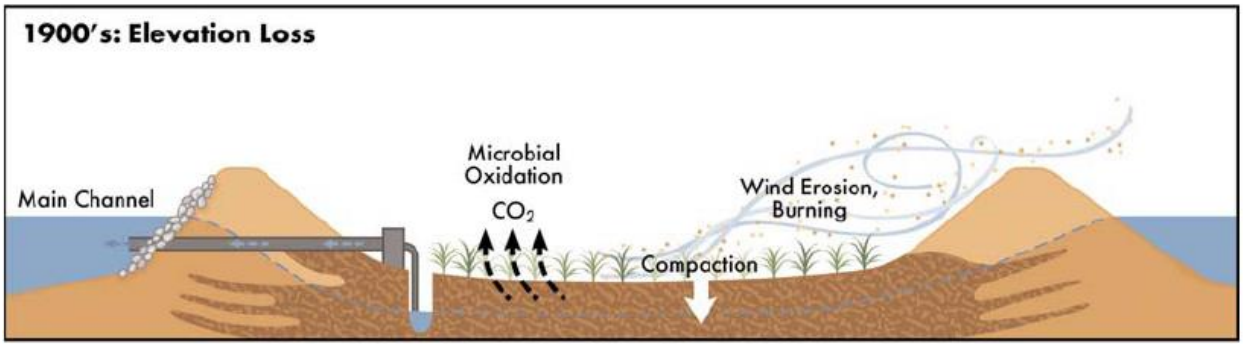
Land development pressures are forcing the building of structures on top of fine grained water saturated sediments. Unfortunately, the weight of the structures presses the water out of the soils. To mitigate the

problem, piles are installed from the footings of the heavy structures to a subsurface zone that will support the structural footing loads. The utilities, travel ways, and smaller building will be constructed to rest on the soil surface. As surface loading causes subsidence, the footings and pile support systems of the heavy structures will be exposed. In extreme situations, it may be necessary to build up the area to gain access into the pile supported structure as the area subsides. Structures that are not supported on piles will have a high probability of damage as the area subsides.

The Erosion of Peat Soils

Prior to 1950, poor land use practices, including burning of peat soils and wind erosion, exacerbated soil losses due to microbial oxidation (discussed in the next section and shown in Figure 4-97). Peat soils, being much less dense than mineral soils, are more easily eroded by wind. Peat soils are frequently wet either at, or close to, the surface thus limiting the amount of material which can be lost. Nevertheless, peat soils do blow causing spectacular dust clouds and degradation of this valuable resource.

Figure 4-97 Causes of Subsidence in the Delta during the 20th Century

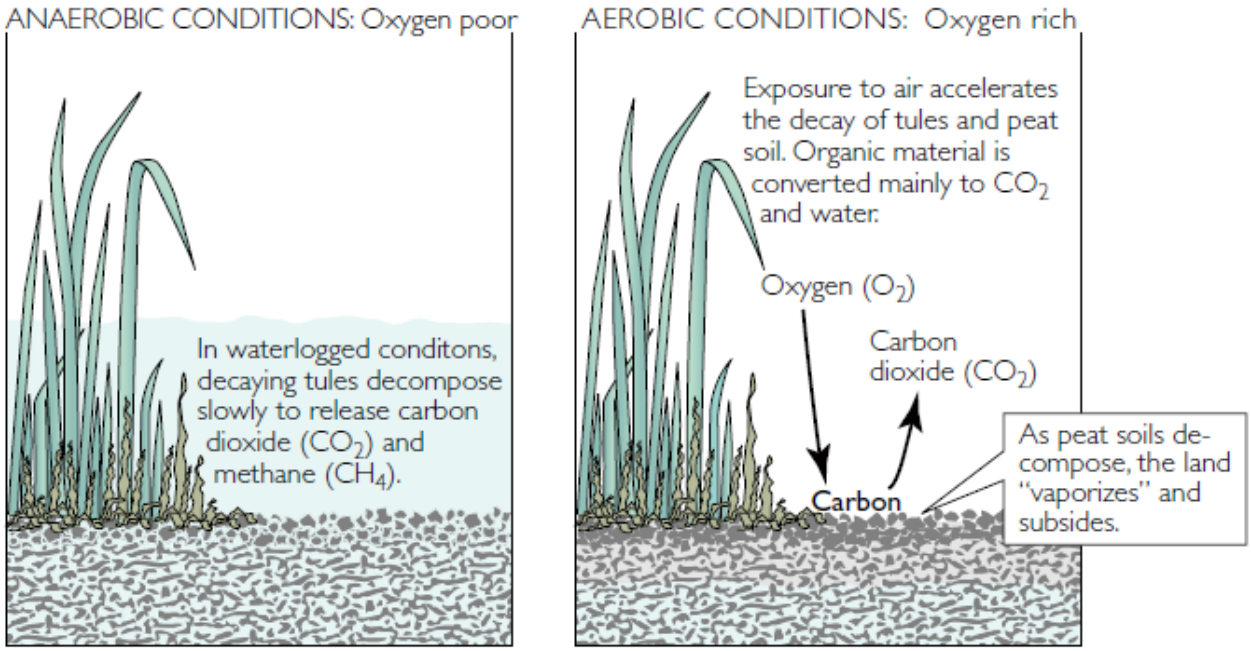


Source: Mount J, Twiss R. 2005. Subsidence, sea level rise, seismicity in the Sacramento-San Joaquin Delta. San Francisco Estuary and Watershed Science. Vol. 3, Issue 1 (March 2005), Article 5.

Peat Oxidation

The dominant cause of land subsidence in the Delta is decomposition of organic carbon in the peat soils. As shown in Figure 4-98, prior to agricultural development, the soil was waterlogged and anaerobic (oxygen-poor). Organic carbon accumulated faster than it could decompose. Drainage for agriculture led to aerobic (oxygen-rich) conditions that favor rapid microbial oxidation of the carbon in the peat soil. Most of the carbon loss is emitted as carbon dioxide gas to the atmosphere.

Figure 4-98 Peat Oxidation in Anaerobic and Aerobic Conditions



Source: USGS Publication "Sacramento-San Joaquin Delta: The Sinking Heart of the State." Report FS-005-00

Fluid Withdrawal

In the late-1800s, large-scale agricultural development in the Delta required levee-building to prevent frequent flooding. The leveed marshland tracts then had to be drained, cleared of wetland vegetation, and tilled. Levees and drainage systems were largely complete by 1930 and the Delta had taken on its current appearance, with most of its 1,150-square mile area reclaimed for agricultural use. As oxidation, erosion, and burning continued to cause subsidence of the land, more water needed to be withdrawn to maintain a constant water table to ensure agricultural plant growth. Water levels in the depressed islands are maintained 3 to 6 feet below the land surface by an extensive network of drainage ditches, and the accumulated agricultural drainage is pumped through or over the levees into stream channels. Without this drainage the islands would become waterlogged.

Groundwater Pumping

Central Sacramento County Groundwater Management Plan discussed groundwater pumping in the County.

> ***Historical benchmark elevation data for the period from 1912 through the late 1960s obtained from the National Geodetic Survey (NGS) were used to evaluate land subsidence in north Sacramento County. From 1947 to 1969, the magnitude of land subsidence measured at benchmarks north of the American River ranged from 0.13 feet to 0.32 feet, with a general decrease in subsidence in a northeastward direction. This decrease is consistent with the geology of the area: formations along the eastern side of the Sacramento Valley are older***

than those on the western side and are subject to a greater degree of pre-consolidation, making them less susceptible to subsidence. The maximum documented land subsidence of 0.32 feet was measured at both benchmark L846, located approximately two miles northeast of the former McClellan AFB, and benchmark G846, located approximately one mile northeast of the intersection of Greenback Lane and Elkhorn Boulevard. Another land subsidence evaluation was performed in the Arden-Arcade area of Sacramento County from 1981 to 1991. Elevations of nine wells in the Arden-Arcade area were surveyed in 1981, 1986, and 1991. The 1986 results were consistently higher than the 1981 results; this was attributed to extremely high rainfall totals in early 1986 that recharged the aquifer and caused a rise in actual land surface elevations. The 1991 results were consistently lower than the 1986 results; this was attributed to five years of drought immediately preceding the 1991 measurements which caused depletion of the aquifer and resulting land surface subsidence. Comparison of eight of the locations indicates that seven benchmarks had lower elevations in 1991 than in 1981 and one benchmark had a higher elevation in 1991. Of the seven benchmarks with lower elevations in 1991, the maximum difference is 0.073 feet (less than one inch). Whether this is inelastic subsidence is indeterminate from the data, but it is clear that the magnitude of the potential subsidence in the benchmarks between 1981 and 1991 was negligible.

Impacts

According to Sacramento County, the subsided islands of the Sacramento-San Joaquin Delta are perpetually at risk of flooding in the event of levee breaks or overtopping and many have flooded in the past, causing millions of dollars in damage. As subsidence progresses, the levees must be regularly maintained and periodically raised and strengthened to support the increasing stresses on their banks. Delta island flooding can also interfere with freshwater exports from the Delta. The statewide water-transfer system in California is so interdependent that decreased water quality in the Delta might lead to accelerated subsidence in other areas. Both the Santa Clara and San Joaquin Valleys rely, in part, on imported water from the Delta to augment local supplies and thereby reduce local ground-water extraction and arrest or slow subsidence. Degradation of the Delta source water could result in increased ground-water use and renewed subsidence.

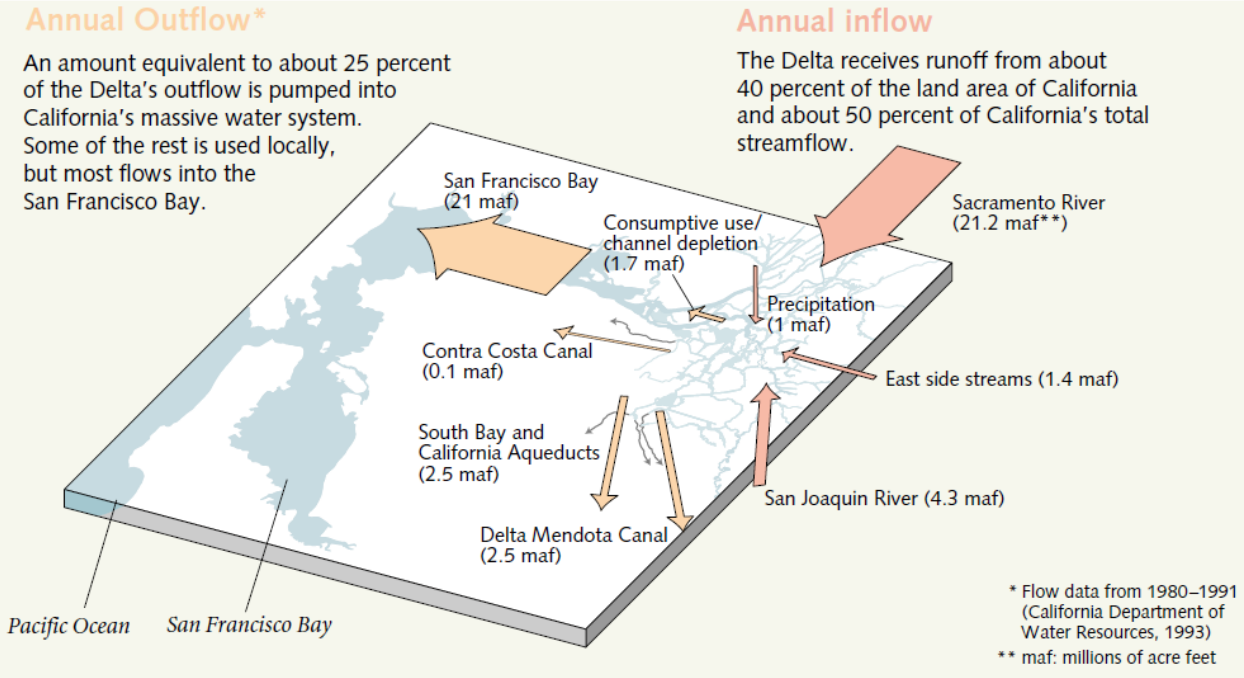
Impacts to the County, Central California, and the State could occur from subsidence. Impacts are discussed below regarding:

- Subsidence and the Delta Water Supply Impacts
- Subsidence and Levee Failure Impacts
- Subsidence and Natural Resource Protection Impacts

Subsidence and Delta Water Supply Impacts

The Delta receives runoff from about 40 percent of the land area of California and about 50 percent of California's total streamflow, as shown in Figure 4-99. It is the heart of a massive north-to-south water-delivery system whose giant engineered arterials transport water southward. State and Federal contracts provide for export of up to 7.5 million acre-feet per year from two huge pumping stations in the southern Delta near the Clifton Court Forebay. About 83 percent of this water is used for agriculture and the remainder for various urban uses in central and southern California. Two-thirds of California's population (more than 20 million people) gets at least part of its drinking water from the Delta.

Figure 4-99 The Delta and California's Water System



Source: USGS Publication "Sacramento-San Joaquin Delta: The Sinking Heart of the State." Report FS-005-00

Land subsidence of Delta islands indirectly affects the north-to-south water transfer system, which is predicated on the available water supply (annual inflows to the Delta), the viability of aquatic species populations, and acceptable water quality in the southern Delta. The statewide water-transfer system in California is so interdependent that decreased water quality in the Delta, whether due to droughts or levee failures, might lead to accelerated subsidence in areas dependent on imported water from the Delta.

The waterways of the Delta are subject to tidal action. Ocean tides propagating into San Francisco Bay are observed 5–6 hours later along the Cosumnes River in the eastern Delta. The position of the interface between the saline waters of the Bay and the freshwaters of the Delta depends upon the tidal cycle and the flow of freshwater through the Delta. Before major dams were built on rivers in the Delta watershed, the salinity interface migrated as far upstream as Courtland along the Sacramento River. Today, releases of freshwater from dams far upstream help reduce the maximum landward migration of the salinity interface during the late summer. In the spring, however, reservoirs and Delta exports consistently act in concert to

increase the landward migration of the salinity interface over that expected under conditions of unimpaired flows.

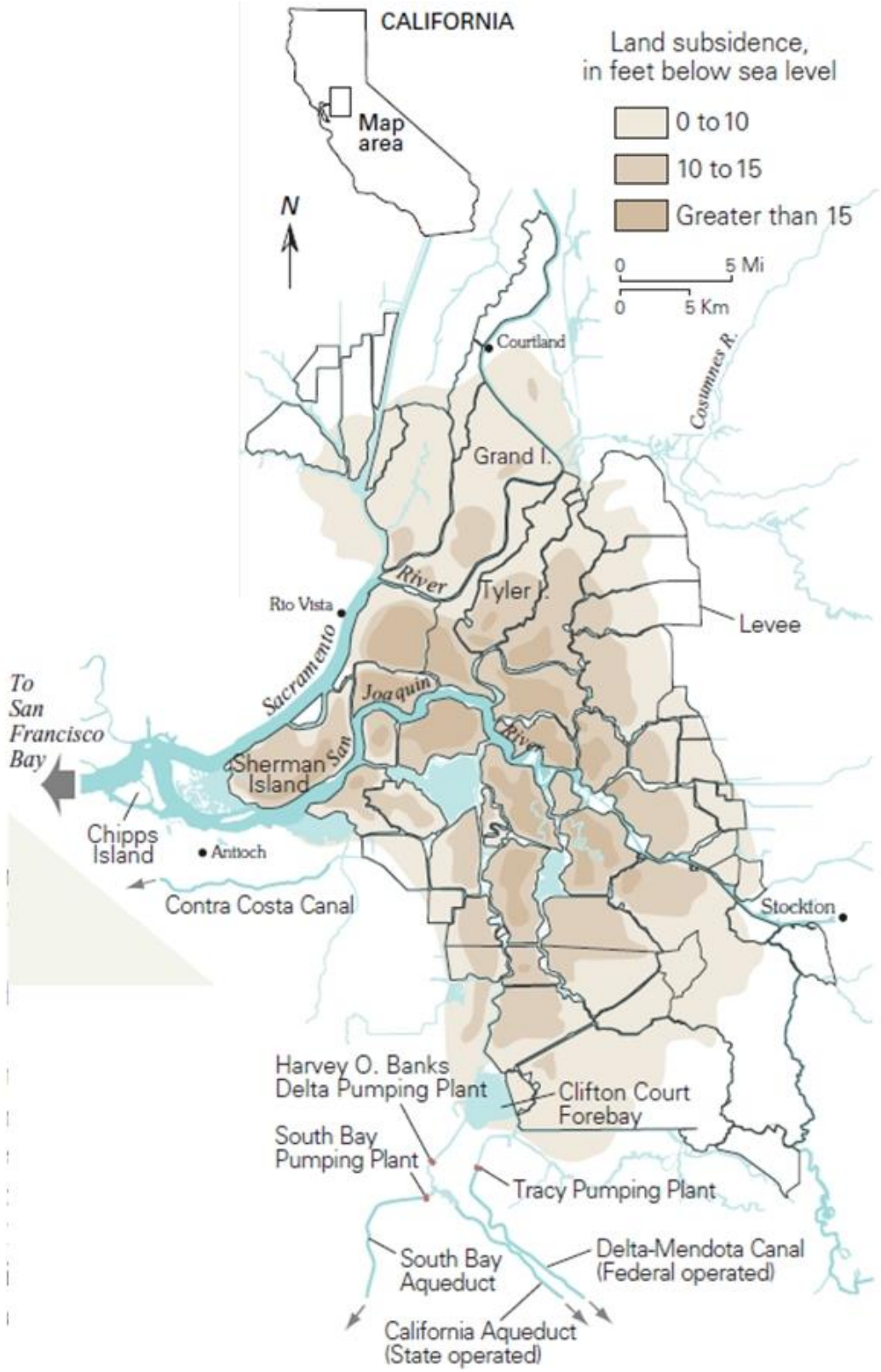
A less significant, terms of acreage effected, but no less severe problem arising from subsidence of bayward Delta islands is saltwater intrusion of subsurface fresh water. River water runoff during years of comparatively normal precipitation has been sufficient to retard salt water from intruding into the freshwater table. However, the rate of saltwater intrusion of west Delta islands increases during years of below normal precipitation, causing damage to crops irrigated with subsurface water contaminated with salt water. Efforts to develop salt tolerant crops and a reduction in the subsidence rate might enable farming to continue on west Delta islands for a limited time. However, continuing crop production accelerates peat oxidation and potentially lessens irrigation water quality from saltwater intrusion of subsurface fresh water sources.

Subsidence and Levee Failure

Island subsidence has reduced the stability of Delta levees, increasing the risk of failure. Embankment and foundation materials for most Delta levees are substandard, adding the risk of failure during seismic events. Subsidence of levees and crop covered islands is occurring, though levees subside at a significantly lower at a slower rate due primarily to a slow oxidation of peat foundations process and from reduced tillage and irrigation. Subsidence in general is limited to a very small percentage of the Delta.

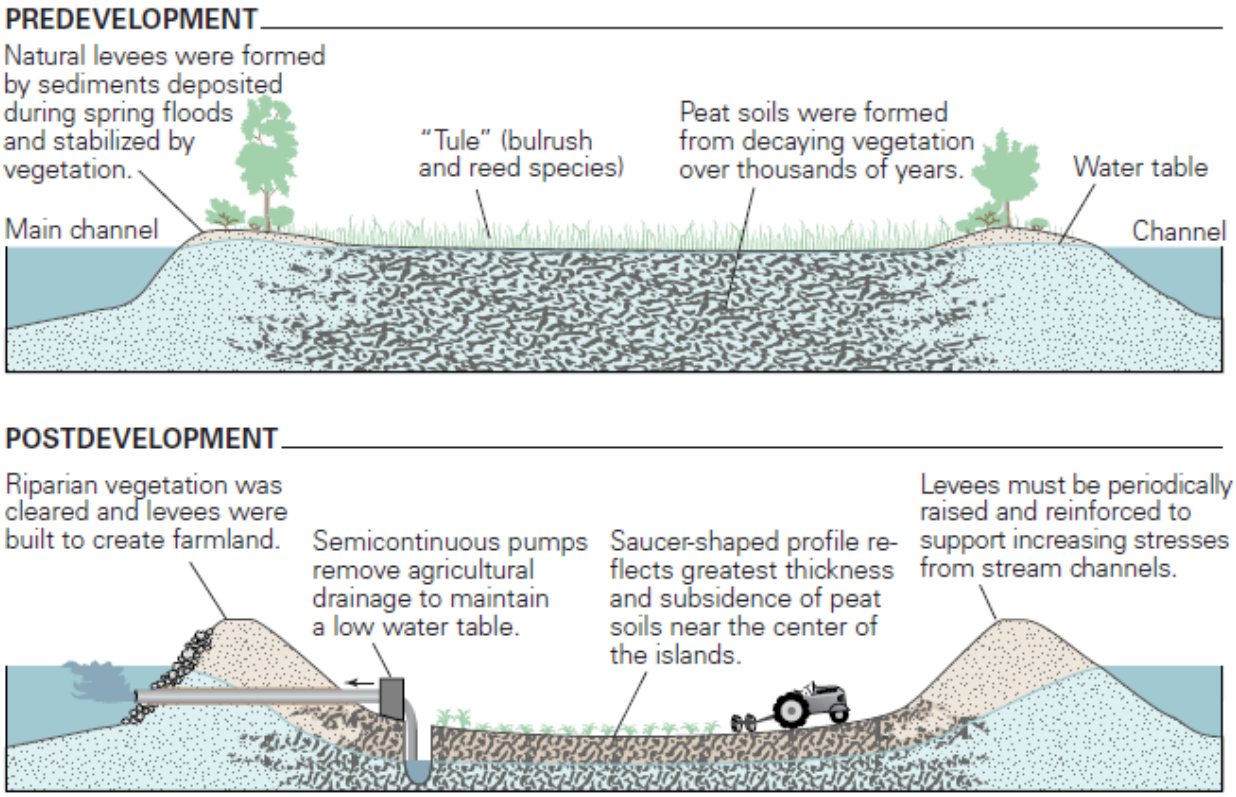
As shown in Figure 4-100, many of the islands in the central Delta are presently 10 to nearly 25 feet below sea level. The land surface profile of many islands is somewhat saucer-shaped, because subsidence is greater in the thick peat soils near their interior than in the more mineral-rich soils near their perimeter. As subsidence progresses, the levees themselves must be regularly maintained and periodically raised and strengthened to support the increasing stresses on their banks.

Figure 4-100 Land Subsidence in the Sacramento-San Joaquin Delta



Source: USGS Publication "Sacramento-San Joaquin Delta: The Sinking Heart of the State." Report FS-005-00

Figure 4-101 Subsidence in Peat Soils on the Delta Islands



Source: USGS Publication "Sacramento-San Joaquin Delta: The Sinking Heart of the State." Report FS-005-00

When levee breaches occur on deeply-subsided islands, rapid filling draws brackish water into the Delta, temporarily degrading water quality over a large region. Known colloquially as the "Big Gulp," the water quality impact of island filling is principally a function of the magnitude and location of anthropogenic accommodation space (vertical space once filled by peat but that has now subsided). Island flooding directly affects tidal prism dynamics within the Delta, with the potential for long-term degradation of water quality. The magnitude of the impact depends upon the location of flooded islands, the volume of water within the island, and the geometry of breach openings.

The costs of levee construction and maintenance are borne by local reclamation districts with assistance by the State of California and the Federal government, as well as by local reclamation districts. These costs increase as subsidence progresses, albeit at a slow rate. Increasing the footprint of the levee by flattening the landside slope will reduce subsidence near the levee and consolidate foundations under the levee. Agricultural operations will consequently move further away from the levee, thus limiting both oxidation and further subsidence near the levee in areas affecting the long-term stability of the levee. forcing levees to be built higher and stronger.

Between 1981 and 1986, the total amount spent on emergency levee repairs related to flooding was about $97 million, and in 1981 to 1991 the amount spent on routine levee maintenance was about $63 million. Annual cost of repair and maintenance of Delta levees in the 1980s averaged about $20 million per year. It is important to note that the cost of levee maintenance and repairs significantly dwarf against long term

impacts and costs of damages prevented to residential, critical State emergency evacuation and transport routes, high-value agricultural land, habitats, state-wide water quality, critical utility crossings (power, water, etc.) throughout the Delta.

Subsidence and Natural Resources Protection

The largest of California's drinking water sources is the Sacramento-San Joaquin Delta and its tributaries. The Delta provides at least a portion of the water supply for about two-thirds of California's population, and provides a migratory pathway for four fish that are listed as endangered or threatened pursuant to the federal Endangered Species Act.

Future Development

Future development in the County is at risk in the Delta. More information on that can be found in Annex G (Delta Annex) and the accompanying chapters.

4.3.17. Volcano

Hazard Profile

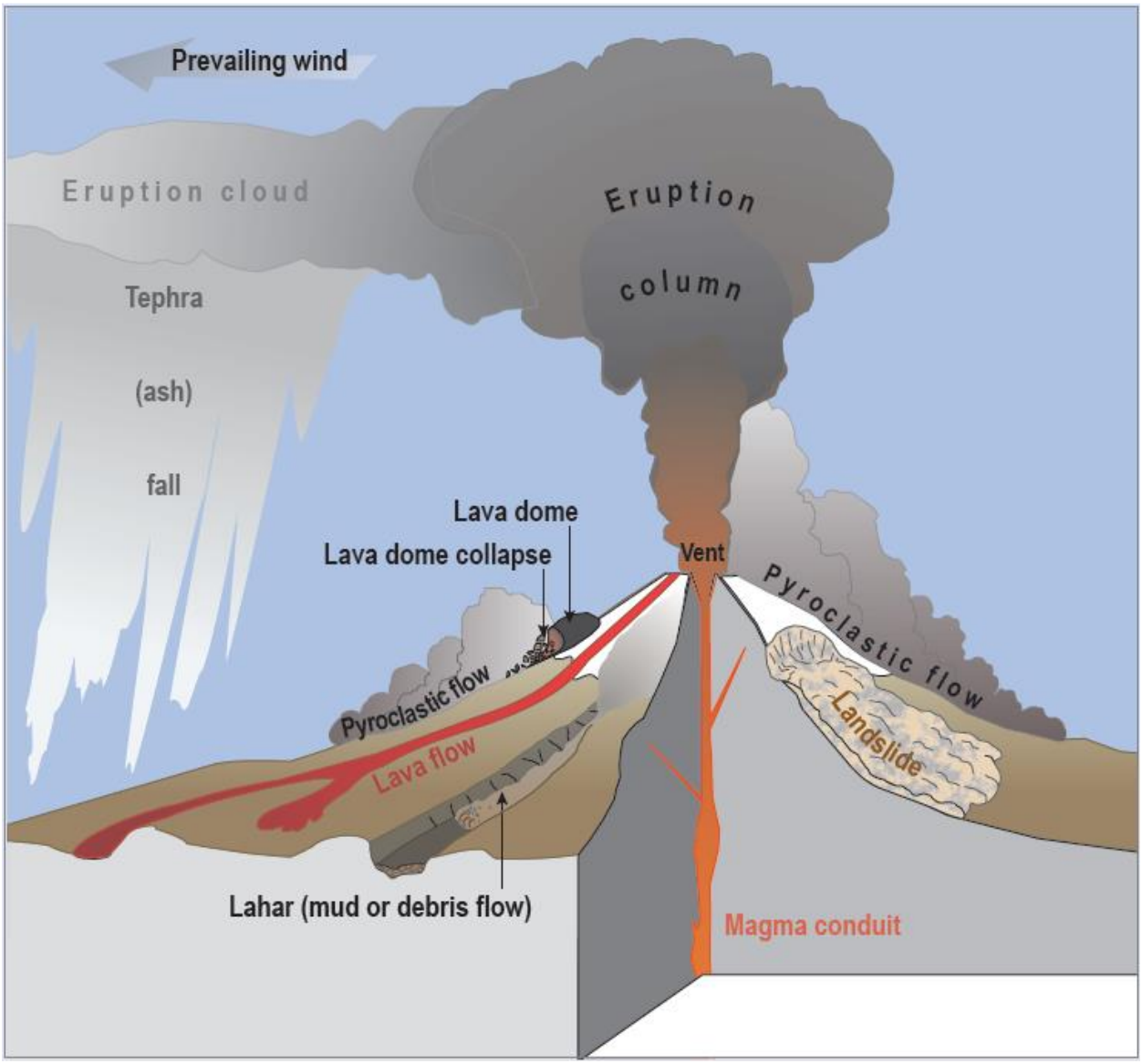
This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

The California State Hazard Mitigation Plan identifies volcanoes as one of the hazards that can adversely impact the State. However, there have been few losses in California from volcanic eruptions.

As shown in Figure 4-102, active volcanoes pose a variety of natural hazards. Explosive eruptions blast lava fragments and gas into the air with tremendous force. The finest particles (ash) billow upward, forming an eruption column that can attain stratospheric heights in minutes. Simultaneously, searing volcanic gas laden with ash and coarse chunks of lava may sweep down the flanks of the volcano as a pyroclastic flow. Ash in the eruption cloud, carried by the prevailing winds, is an aviation hazard and may remain suspended for hundreds of miles before settling to the ground as ash fall. During less energetic effusive eruptions, hot, fluid lava may issue from the volcano as lava flows that can cover many miles in a single day. Alternatively, a sluggish plug of cooler, partially solidified lava may push up at the vent during an effusive eruption, creating a lava dome. A growing lava dome may become so steep that it collapses, violently releasing pyroclastic flows potentially as hazardous as those produced during explosive eruptions.

Figure 4-102 Volcanoes and Associated Hazards



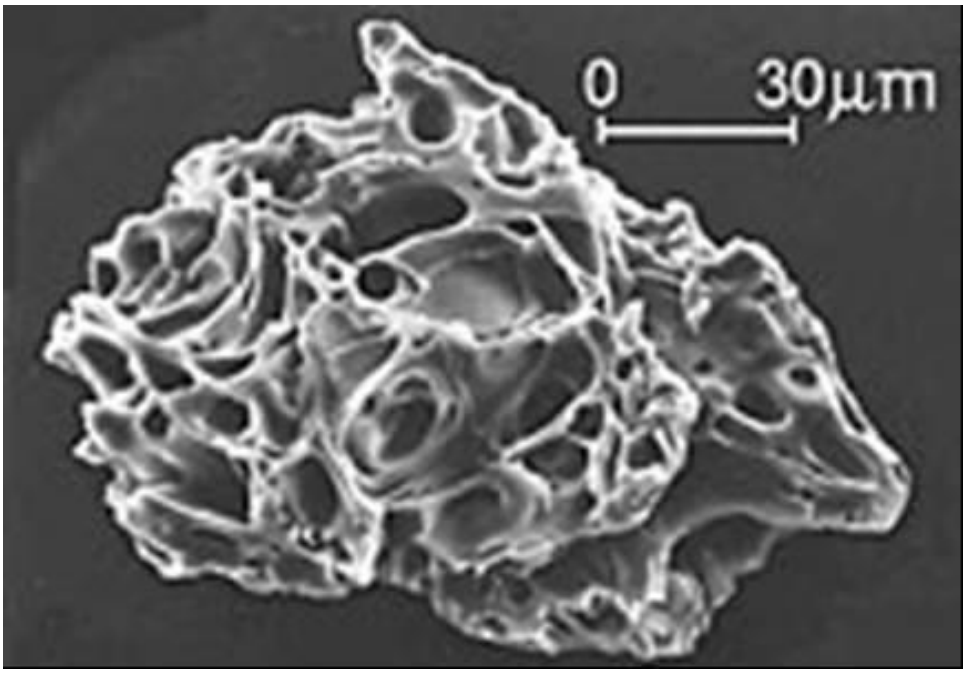
Source: USGS Publication 2014-3120

During and after an explosive or effusive eruption, loose volcanic debris on the flanks of the volcano can be mobilized by heavy rainfall or melting snow and ice, forming powerful floods of mud and rock (lahars) resembling rivers of wet concrete. These can rush down valleys and stream channels as one of the most destructive types of volcano hazards.

Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away and cause problems for aviation. The USGS notes specific characteristics of volcanic ash. Volcanic ash is composed of small, jagged pieces of rocks, minerals, and volcanic glass the size of sand and silt, as shown in Figure 4-103. Very small ash particles can be less than 0.001 millimeters across. Volcanic ash is not the product of combustion, like the

soft fluffy material created by burning wood, leaves, or paper. Volcanic ash is hard, does not dissolve in water, is extremely abrasive and mildly corrosive, and conducts electricity when wet.

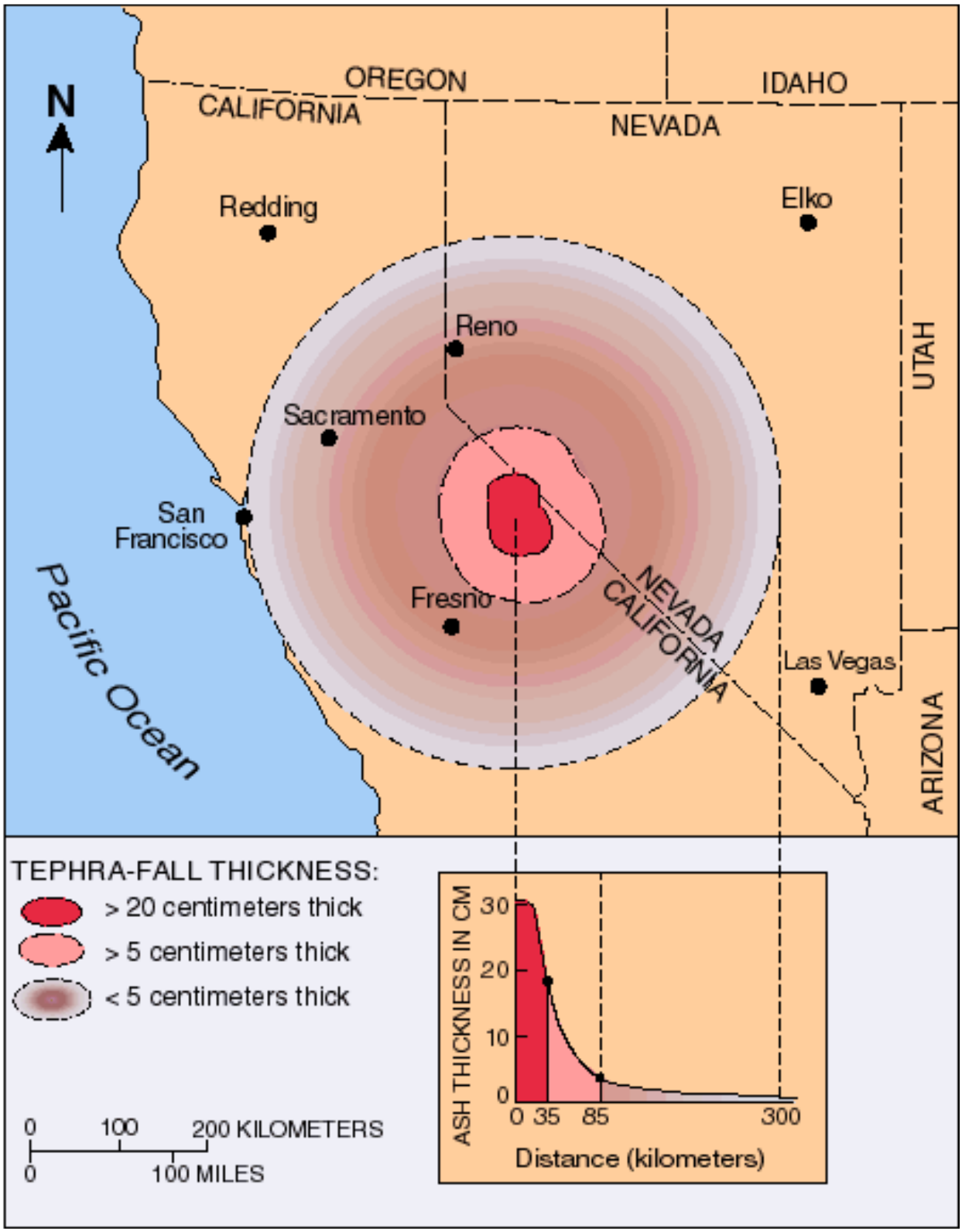
Figure 4-103 Ash Particle from 1980 Mt. St Helens Eruption Magnified 200 Times



Source: US Geological Survey: Volcanic Ash: Effect & Mitigation Strategies. http://volcanoes.usgs.gov/ash/properties.html.

Volcanic ash is formed during explosive volcanic eruptions. Explosive eruptions occur when gases dissolved in molten rock (magma) expand and escape violently into the air, and also when water is heated by magma and abruptly flashes into steam. The force of the escaping gas violently shatters solid rocks. Expanding gas also shreds magma and blasts it into the air, where it solidifies into fragments of volcanic rock and glass. Once in the air, wind can blow the tiny ash particles tens to thousands of miles away from the volcano. Figure 4-104 is a volcanic hazard's ash dispersion map for the Long Valley Caldera, which could possibly affect Sacramento County.

Figure 4-104 Volcanic Hazards Ash Dispersion Map for the Long Valley Caldera



Source: US Geological Survey

The average grain-size of rock fragments and volcanic ash erupted from an exploding volcanic vent varies greatly among different eruptions and during a single explosive eruption that lasts hours to days. Heavier, large-sized rock fragments typically fall back to the ground on or close to the volcano and progressively smaller and lighter fragments are blown farther from the volcano by wind. Volcanic ash, the smallest particles (2 mm in diameter or smaller), can travel hundreds to thousands of kilometers downwind from a volcano depending on wind speed, volume of ash erupted, and height of the eruption column.

The size of ash particles that fall to the ground generally decreases exponentially with increasing distance from a volcano. Also, the range in grain size of volcanic ash typically diminishes downwind from a volcano (becoming progressively smaller). At specific locations, however, the distribution of ash particle sizes can vary widely. Based on Figure 4-104, the USGS estimated that ash of up to 2" could fall in areas of Sacramento County.

Location and Extent

Of the approximately 20 volcanoes in the State, only a few are active and pose a threat. Of these, Long Valley Caldera and Lassen Peak are the closest to Sacramento County. The Long Valley area is considered to be an active volcanic region of California and includes features such as the Mono-Inyo Craters, Long Valley Caldera, and numerous active and potential faults. Figure 4-105 shows volcanoes in or near California and the location of the Lassen Peak and the Long Valley area relative to the Sacramento County Planning Area. The duration of volcano eruptions is short for the eruption, though ash can stay in the air for a long period of time afterwards. There is no scientific scale to measure volcano eruption.

Figure 4-105 Active Volcanoes in California and in the Sacramento County Area

Source: 2013 State of California Hazard Mitigation Plan

Past Occurrences

Disaster Declarations

There have been no disaster declarations related to volcano.

NCDC Events

The NCDC does not track volcanic activity.

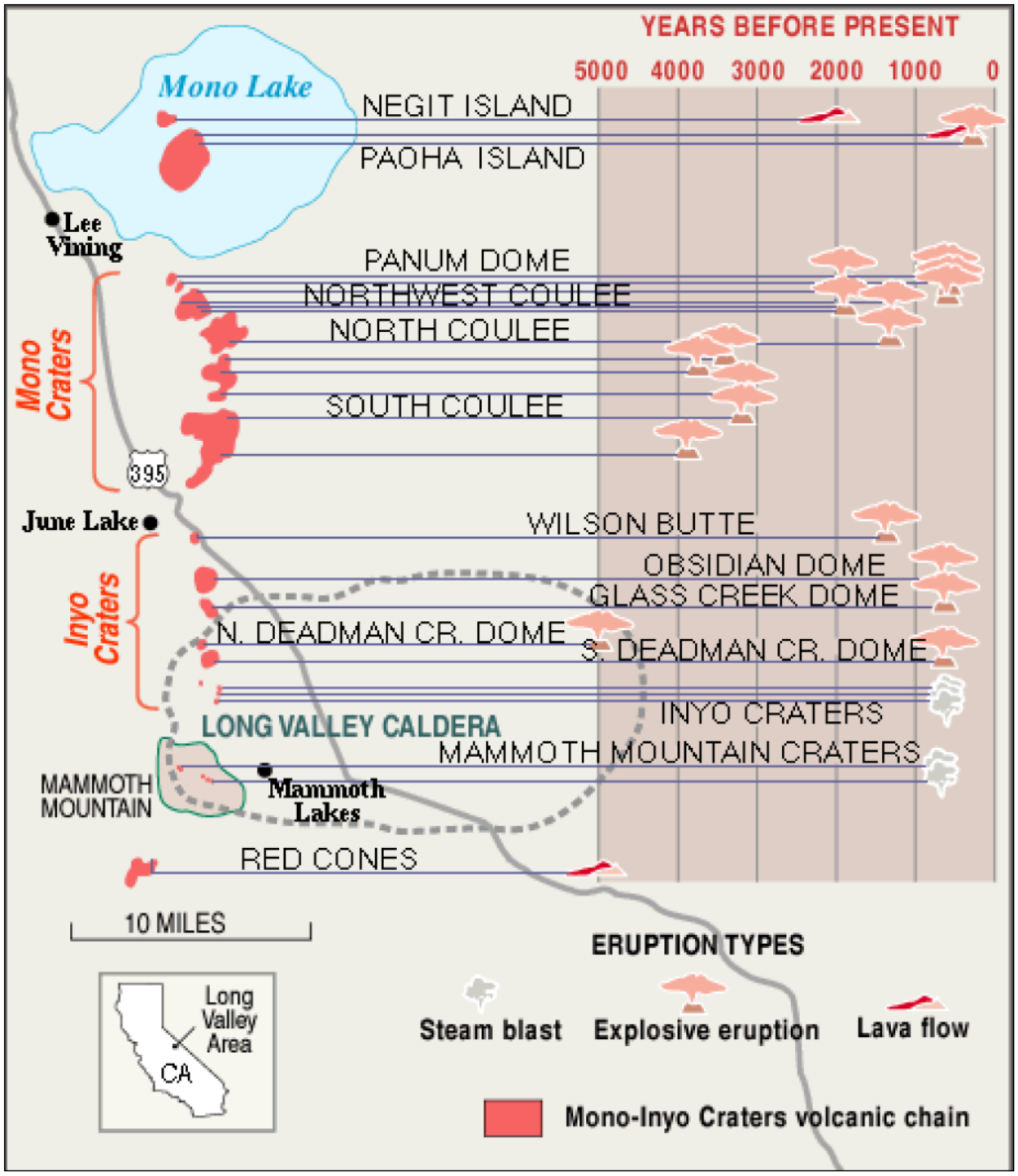
Hazard Mitigation Planning Committee Events

The HMPC noted no volcanic events.

USGS Events

During the past 1,000 years there have been at least 12 volcanic eruptions in the Long Valley area. This activity is likely to continue long into the future. The Long Valley Caldera and Mono-Inyo Craters volcanic chain has a long history of geologic activity that includes both earthquakes and volcanic eruptions. Volcanoes in the Mono-Inyo Craters volcanic chain have erupted often over the past 40,000 years. As shown in Figure 4-106. over the past 5,000 years, small to moderate eruptions have occurred at various sites along the Mono-Inyo Craters volcanic chain at intervals ranging from 250 to 700 years.

Figure 4-106 Volcanic Activity in the Mono-Inyo Craters Volcano Chain in the Past 5,000 Years



Source: U.S. Geological Survey

As recently as 1980 four large earthquakes (greater than magnitude 6 on the Richter Scale) and numerous relatively shallow earthquakes occurred in the area. Since then, earthquakes and associated uplift and deformation in the Mammoth Lakes Caldera have continued. Because such activities are common

precursors of volcanic eruptions, the U.S. Geological Survey closely monitors the unrest in the region. There are no records of past impacts from volcanic eruptions to the Sacramento County Planning Area.

Likelihood of Future Occurrences

Unlikely—According to the U.S. Geological Survey, the pattern of volcanic activity over the past 5,000 years suggests that the next eruption in the Long Valley area will most likely happen somewhere along the Mono-Inyo volcanic chain. However, the probability of such an eruption occurring in any given year is less than 1 percent. The next eruption will most likely be small and similar to previous eruptions along the Mono-Inyo volcanic chain during the past 5,000 years (see Figure 4-106 above). According to the State Multi-Hazard Mitigation Plan, only Medicine Lake, Mount Shasta, Lassen Peak, and the Long Valley Caldera are considered active and pose a threat of future activity. However, due to the location of the Planning Area relative to the active volcanoes, the State Plan does not consider Sacramento County to be vulnerable to eruption and/or ash from these volcanoes.

Climate Change and Volcano

Climate change is unlikely to influence volcanic eruptions.

Vulnerability Assessment

Vulnerability—Low

The USGS has ranked the volcanic threat at all U.S. volcanoes using volcano age, types of potential hazards, and estimates of the societal exposure to those hazards. Sixteen volcanoes are on California's watch list to monitor. Research suggests that partially molten rock (magma) lies beneath seven of these volcanoes—Medicine Lake Volcano, Mount Shasta, Lassen Volcanic Center, Clear Lake Volcanic Field, the Long Valley Volcanic Region, Coso Volcanic Field, and Salton Buttes. At these volcanoes, earthquakes (seismicity), hot springs, volcanic gas emissions, and (or) ground movement (deformation) attest to their restless nature. Information on the Long Valley Volcanic Region threat is shown in Table 4-96.

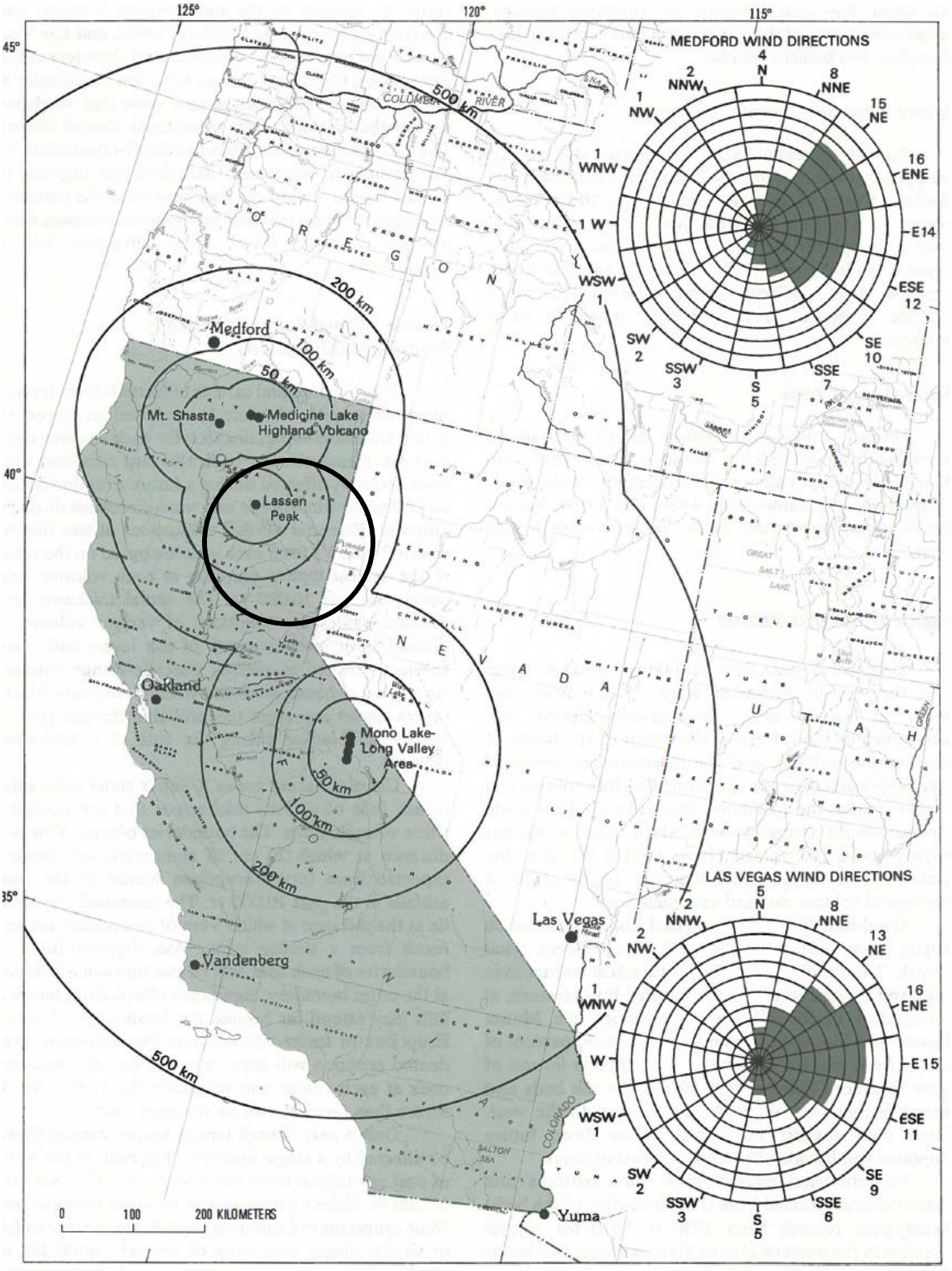
Table 4-96 Volcano Threat near Sacramento County

Volcano	Long Valley Volcanic Region
Threat	Moderate to Very High Threat
	A cataclysmic "super volcano" eruption about 760,000 years ago left behind a depression 20 miles long and 10 miles wide known as Long Valley Caldera, located about 30 miles southeast of Yosemite National Park.

Source: USGS Fact Sheet 2014-3120

Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away and cause problems for aviation. The USGS, in Bulletin 1847, described the nature and probable distribution of potentially hazardous volcanic phenomena and their threat to people and property. It included hazard zonation maps that depicted areas relatively likely to be affected by future eruptions in California. Affected areas fall in Sacramento County. This is shown on Figure 4-107.

Figure 4-107 Potential Ashfall Areas for California Volcanoes



Source: USGS Bulletin 1847

Low-level volcanic unrest can persist for decades or even hundreds of years without an eruption. Although steady, low-level unrest is normal for many young volcanoes, rapidly accelerating unrest is cause for concern. At California's most threatening volcanoes, monitoring sensors are in place to continuously track levels of unrest. Such monitoring is necessary to determine the baseline, or background level, of activity at a volcano to help volcanologists know what is normal. An uptick in unrest may be a sign of increased volcanic threat.

Impacts

The impact of coarse air fall is limited to the immediate area of the volcanic vent. Structures may be damaged by accumulation of falling lava fragments or burnt by their high heat. Wildfires may be ignited by coarse ash. Although generally non-lethal, fine ash fall is the most widespread and disruptive volcanic hazard. People exposed to fine ash commonly experience various eye, nose, and throat symptoms. Short-term exposures are not known to pose a significant health hazard. Long-term health effects have not been demonstrated conclusively. Ash deposited downwind of the volcano covers everything like a snowfall, but also infiltrates cracks and openings in machinery, buildings, and electronics. Falling ash can obscure sunlight, reducing visibility to zero. When wet, it can make paved surfaces slippery and impassable. Fine ash is abrasive, damaging surfaces and moving parts of machinery, vehicles, and aircraft. Life-threatening and costly damage can occur to aircraft that fly through fine ash clouds. Newly fallen volcanic ash may result in short-term physical and chemical changes in water quality. Close to the volcano, heavy ash fall may cause roofs to collapse, wastewater systems to clog, and power systems to shut down. In agricultural areas, fine ash can damage crops, and sicken livestock. Resuspension of ash by human activity and wind cause continuing disruption to daily life.

Future Development

Future development in the County may be at risk to volcanic activity; however, future development is at no greater risk to volcanic activity than current development. Further, given the uncertainties with regard to volcanic activity, it is unlikely that future development activities would be constrained in any manner.

4.3.18. Wildfire

Hazard Profile

This hazard profile contains multiple sections that detail how this hazard can affect Sacramento County. These sections include a hazard/problem description; description of location and extent; past occurrences of this hazard; and how climate change can affect this hazard.

Hazard/Problem Description

California is recognized as one of the most fire-prone and consequently fire-adapted landscapes in the world. The combination of complex terrain, Mediterranean climate, and productive natural plant communities, along with ample natural and aboriginal ignition sources, has created conditions for extensive wildfires. Wildland fire is an ongoing concern for the Sacramento County Planning Area. Generally, the fire season extends from June through October of each year during the hot, dry months, though in recent

years of drought the fire season has expanded to be almost a year around hazard. Fire conditions arise from a combination of high temperatures, an accumulation of vegetation, low humidity, and high winds. These conditions when combined with high winds and years of drought increase the potential for a wildfire to occur. Urban wildfires often occur in those areas where development has expanded into the rural areas. A fire along this urban/rural interface can result in major losses of property and structures.

Location and Extent

Wildfire risk in Sacramento County varies by location. Maps showing the CAL FIRE Fire Hazard Severity Zones (see Figure 4-115) and Fire Threat (see Figure 4-116) are shown in the Vulnerability Assessment below. In some areas of the County, large concentrations of highly flammable brush located in flat open spaces are also quite susceptible to wildland fire. Also at risk are the "river bottoms" or those areas along the American River Parkway. Wildland fires that burn in natural settings with little or no development are part of a natural ecological cycle and may actually be beneficial to the landscape. Century old policies of fire exclusion and aggressive suppression have given way to better understanding of the importance fire plays in the natural cycle of certain forest types. In the County, there are eucalyptus groves where increased fire risk occurs. Some problem areas include fires coming down from Placer County into Sacramento County. There are often light flashy fires that can burn quickly but resolve themselves when fuels burn themselves out.

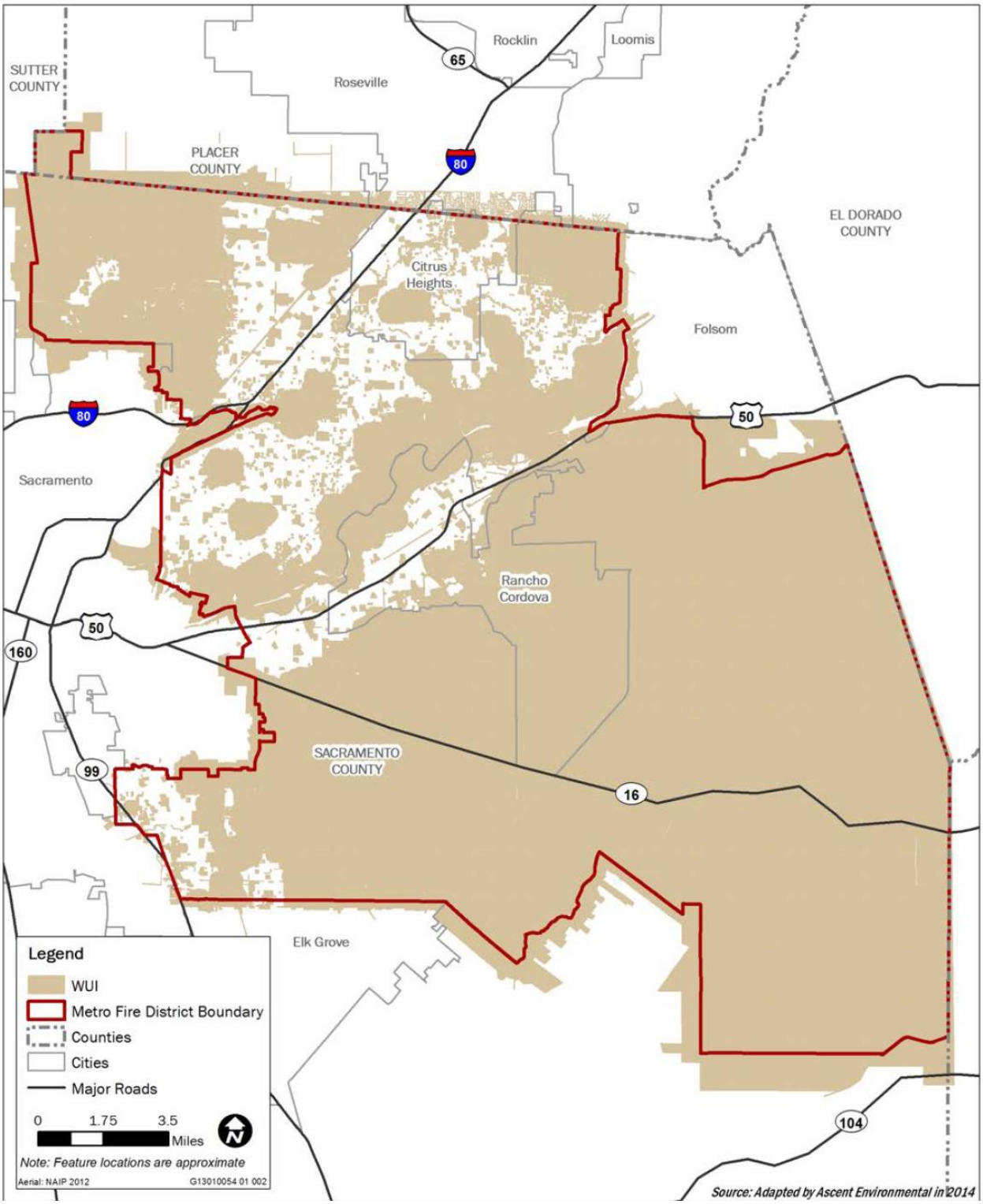
Wildland Urban Interface

Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. While wildfire risk is predominantly associated with wildland urban interface (WUI) areas, significant wildfires can also occur in heavily populated areas. The WUI is a general term that applies to development adjacent to landscapes that support wildland fire. The WUI defines the community development into the foothills and mountainous areas of California. The WUI describes those communities that are mixed in with grass, brush and timbered covered lands (wildland). These are areas where wildland fire once burned only vegetation but now burns homes as well. The WUI for Sacramento County consists of communities at risk as well as the area around the communities that pose a fire threat.

WUI fires are often the most damaging. WUI fires occur where the natural and urban development intersect. Even relatively small acreage fires may result in disastrous damages. The damages are primarily reported as damage to infrastructure, built environment, loss of socio-economic values and injuries to people.

A WUI Map was created for the 2014 Sac Metro Fire CWPP. It is shown in Figure 4-108.

Figure 4-108 Sacramento County – Wildland Urban Interface Areas



Source: Sacramento Metropolitan Fire District 2014 Community Wildfire Protection Plan

Sacramento County Wildfire Setting

As previously stated, there are areas in the County that are prone to wildfire. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Generally, there are four major factors that sustain wildfires and allow for predictions of a given area's potential to burn. These factors include fuel, topography, weather, and human actions.

- **Fuel** – Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles and leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also to be considered as a fuel source, are man-made structures and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels such as grasses burn quickly and serve as a catalyst for fire spread. The volume of available fuel is described in terms of Fuel Loading. Certain areas in and surrounding Sacramento County are extremely vulnerable to fires as a result of dense grassy vegetation combined with a growing number of structures being built near and within rural lands. In the northern portion of the County, such as Folsom, an increase in forested areas increase the risk and vulnerability of wildfire.
- **Topography** – An area's terrain and land slopes affect its susceptibility to wildfire spread. Fire intensities and rates of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The natural arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes. Most of the Sacramento area is relatively flat, thus limiting the influence of this factor on wildfire behavior.
- **Weather** – Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed the wildfire creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most treacherous weather factor. The greater a wind, the faster a fire will spread, and the more intense it will be. Winds can be significant at times in Sacramento County. However, it should be noted that the winds generally occur during the winter storm season, not during the summer, fire season. In addition to high winds, wind shifts can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. Related to weather is the issue of recent drought conditions contributing to concerns about wildfire vulnerability. During periods of drought, the threat of wildfire increases.
- **Human Actions** – Most wildfires are ignited by human action, the result of direct acts of arson, carelessness, or accidents. Many fires originate in populated areas along roads and around homes, and are often the result of arson or careless acts such as the disposal of cigarettes, use of equipment or debris burning. Recreation areas that are located in high fire hazard areas also result in increased human activity that can increase the potential for wildfires to occur.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned and the intensity of the burn. CAL FIRE measures fuels in the areas as part of their Fire Hazard Severity maps. Extents are measured in the following Fire Hazard Severity Zones (FHSZ) categories (discussed in more detail below):

- Very High

- High
- Moderate
- Non-Wildland/Non-Urban
- Urban/Unzoned

CAL FIRE also developed maps using a Fire Threat dataset. This dataset is a combination of fire frequency, or the likelihood of a given area to burn, and potential fire behavior. This dataset ranks extent in the following categories:

- Extreme (none of which exists in Sacramento County)
- Very High
- High
- Moderate
- Low
- No Threat

Geographical extents of these FHSZs in the County can be found on Table 4-97.

Table 4-97 Sacramento County Planning Area– Geographical Extents of FHSZs

Fire Hazard Severity Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
Very High	1,026	0.16%	865	0.24%	160	0.06%
High	2,500	0.39%	1,335	0.37%	1,165	0.41%
Moderate	230,983	35.84%	84,676	23.46%	146,307	51.62%
Non-Wildland/Non-Urban	222,032	34.45%	128,273	35.53%	93,759	33.08%
Urban Unzoned	187,877	29.15%	145,853	40.40%	42,024	14.83%
Unincorporated Sacramento County Total	**644,418.0**	**100.00%**	**361,003.2**	**100.00%**	**283,414.8**	**100.00%**

Source: CAL FIRE

*Percentage of total acres is the percent of total acres of the entire County Planning Area

Geographical extents of these Fire Threat Areas in the County can be found on Table 4-98.

Table 4-98 Sacramento County Planning Area – Geographical Extent of Fire Threat Areas

Fire Hazard Severity Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
Very High	14,711	2.28%	2,769	0.77%	11,942	4.21%
High	82,651	12.83%	16,209	4.49%	66,442	23.44%
Moderate	82,062	12.73%	21,816	6.04%	60,245	21.26%
Low	21,609	3.35%	5,766	1.60%	15,843	5.59%

Fire Hazard Severity Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
No Threat	443,385	68.80%	314,443	87.10%	128,942	45.50%
Unincorporated Sacramento County Total	**644,418.0**	**100.00%**	**361,003.2**	**100.00%**	**283,414.8**	**100.00%**

Source: CAL FIRE

*Percentage of total acres is the percent of total acres of the entire County Planning Area

Fires can have a quick speed of onset, especially during periods of drought. Fires can burn for a short period of time, or may have durations lasting for a week or more.

Post-Wildfire Landslides and Debris Flows

Post-wildfire landslides and debris flows are not generally a concern in Sacramento County due to its relatively flat topography. Fires that burn in sloped areas remove vegetation that holds hillsides together during rainstorms. Once that vegetation is removed, the hillside may be compromised, resulting in landslides and debris flows. Mapping of these areas has begun to occur, though none exist in Sacramento County.

Past Occurrences

Disaster Declaration History

A search of FEMA and Cal OES disaster declarations turned up no federal and one state disaster declaration, as shown on Table 4-4. It was noted that this was for an explosion of a train near Roseville and not for a wildfire.

NCDC Events

The NCDC has tracked wildfire events in the County dating back to 1993. Events in Sacramento County in the database are shown in Table 4-99.

*Table 4-99 NCDC Wildfire Events in Sacramento County 1993 to 5/31/2020**

Event Type	Number of Events	Deaths	Deaths (indirect)	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Wildfire	7	0	1	2	0	$5,000,000	$0

Source: NCDC

*Deaths, injuries, and damages are for the entire event, and may not be exclusive to the County.

CAL FIRE Events

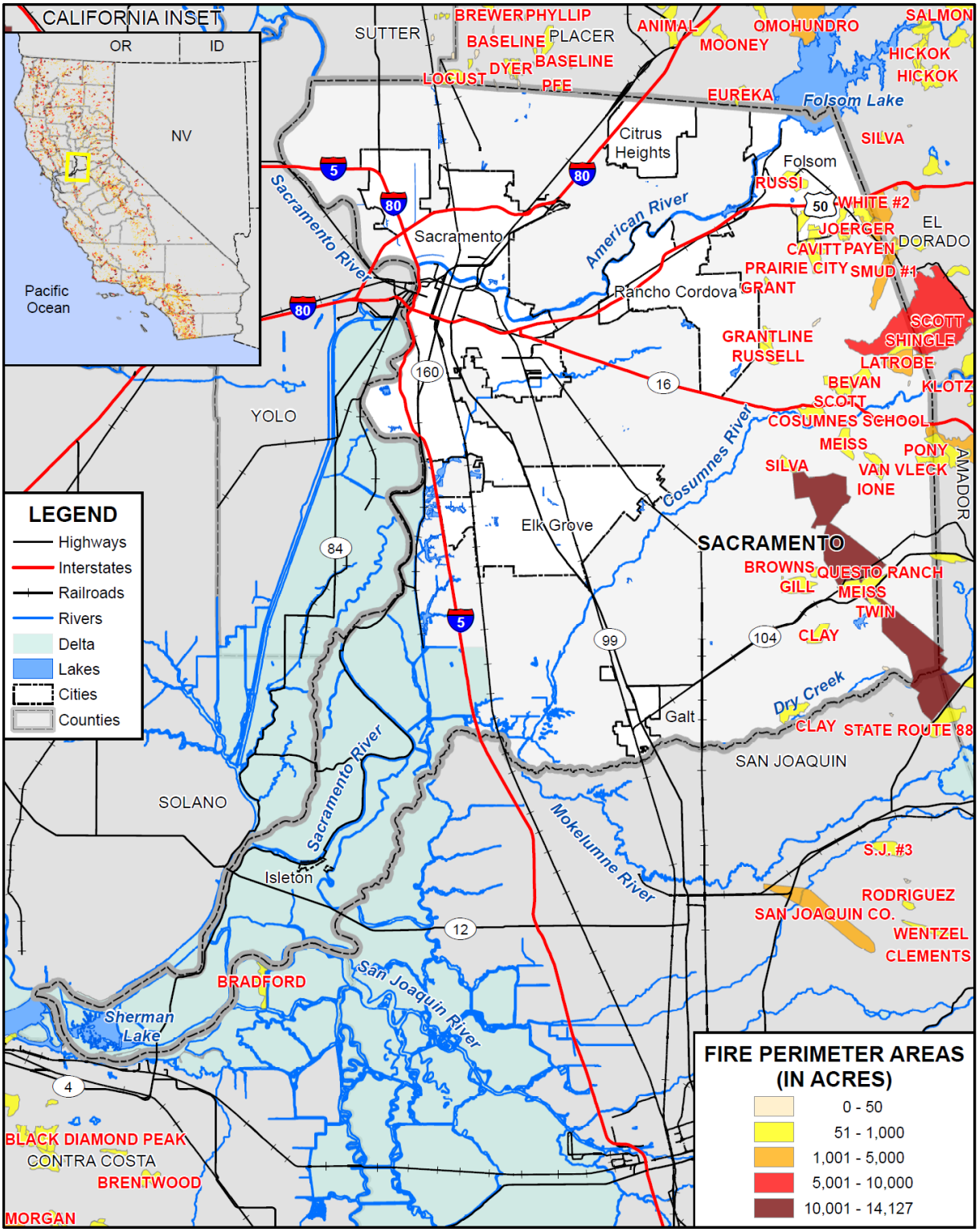
CAL FIRE, USDA Forest Service Region 5, Bureau of Land Management (BLM), the National Park Service (NPS), Contract Counties and other agencies jointly maintain a comprehensive fire perimeter GIS layer for public and private lands throughout the state. The data covers fires back to 1878 (though the first

recorded incident for the County was in 1917). For the National Park Service, Bureau of Land Management, and US Forest Service, fires of 10 acres and greater are reported. For CAL FIRE, timber fires greater than 10 acres, brush fires greater than 50 acres, grass fires greater than 300 acres, and fires that destroy three or more residential dwellings or commercial structures are reported. CAL FIRE recognizes the various federal, state, and local agencies that have contributed to this dataset, including USDA Forest Service Region 5, BLM, National Park Service, and numerous local agencies.

Fires may be missing altogether or have missing or incorrect attribute data. Some fires may be missing because historical records were lost or damaged, fires were too small for the minimum cutoffs, documentation was inadequate, or fire perimeters have not yet been incorporated into the database. Also, agencies are at different stages of participation. For these reasons, the data should not be used for statistical or analytical purposes.

The data provides a reasonable view of the spatial distribution of past large fires in California. Using GIS, fire perimeters that intersect Sacramento County since 1950 were extracted and are listed in Table 4-100 (in alphabetical order of fire name). Each of them was tracked by CAL FIRE. Figure 4-109 shows the fires in the CAL FIRE database for the County from 1950 to 2020, colored by the size of the acreage burned.

Figure 4-109 Sacramento County – Wildfire History CAL FIRE 1950 to 2020



Data Source: CAL FIRE Fire History (firep19_1) 5/2020, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 4-100 Sacramento County – Wildfires by Acres Burned 1950-2020

Wildfire Name	Date	Cause Description	GIS Acres	Acres Burned in County
Baseline	7/3/2018	Unknown / Unidentified	20	6
Bevan	6/23/2001	Equipment Use	687	687
Boys	9/11/2016	Equipment Use	40	40
Browns	8/2/2019	Miscellaneous	84	84
Cavitt	9/13/1950	Unknown / Unidentified	339	339
Clay	7/31/2001	Arson	526	526
Clay	7/6/1983	Equipment Use	405	405
Clay	6/3/2016	Equipment Use	32	32
Cosumnes School	6/7/1974	Unknown / Unidentified	582	582
Dillard WF2	7/4/2001	Playing with Fire	11	11
Gill	6/20/1976	Unknown / Unidentified	715	715
Grant	6/29/2018	Vehicle	51	51
Grantline	6/7/1974	Unknown / Unidentified	311	311
Indio	6/8/2018	Vehicle	13	13
Ione	7/2/2015	Arson	358	358
Joerger	7/10/1964	Unknown / Unidentified	1,514	680
Joerger Series	6/18/1981	Equipment Use	1,676	570
Largo	7/30/2017	Arson	238	238
Latrobe	7/26/2017	Debris	1,268	1,074
Locust	7/27/2015	Arson	644	54
Meiss	6/14/1981	Miscellaneous	14,126	11,404
Meiss	8/28/1983	Equipment Use	603	603
Michigan #4	7/31/2001	Arson	55	55
Michigan Bar	7/29/1980	Unknown / Unidentified	848	157
Pony	6/12/2002	Powerline	702	59
Prairie City	9/21/1981	Arson	593	593
Puerto	9/16/2002	Arson	17	17
Questo Ranch	6/19/1950	Unknown / Unidentified	878	878
Rancho	6/28/2016	Vehicle	372	20
Roadside #31 Series	10/4/1962	Unknown / Unidentified	352	349
Russell	6/18/1973	Unknown / Unidentified	408	408
Russi	6/6/1950	Unknown / Unidentified	534	534
Scott	(blank)	Unknown / Unidentified	87	87
Scott	8/2/1996	Arson	8,828	2,451
Scott	4/4/2004	Unknown / Unidentified	609	609

Wildfire Name	Date	Cause Description	GIS Acres	Acres Burned in County
Shingle	7/4/2018	Arson	316	84
Silva	6/20/1981	Arson	248	248
SMUD #1	6/21/1992	Powerline	1,179	752
Twin	9/26/2005	Vehicle	104	104
Twin	6/8/2002	Arson	322	322
Van Vleck	6/22/1968	Unknown / Unidentified	2,665	146
White	7/1/2002	Vehicle	81	81
White #2	10/10/2002	Unknown / Unidentified	170	170
White Rock	7/14/1983	Miscellaneous	169	169
White Rock Series	7/20/1986	Arson	566	566
Grand Total			**44,344**	**27,639**

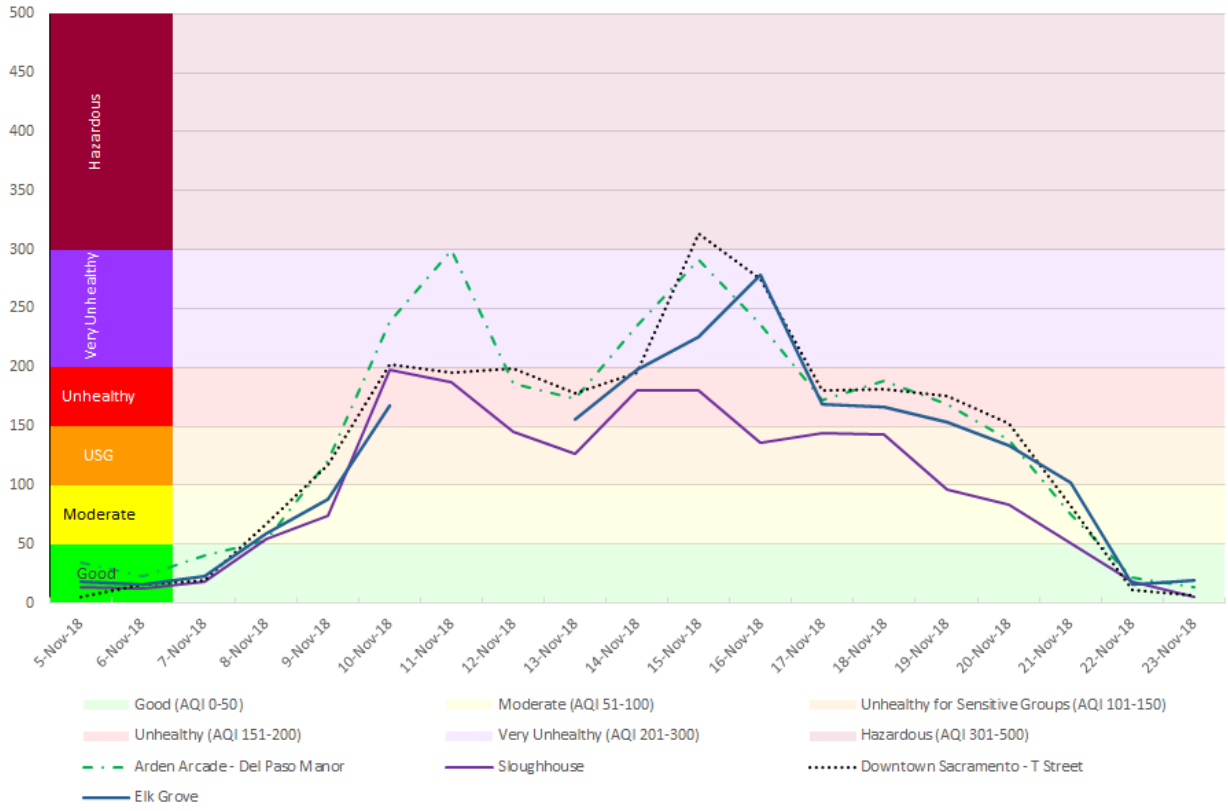
Source: CAL FIRE

Hazard Mitigation Planning Committee Events

The HMPC noted the following fires to affect the County:

- **Late 1850s**: The worst fire in Sacramento history leveled nine-tenths of the City.
- **September/October 2014** – King Fire. While the King Fire did not burn ground in Sacramento County, it did affect the County. Production from the Upper American River Hydroelectric Power Plant was disrupted for 2 weeks, requiring an additional unbudgeted $37 million for replacement power, by far the largest cost compared to the approximately $4M in immediate physical damage.
- **July 2015 NOAA** (fires regional to Sacramento County) – Rocky Fire burned 69,000 acres in Lake, Yolo & Colusa Counties. 43 homes and 53 outbuildings were destroyed.
- **June 9, 2015 –** A 25-acre fire in Elk Grove occurred. A grass fire that started about 1:30 p.m. at Bond and Waterman roads was driven by high, shifting winds. It quickly spread toward homes that border the field to the east and south. The fire damaged one Elk Grove home and prompted evacuation of several other residences before it was contained.
- **2018 Camp Fire** – Though the Camp Fire burned in Butte County, wildfire smoke affected Sacramento County. Air Quality Index figures for the County during and after the Camp Fire can be seen in Figure 4-110.

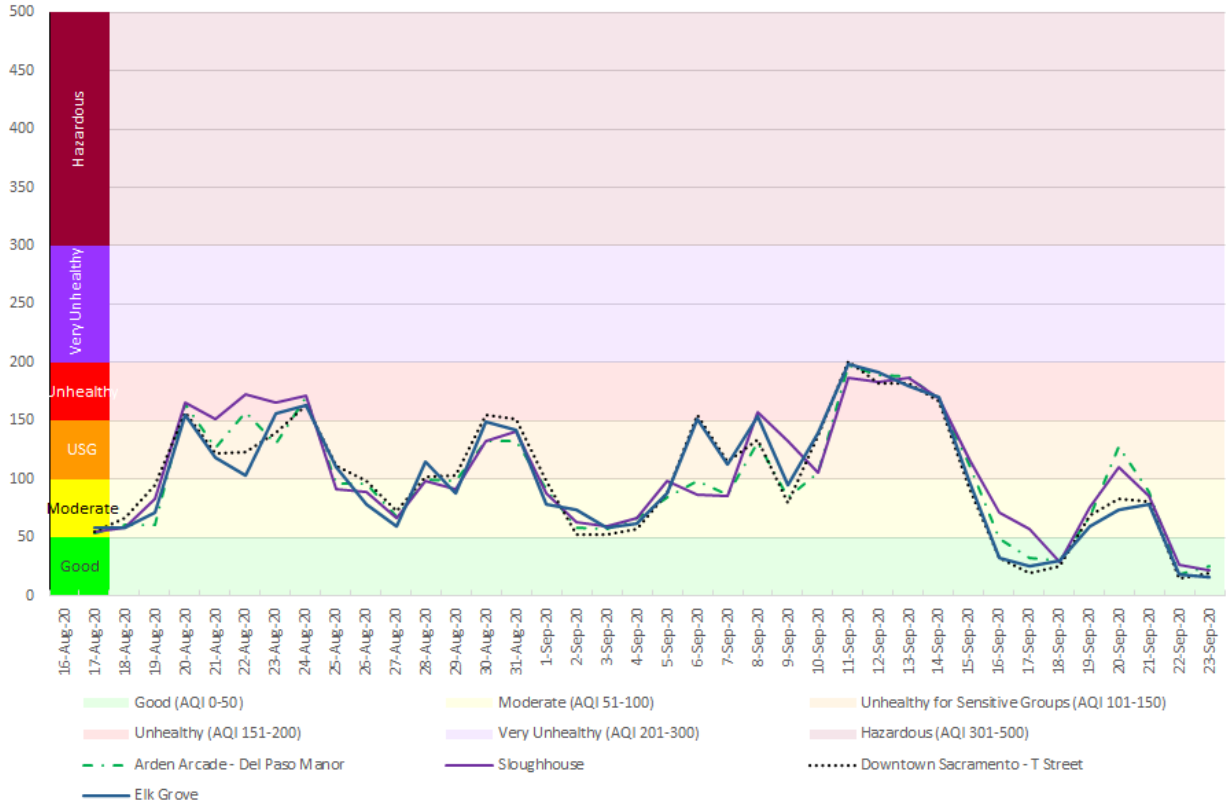
Figure 4-110 Sacramento County – 2018 Wildfire Smoke Air Quality Readings at Sacramento Stations



Source: Sacramento County OES

- **August/September 2020** – Extreme heat struck the County. As the heat event ended, multiple wildfires around northern California were ignited by dry lightning. Sacramento County received smoke into the valley that was not pushed out by light winds. The cities of Folsom and Sacramento converted their cooling centers to cleaner air spaces to serve the public unable to get into an indoor space to escape the smoke. Air quality during this time can be seen in Figure 4-111.

Figure 4-111 Sacramento County – 2020 Wildfire Smoke Air Quality Readings at Sacramento Stations



Source: Sacramento County OES

June 2021 – A wildfire charred Bushy Lake Restoration Project outside Cal Expo not long after it burned earlier this month. According to a June 23, 2021 article from the Sacramento Bee, the 130-acre fire started at one of the American River Parkway's many homeless camps. The fire at Bushy Lake points to a troubling rise in fires caused by homeless people in the parkway. The fires associated with homeless camps are a growing statewide problem that firefighters warn is only going to get more dangerous as California and the Sacramento region enter one of the driest fire seasons in modern history. Just a few weeks into fire season, park rangers say close to 60 fires have started in the parkway this year. That's more than half the number of fires that started in the parkway all of last year, a season that already saw an alarming rise in the number of parkway fires.

August 2021 – Wildfires occurred in the area. The Dixie Fire burned to the northeast of the County, torching almost 1,000,000 acres. While no wildfires affected Sacramento County, wildfire smoke from the fires affected the County. An example can be seen on Figure 4-112.

Figure 4-112 Dixie Fire Wildfire Smoke in Sacramento County

Source: Sacramento County DWR

Likelihood of Future Occurrence

Highly Likely — From May to October of each year, Sacramento County faces a wildfire threat. Fires will continue to occur on an annual basis in the Sacramento County Planning Area. The threat of wildfire and potential losses constantly increase as human development and population increase in the wildland urban interface area in the County. This results in a highly likely rating for future occurrence.

Climate Change and Wildfire

Climate change and its effects on wildfire is discussed by three sources for Sacramento County:

- 2017 Sacramento County CAP/2021 Draft Climate Action Plan Update
- Sacramento Metro Fire District CWPP (2012)
- Cal-Adapt

2017 Sacramento County CAP/2021 Draft Climate Action Plan Update

Wildfires affect the functioning of transportation systems, emergency services, recreation and tourism, and healthy ecosystems. Roadway closures during a wildfire may result in poor emergency vehicle access and the isolation of rural and remote populations throughout the County (Valley Vision 2014). Hospitals may incur additional strain on their resources to accommodate an influx in emergency room visits during wildfire events. Wildfires impede recreational uses as well as the associated tourism revenue (Valley Vision 2014). Damage to ecological functions may also result due to catastrophic wildfire. When rain falls in burn scarred areas, there is a higher potential for soil erosion and mud flows into roads, ditches, and streams, which reduces water quality.

Lastly, wildfires can damage and destroy physical assets and infrastructure. In particular, critical transmission lines and hydroelectric infrastructure may be vulnerable to damage or temporary shutdown caused by wildfires.

Wildfires and Air Quality. The 2017 CAP noted that in addition to a probable increase in wildfire risk, wildfires within the Sierra Nevada and areas outside the County affect air quality in Sacramento County and across the Sacramento Valley. Particulate matter from wildfire dissipates throughout the Central Valley degrading air quality conditions for short or extended periods of time. An increase in air pollutants can cause or exacerbate health conditions. The duration of wildfire-related particulate matter in the County's air is further linked to wind patterns (i.e., the Delta Breeze) originating from the Sacramento-San Joaquin Delta that disperse air pollutants north of the Sacramento Valley. However, during about half of the days from July to September (high fire season), a phenomenon called the "Schultz Eddy" prevents this from occurring. All of these factors will affect the severity of wildfire-related air pollution in Sacramento County. Climate change has already significantly lengthened California's fire season, as well as the intensity, frequency and size of individual wildfires around the state, and this trend is likely to continue without further mitigation. It is likely that Sacramento County will experience worsened air quality from increased wildfires throughout Northern California and even Oregon.

Increased frequency and intensity of wildfires will directly affect the safety of populations living within or near wildland areas (i.e., wildland-urban interface) prone to wildfire. Wildfires also result in the release of harmful air pollutants into the atmosphere, which dissipate and can affect the respiratory health of residents across a broad geographical scope.

Sacramento Metro Fire District CWPP

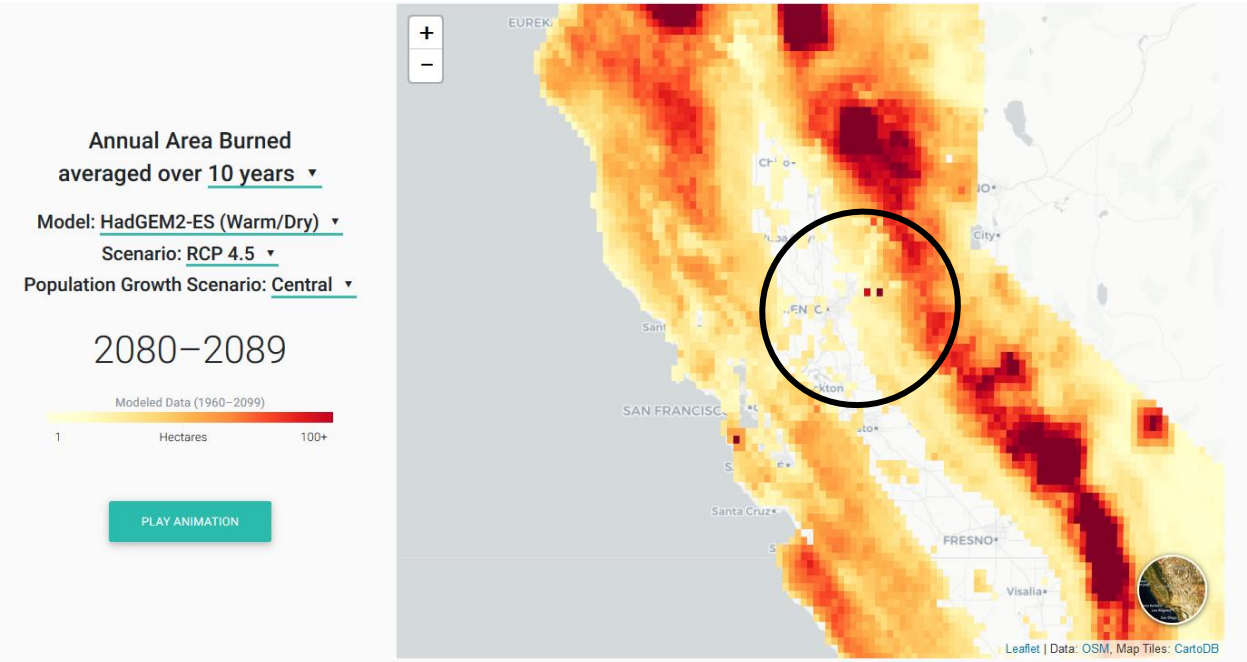
The 2014 Sacramento Metropolitan Fire District's CWPP also predicts an overall increase in the frequency and intensity of wildfires as a result of the changes associated with climate change.

Cal Adapt

Warmer temperatures can exacerbate drought conditions. Drought often kills plants and trees, which serve as fuel for wildfires. Warmer temperatures could increase the number of wildfires and pest outbreaks, such as the western pine beetle. Cal-Adapt's wildfire tool predicts the potential increase in the amount of burned areas for the year 2080-2089, as compared to recent (2010) conditions. This is shown in Figure 4-113.

Based on this model, Cal-Adapt predicts that wildfire risk in Sacramento County will increase slightly (and much less than other California counties) in the near term and subside during mid-to late-century. However, wildfire models can vary depending on the parameters used. Cal-Adapt does not take landscape and fuel sources into account in their model. In all likelihood, in Sacramento County, precipitation patterns, high levels of heat, topography, and fuel load will determine the frequency and intensity of future wildfire.

Figure 4-113 Sacramento County – Projected Increase in Wildfire Burn Areas



Source: Cal-Adapt

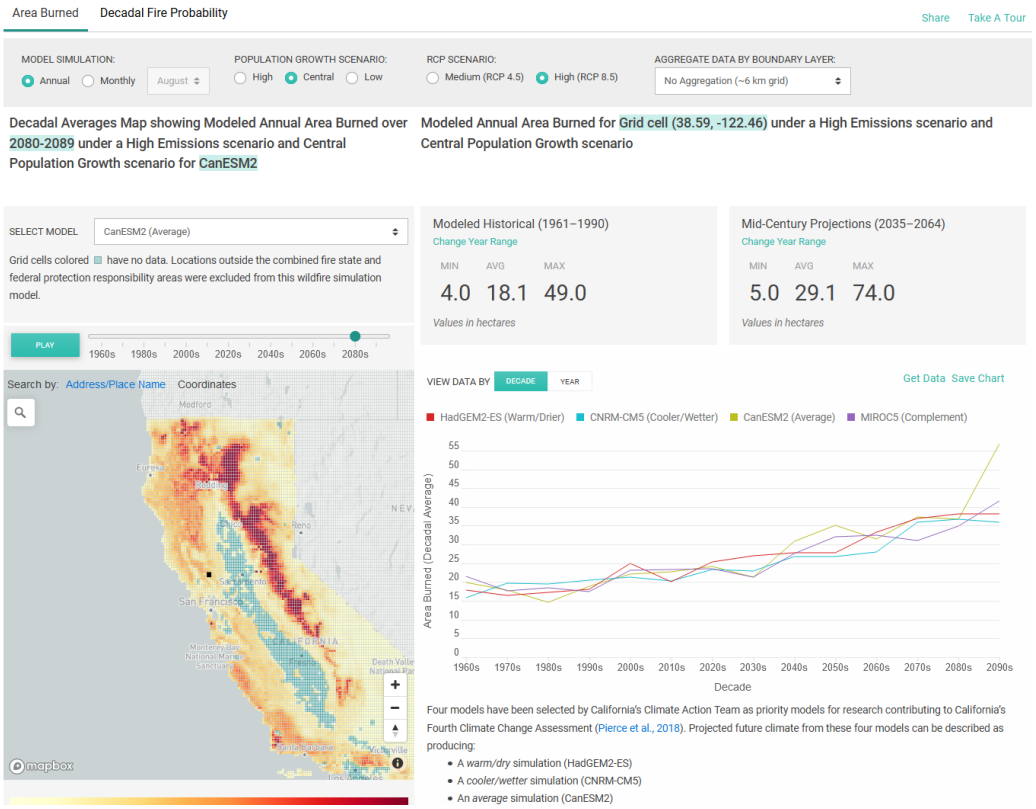
Cal-Adapt has also sought to model annual averages of area burned in the State. Four models have been selected by California's Climate Action Team Research Working Group as priority models for research contributing to California's Fourth Climate Change Assessment. Projected future climate from these four models can be described as producing:

- A warm/dry simulation (HadGEM2-ES) – shown by the red line on the below charts
- A cooler/wetter simulation (CNRM-CM5) – shown by the blue line on the below charts
- An average simulation (CanESM2) – shown by the green line on the below charts
- The model simulation that is most unlike the first three for the best coverage of different possibilities (MIROC5) – shown by the purple line on the below charts

Future modeled annual averages of area burned from Cal-Adapt for the Sacramento County Planning (using the quad that contains Sacramento) are shown in Figure 4-114. It shows the following:

- The upper chart shows modeled annual averages of area burned for the selected area on map under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100.
- The lower chart shows modeled annual averages of area burned for the selected area on map under the RCP 4.5 scenario in which emissions peak around 2040, then decline.

Figure 4-114 Sacramento County – Future Acreage Burned: High and Low Emission Scenarios



Source: Cal-Adapt – Annual Average of Acres Burned

Vulnerability Assessment

Vulnerability—Medium

Risk and vulnerability to the Sacramento County Planning Area from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in the Planning Area, combined with a large built environment and population, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. During the May to October fire season, the dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the Planning Area, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

A major concern in the urbanized area is the American River Parkway that adjoins the American River from its headwaters at Folsom Dam and travels approximately twenty-three miles through a heavily urbanized area to the Sacramento River. One of the major firefighting problems in the parkway is the lack of access for fire-fighting equipment. Parts of the parkway can only be accessed by helicopter, boat, or land-based hand crews. Once a fire starts in the parkway, the structures next to the parkway become part of the fire problem. Other areas of concern include the Fair Oaks area, Folsom, and areas where eucalyptus trees are prevalent.

Sacramento County Communities at Risk to Wildfire

The National Fire Plan is a cooperative, long-term effort between various government agency partners with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. For purposes of the National Fire Plan, CAL FIRE generated a list of California communities at risk for wildfire. The intent of this assessment was to evaluate the risk to a given area from fire escaping off federal lands. Three main factors were used to determine the wildfire threat in the wildland-urban interface areas of California: fuel hazards, probability of fire, and areas of suitable housing density that could create wildland urban interface fire protection strategy situations. The preliminary criteria and methodology for evaluating wildfire risk to communities is published in the Federal Register, January 4, 2001. The National Fire Plan identifies 13 "Communities at Risk" in Sacramento County. These are shown in Table 4-101.

Table 4-101 Sacramento County Communities at Risk to Wildfire

Communities at Risk to Wildfire				
Fair Oaks	Folsom	Galt	Isleton	La Riviera
Mather Air Force Base	North Highlands	Orangevale	Rancho Cordova	Rancho Murieta

Communities at Risk to Wildfire				
Rio Lino	Rosemont	Sacramento		

Source: CAL FIRE

Impacts

Wildfires can result in loss of life, injuries, damage to structures, and can cause short-term and long-term disruption to the County. Loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Smoke and air pollution from wildfires can be a severe health hazard. School closures also may occur during wildfires. Economic impacts can be significant to a community.

Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the County by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Loss of grazing and agricultural lands may also occur. Other assets at risk include recreation areas, wildlife and habitat areas, and rangeland resources. The loss to these natural resources can be significant. In addition, large wildfires can create favorable conditions for other hazards such as flooding, landslides and mudflows, and erosion during the rainy season.

In addition, there are natural resources at risk when wildland-urban interface fires occur. One is the watershed and ecosystem losses that occur from wildland fires. Fires can have devastating effects on

Tree Mortality

Also a factor in increased wildfire conditions is the degree of tree mortality occurring in a community. Drought can weaken trees, making them less resistant to bark beetles and other pests and diseases. These types of infestations attack trees, weaken them, and can kill them. These trees then become fuel for wildfires. Recent aerial mapping conducted between 2012 and 2018 indicates the County has very little incidence of tree mortality. However with continued drought conditions in California, tree mortality could become more of an issue in the County.

On October 30, 2015, Governor Brown proclaimed a State of Emergency and included provisions to expedite the removal and disposal of dead and dying hazardous trees. As a result, costs related to identification, removal, and disposal of dead and dying trees caused from drought conditions may be eligible for California Disaster Assistance Act (CDAA) reimbursement.

Wildfire (Smoke) and Air Quality

During many summer months in past years, Sacramento County residents have had to breathe wildfire smoke, from fires both within and outside of the County. Smoke from wildfires is made up of gas and particulate matter, which can be easily observed in the air. Air quality standards have been established to protect human health with the pollutant referred to as PM2.5 which consists of particles 2.5 microns or less in diameter. These smaller sizes of particles are responsible for adverse health effects because of their ability to reach the lower regions of the respiratory tract.

During the summers of 2013 through 2015, several wildfire incidents occurred in Northern California that increased PM2.5 concentration within Sacramento County. These types of concentrations were also experienced during the 2018-2020 regional northern California fires. When Sacramento air quality is affected by wildfire smoke, whether from fires within the County or from throughout Northern California, the Sacramento County Air Pollution Control Officer works with the County health department to issue health advisories to residents. These advisories are sent to the media, including newspapers, TV, radio, the community, and posted on county websites and the regional Spare the Air website.

While Sacramento-specific projections on future wildfire risk are limited, overall wildfire risk in California is expected to increase as a result of reduced precipitation, rising temperatures, deteriorating forest health due to drought, heat, and tree disease and pests; and logging dead trees. According to a study by *Climate Central*, wildfires burning within 50-100 miles of a city generally caused air quality to be 5-15 times worse than normal. On average, in the U.S. West there are now twice as many fires burning each year as there were in the 1970s. A recent Yale University study published in Climatic Change predicts a significant increase in the number of days that people in the western U.S. will be exposed to wildfire smoke by 2050. The number of people exposed to "smoke waves," or consecutive days with poor air quality due to wildfires, will also increase from 57 million today to 82 million by 2050, the majority of whom will be in northern California, western Oregon, and the Great Plains.

Cal-Adapt is an online tool put together by the California Energy Commission that downscales global climate models to the California level with projections for sea-level rise, drought, temperature increase, heat, and wildfire, from 2020 out to 2085. Figure 4-113 showed the 2085 wildfire projection for Sacramento County. Air quality in these areas of the County could be greatly reduced due to wildfire if the scenario projected is accurate.

Public Safety Power Shutoff Events

During extreme wildfire conditions, usually resulting from high winds, high temperatures, and and low humidity a PSPS may be initiated by local utility companies, as discussed at the beginning of Section 4.3. However, given the overall low to moderate wildfire risk in the County, with limited areas of high or very high risk, no PSPS events have occurred; although, this remains a possibility given the right conditions.

Wildfire Analysis

The Sacramento County Planning Area has mapped CAL FIRE Fire Hazard Severity Zones (FHSZs) and Fire Threat Areas based on fire responsibility areas as further described below. The wildfire analysis for the County is broken down in the following manner:

- Fire Responsibility Area Analysis is presented for:
  - ✓ Sacramento County Planning Area
- Fire Hazard Severity Zone Analysis is presented for:
  - ✓ Sacramento County Planning Area
  - ✓ Unincorporated Sacramento County
- Fire Threat Zone Analysis is presented for:
  - ✓ Sacramento County Planning Area

- ✓ Unincorporated Sacramento County

GIS was used to determine the possible impacts of wildfire within the County and how the wildfire risk varies across the Planning Area. The wildfire analysis includes an analysis of affected parcels and values by Fire Responsibility areas and by CAL FIRE's FHSZs.

Fire Responsibility Area Analysis

There are numerous wildland fire protection agencies that have responsibility within the County, including the USFS, the BLM, the BIA, and CAL FIRE. There are also numerous fire departments and fire protection districts that serve local areas, many of whom have mutual aid agreements with each other as well as state and federal agencies for fire suppression and protection. Fire Responsibility areas are generally categorized by Federal Responsibility Areas (FRA), State Responsibility Areas (SRA) and Local Responsibility Areas (LRA).

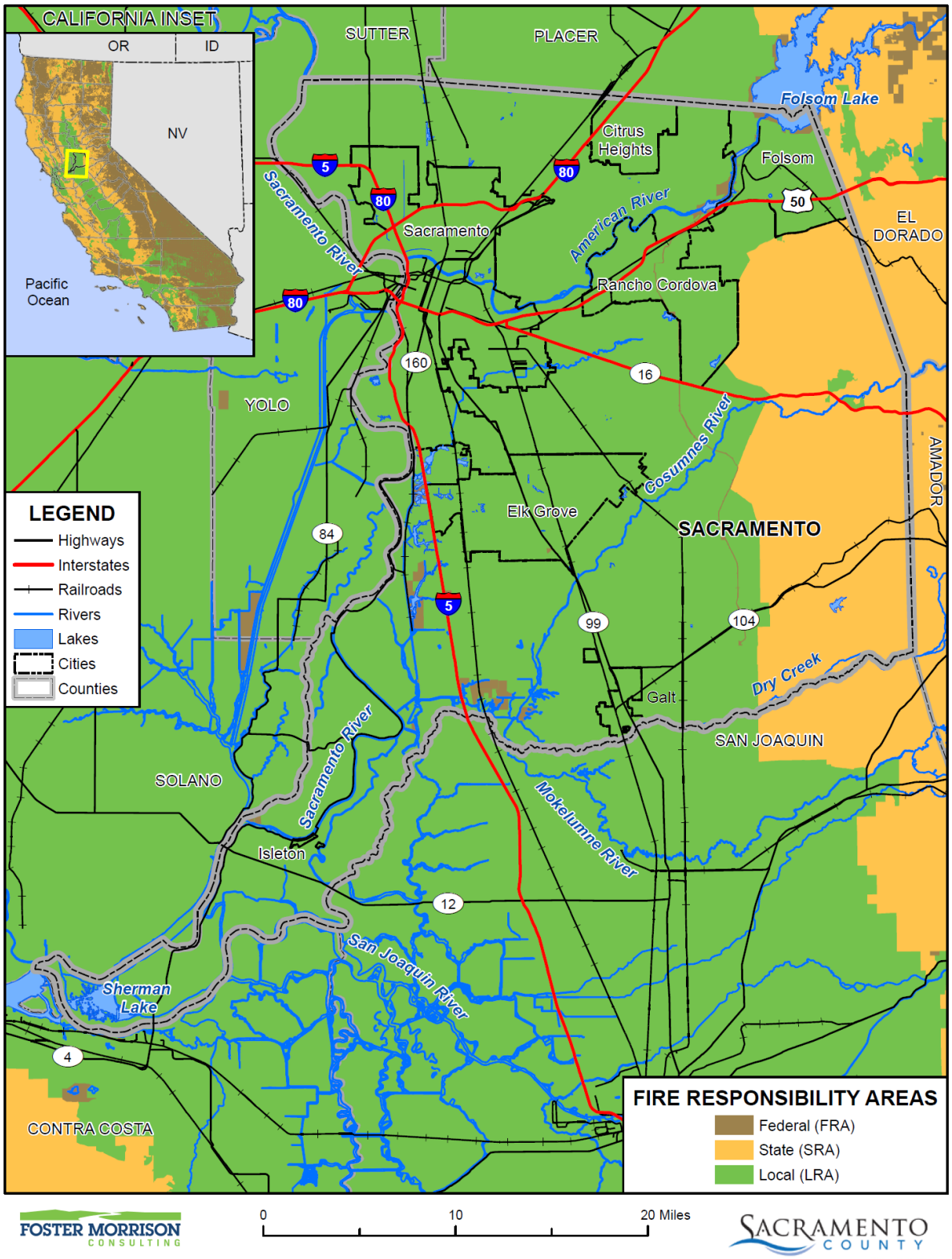
The CAL FIRE data, detailing Fire Responsibility Areas within the County Planning Area, was utilized to determine the locations, numbers, types, and values of land and structures falling within each Fire Responsibility Area. The following sections provide details on the methodology and results for this analysis.

Methodology

CAL FIRE has a legal responsibility to provide fire protection on all SRA lands, which are defined based on land ownership, population density and land use. CAL FIRE's State Responsibility Area layer was used in this analysis to show Sacramento County's parcel counts and values by FRA, SRA, and LRA.

The fire responsibility area layer was overlaid with the parcel data. Since it is possible for any given parcel to intersect with multiple fire responsibility areas, for purposes of this analysis, the parcel centroid was used to determine which fire responsibility area to assign to each parcel. Once completed, the parcel boundary layer was joined to the centroid layer and values were transferred based on the identification number in the Assessor's database and the FIS parcel layer. Based on this approach, the fire responsibility areas for the Sacramento County Planning Area were determined and further broken out by property use and included information on both land and improved values. Locations of each responsibility area are shown in Figure 4-115.

Figure 4-115 Sacramento County Planning Area – Fire Responsibility Areas by FRA, SRA, LRA



Data Source: CAL FIRE (SRA 20_3) 11/2020, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Fire Responsibility Areas and Values at Risk Results

As shown in Figure 4-115, most of the physical area of Sacramento County falls in the LRA. The County parcel inventory and associated values by fire responsibility area are provided in Table 4-102 for the entire Sacramento County Planning Area, as described in the Values at Risk in Section 4.2. It should be noted that fire does not just affect structural values, fire can also affect land values. As such the Assessor's land values and all parcels were accounted for in this analysis to represent total county values at risk. However, it is highly unlikely the whole County will ever be on fire at once. Also, it is important to keep in mind that these assessed values may be well below the actual market value of improved parcels located within the fire hazard severity zones due primarily to Proposition 13 and to a lesser extent properties falling under the Williamson Act.

Table 4-102 Sacramento County Planning Area – Count and Value of Parcels by Local, State, and Federal Responsibility Areas by Jurisdiction

Jurisdiction / Fire Responsibility Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
Citrus Heights					
LRA	26,777	25,821	$2,277,237,402	$5,468,554,811	$7,745,792,213
Citrus Heights Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$7,745,792,213**
Elk Grove					
FRA	4	0	$40		$40
LRA	55,580	51,809	$6,262,511,253	$16,354,975,148	$22,617,486,401
Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$22,617,486,441**
Folsom					
FRA	30	1	$239,321	$299,635	$538,956
LRA	27,028	23,613	$4,438,354,523	$10,586,058,035	$15,024,412,558
Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$15,024,951,514**
Galt					
LRA	7,986	7,448	$644,457,481	$1,729,332,844	$2,373,790,325
Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$2,373,790,325**
Isleton					
LRA	536	338	$22,717,211	$41,268,279	$63,985,490
Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$63,985,490**
Rancho Cordova					
FRA	6	0			
LRA	23,779	21,532	$2,696,956,614	$6,828,148,604	$9,525,105,218
Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$9,525,105,218**

Jurisdiction / Fire Responsibility Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
City of Sacramento					
LRA	155,590	142,896	$16,332,022,285	$43,393,435,771	$59,725,458,056
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$59,725,458,056**
Unincorporated Sacramento County					
FRA	140	0	$61,040		$61,040
SRA	1,723	963	$404,385,304	$394,281,577	$798,666,881
LRA	181,186	168,464	$19,018,033,887	$42,961,400,417	$61,979,434,304
Unincorporated Sacramento County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$62,778,162,225**
Grand Total	**480,365**	**442,885**	**$52,096,976,361**	**$127,757,755,121**	**$179,854,731,482**

Source: CAL FIRE, Sacramento County 2020 Parcel/Assessor's Data

Fire Hazard Severity Zone Analysis

As part of the Fire and Resource Assessment Program (FRAP), CAL FIRE was mandated to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as FHSZs, then define the application of various mitigation strategies to reduce risk associated with wildland fires.

Fire hazard is a way to measure the physical fire behavior so that people can predict the damage a fire is likely to cause. Fire hazard measurement includes the speed at which a wildfire moves, the amount of heat the fire produces, and most importantly, the burning fire brands that the fire sends ahead of the flaming front.

The fire hazard model developed by CAL FIRE considers the wildland fuels. Fuel is that part of the natural vegetation that burns during the wildfire. The model also considers topography, especially the steepness of the slopes. Fires burn faster as they burn up-slope. Weather (temperature, humidity, and wind) has a significant influence on fire behavior. The model recognizes that some areas of California have more frequent and severe wildfires than other areas. Finally, the model considers the production of burning fire brands (embers) how far they move, and how receptive the landing site is to new fires.

In 2007, CAL FIRE updated its FHSZ maps for the State of California to provide updated map zones, based on new data, science, and technology that will create more accurate zone designations such that mitigation strategies are implemented in areas where hazards warrant these investments. The zones will provide specific designation for application of defensible space and building standards consistent with known mechanisms of fire risk to people, property, and natural resources. The program is still ongoing with fire hazard severity zone maps being updated based on designated responsibility areas: FRA, SRA, and LRA.

The CAL FIRE data, detailing FHSZs within the Sacramento County Planning Area, was utilized to determine the locations, numbers, types, and values of land and structures falling within each FHSZ. The following sections provide details on the methodology and results for this analysis.

Methodology

CAL FIRE mapped the SRA FHSZs, or areas of significant fire hazard, based on fuels, terrain, weather, and other relevant factors. Zones are designated with Very High, High, Moderate, Non-Wildland/Non-Urban and Urban Unzoned hazard classes. The goal of this mapping effort is to create more accurate fire hazard zone designations such that mitigation strategies are implemented in areas where hazards warrant these investments. The FHSZs will provide specific designation for application of defensible space and building standards consistent with known mechanisms of fire risk to people, property, and natural resources.

The "Draft" LRA FHSZ (c6fhszl06_1) dated September 2007 layer and the Adopted SRA FHSZ (fhszs06_3_6) dated November 2007 were used to get a complete coverage of Fire Hazards.

Analysis was performed using the FHSZ datasets, and using GIS, the parcel layer was overlaid on the Draft and Adopted FHSZ layers. For the purposes of this analysis, if the parcel centroid intersects the zone's area, it will be assumed that the entire parcel is in that area. This analysis illustrates the FHSZs specific to the Planning Area and the unincorporated County.

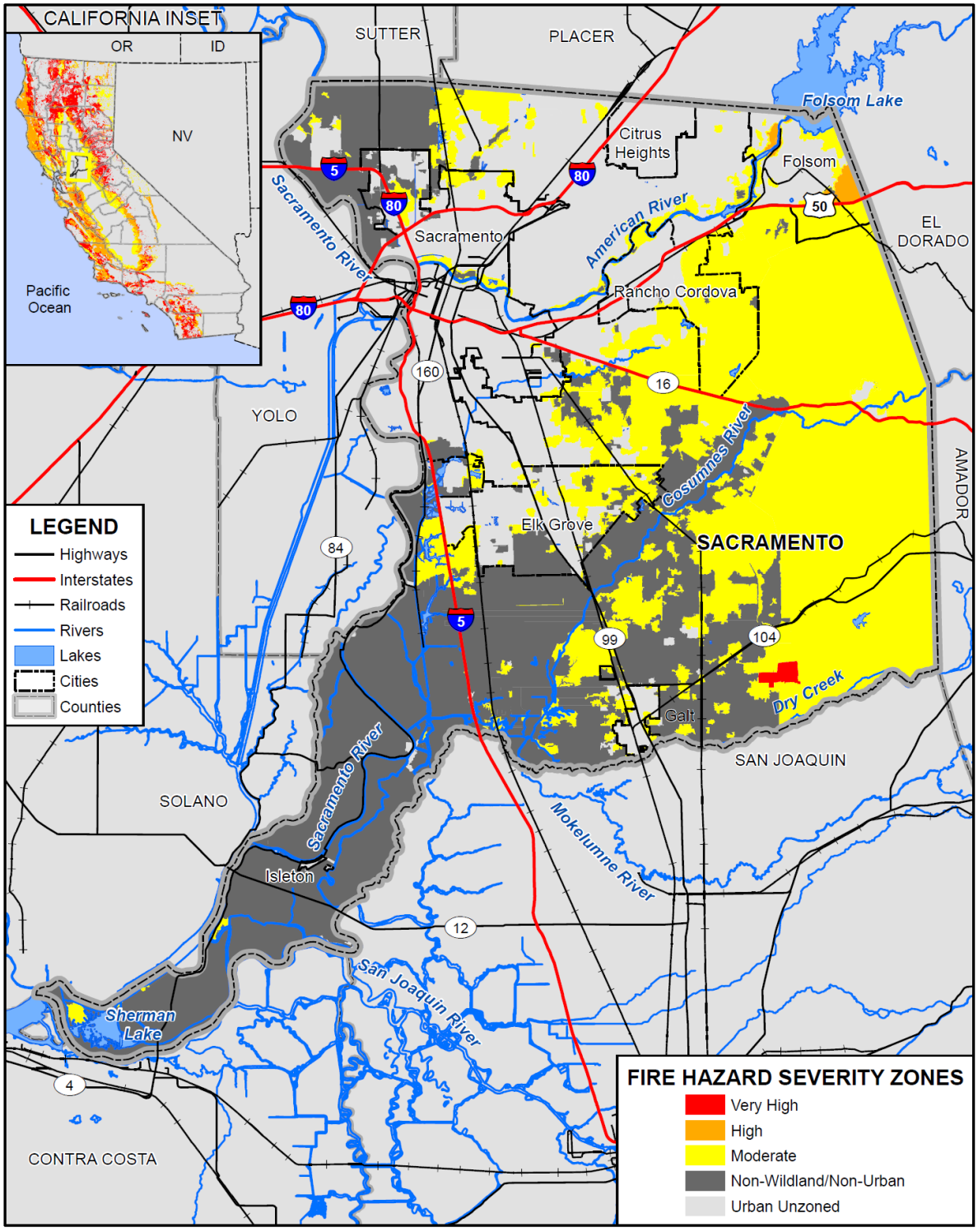
Fire Hazard Severity Zones Analysis Results: Values at Risk

Results are presented in this section for the Sacramento County Planning Area and the unincorporated County. Detail tables for the incorporated communities are included in their respective annexes to this LHMP Update.

Sacramento County Planning Area

The FHSZs in Sacramento County are shown in Figure 4-116. Analysis results for the entire Sacramento County Planning Area are summarized in Table 4-103 and broken out by jurisdiction in Table 4-104. These tables summarize total parcel counts, improved parcel counts, and their improved and land values, other values, and the estimated contents replacement values based on the CRV factors detailed in Table 4-6.

Figure 4-116 Sacramento County Planning Area – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 4-103 Sacramento County Planning Area – Count and Value of Parcels in Fire Hazard Severity Zones

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	101	87	$14,857,296	$20,046,967	$9,948,981	$44,853,241
High	3,153	2,738	$639,852,655	$1,639,767,622	$1,026,226,584	$3,305,846,828
Moderate	37,157	28,629	$5,358,836,460	$10,086,862,461	$6,104,416,952	$21,550,115,976
Non-Wildland/Non-Urban	17,489	12,362	$2,908,144,650	$5,249,465,634	$3,404,209,047	$11,561,819,483
Urban Unzoned	422,465	399,069	$43,175,285,300	$110,761,612,437	$70,257,120,162	$224,194,018,262
Total	**480,365**	**442,885**	**$52,096,976,361**	**$127,757,755,121**	**$80,801,921,726**	**$260,656,653,790**

Source: CAL FIRE, Sacramento County 2020 Parcel/Assessor's Data

Table 4-104 Sacramento County Planning Area – Count and Value of Parcels in Fire Hazard Severity Zones by Jurisdiction

Jurisdiction / Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Citrus Heights						
Urban Unzoned	26,777	25,821	$2,277,237,402	$5,468,554,811	$3,145,021,676	$10,890,813,812
Citrus Heights Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$3,145,021,676**	**$10,890,813,812**
Elk Grove						
Moderate	4,626	4,096	$706,051,086	$1,660,424,981	$1,009,598,054	$3,376,074,109
Non-Wildland/Non-Urban	5,579	4,199	$824,296,197	$1,706,112,600	$931,174,201	$3,461,583,045
Urban Unzoned	45,379	43,514	$4,732,164,010	$12,988,437,567	$7,499,238,222	$25,219,839,740
Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**
Folsom						
High	3,153	2,738	$639,852,655	$1,639,767,622	$1,026,226,584	$3,305,846,828
Moderate	5,544	3,619	$1,068,214,044	$1,638,882,317	$998,944,800	$3,706,041,180
Non-Wildland/Non-Urban	10	4	$11,822,351	$66,472,063	$33,236,032	$111,530,446
Urban Unzoned	18,351	17,253	$2,718,704,794	$7,241,235,668	$4,471,131,619	$14,431,072,047
Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**

Jurisdiction / Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Galt						
Moderate	515	450	$55,943,481	$153,171,395	$118,098,793	$327,213,685
Non-Wildland/Non-Urban	60	39	$27,392,033	$13,676,004	$6,986,499	$48,054,537
Urban Unzoned	7,411	6,959	$561,121,967	$1,562,485,445	$887,067,558	$3,010,674,957
Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**
Isleton						
Non-Wildland/Non-Urban	70	4	$717,781	$1,041,625	$520,813	$2,280,218
Urban Unzoned	466	334	$21,999,430	$40,226,654	$25,532,743	$87,758,826
Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**
Rancho Cordova						
Moderate	6,018	4,547	$717,507,511	$1,392,960,061	$795,178,643	$2,905,646,250
Non-Wildland/Non-Urban	11	2	$6,904,882	$428,132	$214,066	$7,547,080
Urban Unzoned	17,756	16,983	$1,972,544,221	$5,434,760,411	$4,203,228,459	$11,610,532,935
Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**
City of Sacramento						
Moderate	3,966	3,052	$476,852,476	$1,381,070,910	$948,198,494	$2,806,121,933
Non-Wildland/Non-Urban	5,208	3,798	$766,099,910	$1,882,990,400	$1,136,701,772	$3,785,792,130
Urban Unzoned	146,416	136,046	$15,089,069,899	$40,129,374,461	$26,994,730,553	$82,213,175,523
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**
Unincorporated Sacramento County						
Very High	101	87	$14,857,296	$20,046,967	$9,948,981	$44,853,241
Moderate	16,488	12,865	$2,334,267,862	$3,860,352,797	$2,234,398,168	$8,429,018,819
Non-Wildland/Non-Urban	6,551	4,316	$1,270,911,496	$1,578,744,810	$1,295,375,664	$4,145,032,027
Urban Unzoned	159,909	152,159	$15,802,443,577	$37,896,537,420	$23,031,169,332	$76,730,150,422
Unincorporated Sacramento County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**

Jurisdiction / Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Grand Total	**480,365**	**442,885**	**$52,096,976,361**	**$127,757,755,121**	**$80,801,921,726**	**$260,656,653,790**

Source: CAL FIRE, Sacramento County 2020 Parcel/Assessor's Data

Unincorporated Sacramento County

Table 4-105 summarized parcel counts and values in the unincorporated County by FHSZ using the CRVs described in Table 4-6. Table 4-106 breaks out Table 4-105 into greater details and shown the FHSZ by property use for the unincorporated County.

Table 4-105 Unincorporated Sacramento County – Parcels and Values at Risk in Fire Hazard Severity Zones

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	101	87	$14,857,296	$20,046,967	$9,948,981	$44,853,241
Moderate	16,488	12,865	$2,334,267,862	$3,860,352,797	$2,234,398,168	$8,429,018,819
Non-Wildland/Non-Urban	6,551	4,316	$1,270,911,496	$1,578,744,810	$1,295,375,664	$4,145,032,027
Urban Unzoned	159,909	152,159	$15,802,443,577	$37,896,537,420	$23,031,169,332	$76,730,150,422
Unincorporated Sacramento County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**

Source: CAL FIRE, Sacramento County 2020 Parcel/Assessor's Data

Table 4-106 Unincorporated Sacramento County – Parcels and Values at Risk in Fire Hazard Severity Zones by Property Use

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	1	0	$2,721	$0	$0	$2,721
Office	0	0	$0	$0	$0	$0
Public/Utilities	1	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Residential	86	85	$13,583,909	$19,897,961	$9,948,981	$43,430,848
Retail / Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	13	2	$1,270,666	$149,006	$0	$1,419,672
Very High Total	**101**	**87**	**$14,857,296**	**$20,046,967**	**$9,948,981**	**$44,853,241**
Moderate						
Agricultural	781	239	$234,747,954	$146,288,697	$146,288,697	$527,325,348
Care/Health	21	17	$8,737,989	$33,878,492	$33,878,492	$76,494,973
Church/Welfare	27	21	$8,927,462	$69,800,229	$69,800,229	$148,527,920
Industrial	180	89	$87,652,767	$148,354,054	$222,531,082	$458,537,899
Miscellaneous	782	1	$1,185,344	$5,854	$5,854	$1,197,052
Office	31	19	$10,631,430	$20,430,988	$20,430,988	$51,493,406
Public/Utilities	118	0	$66	$0	$0	$66
Recreational	35	14	$9,098,322	$10,807,098	$10,807,098	$30,712,518
Residential	12,628	12,351	$1,614,550,347	$3,391,634,555	$1,695,817,264	$6,702,002,162
Retail / Commercial	32	29	$21,530,474	$34,838,464	$34,838,464	$91,207,402
Unknown	1	0	$5,576	$0	$0	$5,576
Vacant	1,852	85	$337,200,131	$4,314,366	$0	$341,514,497
Moderate Total	**16,488**	**12,865**	**$2,334,267,862**	**$3,860,352,797**	**$2,234,398,168**	**$8,429,018,819**
Non-Wildland/Non-Urban						
Agricultural	1,805	1,197	$565,182,770	$510,806,234	$510,806,234	$1,586,795,238
Care/Health	6	2	$481,533	$640,321	$640,321	$1,762,175
Church/Welfare	12	10	$2,104,850	$12,080,753	$12,080,753	$26,266,356
Industrial	74	38	$75,456,176	$235,740,592	$353,610,886	$664,807,656
Miscellaneous	479	4	$3,083,888	$12,802	$12,802	$3,109,492
Office	3	1	$1,501,275	$4,830,000	$4,830,000	$11,161,275
Public/Utilities	198	0	$63	$0	$0	$63
Recreational	46	24	$11,848,945	$9,773,727	$9,773,727	$31,396,399
Residential	3,013	2,944	$391,456,726	$793,857,071	$396,928,505	$1,582,242,357
Retail / Commercial	27	26	$1,822,851	$6,692,436	$6,692,436	$15,207,723
Unknown	1	1	$36,466	$131,696	$0	$168,162
Vacant	887	69	$217,935,953	$4,179,178	$0	$222,115,131

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Non-Wildland/Non-Urban Total	**6,551**	**4,316**	**$1,270,911,496**	**$1,578,744,810**	**$1,295,375,664**	**$4,145,032,027**
Urban Unzoned						
Agricultural	27	13	$1,729,933	$1,767,497	$1,767,497	$5,264,927
Care/Health	189	179	$122,680,636	$579,571,194	$579,571,194	$1,281,823,024
Church/Welfare	420	366	$134,915,061	$579,445,761	$579,445,761	$1,293,806,583
Industrial	1,338	1,108	$556,444,087	$1,563,843,638	$2,345,765,464	$4,466,053,174
Miscellaneous	2,456	19	$8,429,791	$674,931	$674,931	$9,779,653
Office	1,345	1,219	$494,821,486	$1,448,403,087	$1,448,403,087	$3,391,627,660
Public/Utilities	345	1	$1,229,074	$1,483,565	$1,483,565	$4,196,204
Recreational	141	94	$44,066,636	$93,594,730	$93,594,730	$231,256,096
Residential	148,153	146,930	$12,756,510,780	$31,240,141,696	$15,620,070,599	$59,616,723,183
Retail / Commercial	2,189	2,042	$1,263,070,399	$2,360,392,504	$2,360,392,504	$5,983,855,407
Unknown	7	6	$42,958	$385,906	$0	$428,864
Vacant	3,299	182	$418,502,736	$26,832,911	$0	$445,335,647
Urban Unzoned Total	**159,909**	**152,159**	**$15,802,443,577**	**$37,896,537,420**	**$23,031,169,332**	**$76,730,150,422**
Unincorporated Sacramento County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**

Source: CAL FIRE, Sacramento County 2020 Parcel/Assessor's Data

Fire Threat Zone Analysis

Cal Fire develops and maintains datasets related to wildland fire threat and risk. The Fire Threat dataset, created in 2004, was used for analysis on unincorporated Sacramento County and for the county's seven incorporated areas including Citrus Heights, Elk Grove, Folsom, Galt, Isleton, Rancho Cordova and Sacramento. This fire threat layer was used for loss estimation purposes based on its comprehensive coverage of the Planning Area. Sacramento County's parcel and associated assessor data was used as the basis for the countywide inventory of developed parcels, or structures.

The Fire Threat dataset is a combination of fire frequency, or the likelihood of a given area to burn, and potential fire behavior. Fire rotation is calculated using fifty years of fire history, as well as climate, vegetation, and land ownership information. Fuel rank is calculated based on expected fire behavior for unique combinations of topography and vegetative fuels under given weather conditions (wind speed, humidity, temperature, and fuel moistures). Fuel rank and fire rotation are then combined to create the 5 threat classes in the Fire Threat dataset, ranging from Little or No Threat to Extreme Threat. There are no areas of Extreme Threat in Sacramento County.

Methodology

GIS was used to create a centroid, or point representing the center of the Sacramento County parcel polygon. Fire Threat was then overlaid on the parcel centroids. For the purposes of this analysis, the wildfire threat zone (Little or No Threat | Moderate | High | Very High | Extreme) that intersected a parcel centroid was assigned as the threat zone for the entire parcel.

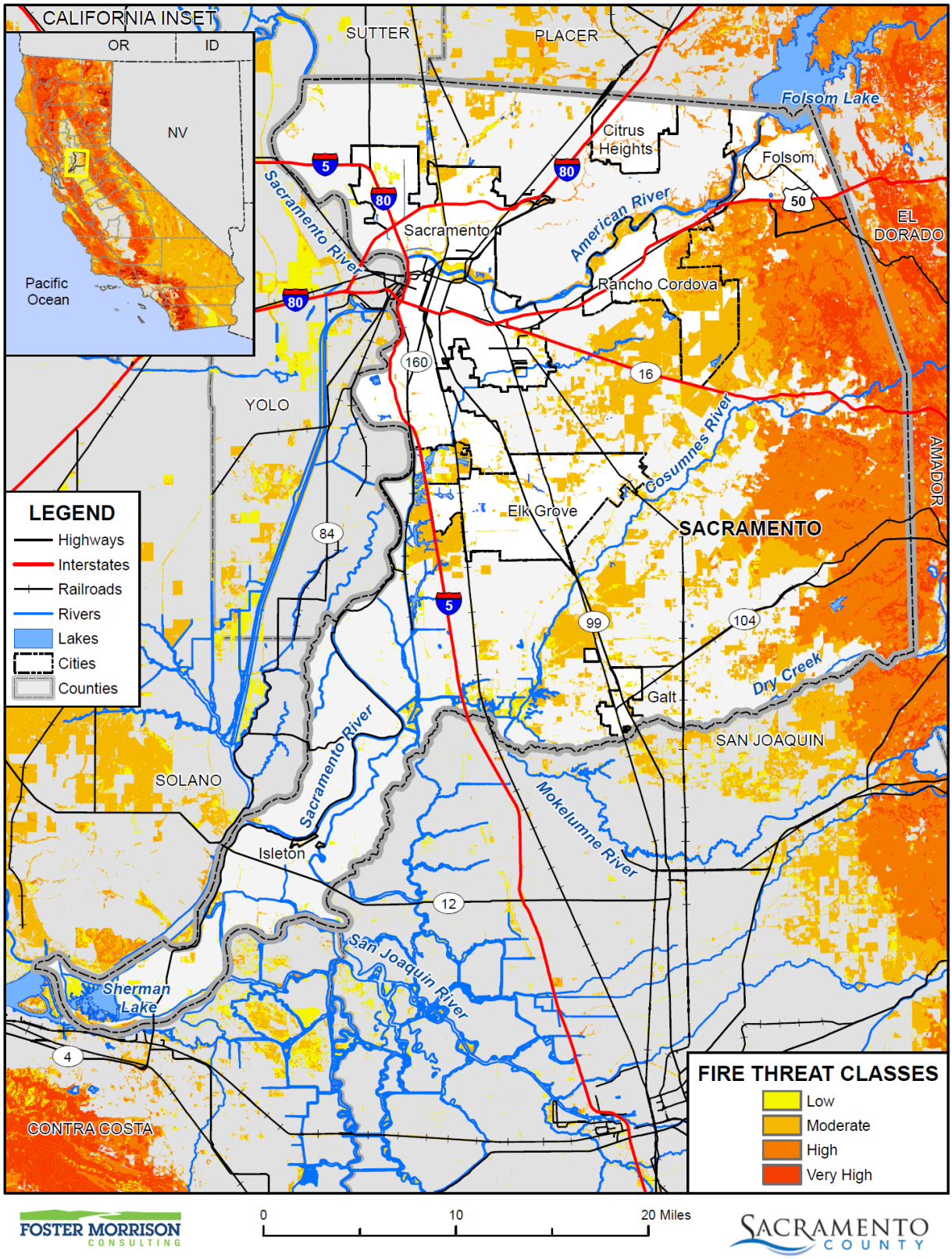
Assets at Risk

Results are presented by total Planning Area, unincorporated county, and for the participating jurisdictions (in their respective annexes to the plan), and detailed tables show improved parcel counts and their land and structure values by property use (residential, industrial, etc.) within each fire threat zone.

Sacramento County Planning Area

Fire Threat Zones in the County are shown on Figure 4-117. Analysis results for the entire Sacramento County Planning Area are summarized in Table 4-107. Table 4-108 summarizes total parcel counts, improved parcel counts, and their improved and land values by jurisdiction in each Fire Threat Zone.

Figure 4-117 Sacramento County – Fire Threat Zones



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 4-107 Sacramento County Planning Area – Parcels and Values at Risk in the Fire Threat Areas

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	883	87	$161,574,920	$45,458,503	$23,710,224	$230,743,645
High	3,328	1,543	$708,173,329	$628,820,187	$367,818,109	$1,704,811,656
Moderate	6,587	2,835	$1,124,068,935	$1,257,783,918	$809,982,222	$3,191,835,136
Low	2,058	792	$232,020,537	$369,804,777	$258,929,114	$860,754,428
No Threat	467,509	437,628	$49,871,138,640	$125,455,887,736	$79,341,482,057	$254,668,508,925
Total	**480,365**	**442,885**	**$52,096,976,361**	**$127,757,755,121**	**$80,801,921,726**	**$260,656,653,790**

Source: CAL FIRE, Sacramento County 2020 Parcel/Assessor's Data

Table 4-108 Sacramento County Planning Area – Parcels and Values at Risk in the Fire Threat Areas by Jurisdiction

Jurisdiction / Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Citrus Heights						
Very High	0	0	$0	$0	$0	$0
High	154	83	$10,944,958	$21,098,428	$11,115,363	$43,158,746
Moderate	26	15	$3,862,157	$3,279,905	$1,639,955	$8,782,013
Low	20	17	$1,456,037	$3,126,388	$1,563,197	$6,145,619
No Threat	26,577	25,706	$2,260,974,250	$5,441,050,090	$3,130,703,161	$10,832,727,434
Citrus Heights Total	**26,777**	**25,821**	$2,277,237,402	$5,468,554,811	$3,145,021,676	$10,890,813,812
Elk Grove						
Very High	0	0	$0	$0	$0	$0
High	3	1	$64,995	$154,762	$77,381	$297,138
Moderate	552	275	$164,149,216	$255,300,118	$194,070,862	$613,520,201
Low	192	113	$38,024,306	$74,113,140	$55,684,179	$167,821,621
No Threat	54,837	51,420	$6,060,272,776	$16,025,407,128	$9,190,178,055	$31,275,857,934
Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**
Folsom						
Very High	788	63	$131,919,565	$37,185,086	$18,611,485	$187,716,135
High	1,737	706	$441,821,634	$327,213,052	$181,478,986	$950,513,693
Moderate	389	273	$51,523,132	$147,125,846	$86,757,208	$285,406,188
Low	52	31	$5,126,140	$14,542,079	$7,271,039	$26,939,258
No Threat	24,092	22,541	$3,808,203,373	$10,060,291,607	$6,235,420,317	$20,103,915,227

Jurisdiction / Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**
Galt						
Very High	0	0	$0	$0	$0	$0
High	0	0	$0	$0	$0	$0
Moderate	117	76	$19,244,497	$26,116,639	$14,330,175	$59,691,317
Low	83	7	$9,060,926	$1,236,367	$618,184	$10,915,477
No Threat	7,786	7,365	$616,152,058	$1,701,979,838	$997,204,491	$3,315,336,385
Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**
Isleton						
Very High	0	0	$0	$0	$0	$0
High	1	0	$45,900	$0	$0	$45,900
Moderate	9	0	$539,519	$0	$0	$539,519
Low	27	6	$1,846,908	$990,414	$494,473	$3,331,796
No Threat	499	332	$20,284,884	$40,277,865	$25,559,083	$86,121,829
Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**
Rancho Cordova						
Very High	0	0	$0	$0	$0	$0
High	12	2	$1,063,212	$1,129,950	$1,564,925	$3,758,087
Moderate	1,275	268	$203,019,166	$89,618,589	$61,131,735	$353,769,501
Low	175	71	$17,185,898	$35,417,063	$41,930,608	$94,533,581
No Threat	22,323	21,191	$2,475,688,338	$6,701,983,002	$4,893,993,900	$14,071,665,096
Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**
City of Sacramento						
Very High	0	0	$0	$0	$0	$0
High	109	67	$15,788,630	$38,303,420	$28,104,152	$82,196,206
Moderate	820	354	$142,451,051	$214,897,344	$149,835,830	$507,184,233
Low	693	245	$74,272,287	$129,795,580	$80,617,834	$284,685,707
No Threat	153,968	142,230	$16,099,510,317	$43,010,439,427	$28,821,073,003	$87,931,023,440
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**
Unincorporated Sacramento County						
Very High	95	24	$29,655,355	$8,273,417	$5,098,739	$43,027,510
High	1,312	684	$238,444,000	$240,920,575	$145,477,302	$624,841,886
Moderate	3,399	1,574	$539,280,197	$521,445,477	$302,216,457	$1,362,942,164

Jurisdiction / Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Low	816	302	$85,048,035	$110,583,746	$70,749,600	$266,381,369
No Threat	177,427	166,843	$18,530,052,644	$42,474,458,779	$26,047,350,047	$87,051,861,580
Unincorporated Sacramento County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**
Grand Total	**480,365**	**442,885**	**$52,096,976,361**	**$127,757,755,121**	**$80,801,921,726**	**$260,656,653,790**

Source: CAL FIRE, Sacramento County 2020 Parcel/Assessor's Data

Unincorporated Sacramento County

Analysis results for the entire Sacramento County Planning Area are summarized in Table 4-109. Table 4-110 summarizes total parcel counts, improved parcel counts, and their improved and land values in the unincorporated County in each Fire Threat Zone.

Table 4-109 Unincorporated Sacramento County – Parcels and Values at Risk in the Fire Threat Areas

Jurisdiction / Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	95	24	$29,655,355	$8,273,417	$5,098,739	$43,027,510
High	1,312	684	$238,444,000	$240,920,575	$145,477,302	$624,841,886
Moderate	3,399	1,574	$539,280,197	$521,445,477	$302,216,457	$1,362,942,164
Low	816	302	$85,048,035	$110,583,746	$70,749,600	$266,381,369
No Threat	177,427	166,843	$18,530,052,644	$42,474,458,779	$26,047,350,047	$87,051,861,580
Unincorporated Sacramento County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**

Source: CAL FIRE, Sacramento County 2020 Parcel/Assessor's Data

Table 4-110 Unincorporated Sacramento County – Parcels and Values at Risk in the Fire Threat Areas by Property Use

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High						
Agricultural	61	7	$24,871,475	$1,721,235	$1,721,235	$28,313,945
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	3	1	$1,378,549	$101,415	$152,122	$1,632,086

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Miscellaneous	4	0	$788	$0	$0	$788
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	1	0	$0	$0	$0	$0
Residential	17	16	$2,194,006	$6,450,767	$3,225,382	$11,870,154
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	9	0	$1,210,537	$0	$0	$1,210,537
Very High Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
High						
Agricultural	285	40	$73,092,647	$9,756,705	$9,756,705	$92,606,057
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	1	1	$94,477	$1,211,521	$1,211,521	$2,517,519
Industrial	13	1	$11,927,895	$20,349,950	$30,524,925	$62,802,770
Miscellaneous	135	1	$466,076	$3,376	$3,376	$472,828
Office	0	0	$0	$0	$0	$0
Public/Utilities	10	0	$0	$0	$0	$0
Recreational	5	0	$14,598	$0	$0	$14,598
Residential	675	635	$96,089,343	$207,961,576	$103,980,775	$408,031,703
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	188	6	$56,758,964	$1,637,447	$0	$58,396,411
High Total	**1,312**	**684**	**$238,444,000**	**$240,920,575**	**$145,477,302**	**$624,841,886**
Moderate						
Agricultural	298	64	$77,228,002	$28,294,489	$28,294,489	$133,816,980
Care/Health	5	5	$715,645	$2,036,455	$2,036,455	$4,788,555
Church/Welfare	9	4	$2,304,453	$1,179,176	$1,179,176	$4,662,805
Industrial	47	5	$28,102,451	$20,332,359	$30,498,539	$78,933,348
Miscellaneous	330	0	$785,850	$0	$0	$785,850
Office	2	1	$1,152,536	$495,720	$495,720	$2,143,976
Public/Utilities	55	0	$19	$0	$0	$19
Recreational	11	5	$696,776	$1,017,294	$1,017,294	$2,731,364
Residential	1,523	1,462	$228,986,830	$454,425,889	$227,212,932	$910,625,685

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Retail/ Commercial	7	5	$9,297,261	$11,481,852	$11,481,852	$32,260,965
Unknown	1	0	$5,576	$0	$0	$5,576
Vacant	1,111	23	$190,004,798	$2,182,243	$0	$192,187,041
Moderate Total	**3,399**	**1,574**	**$539,280,197**	**$521,445,477**	**$302,216,457**	**$1,362,942,164**
Low						
Agricultural	92	27	$14,207,044	$10,872,297	$10,872,297	$35,951,638
Care/Health	1	0	$10			$10
Church/Welfare	2	2	$1,467,640	$8,515,081	$8,515,081	$18,497,802
Industrial	8	4	$1,340,467	$827,643	$1,241,464	$3,409,575
Miscellaneous	184	1	$212,655	$2,878	$2,878	$218,411
Office	1	0	$1,020	$0	$0	$1,020
Public/Utilities	78	0	$27	$0	$0	$27
Recreational	15	7	$2,054,596	$941,538	$941,538	$3,937,672
Residential	264	249	$42,843,997	$80,294,602	$40,147,311	$163,285,897
Retail/ Commercial	4	4	$2,351,344	$9,029,031	$9,029,031	$20,409,406
Unknown	0	0	$0	$0	$0	$0
Vacant	167	8	$20,569,235	$100,676	$0	$20,669,911
Low Total	**816**	**302**	**$85,048,035**	**$110,583,746**	**$70,749,600**	**$266,381,369**
No Threat						
Agricultural	1,877	1,311	$612,261,489	$608,217,702	$608,217,702	$1,828,696,893
Care/Health	210	193	$131,184,503	$612,053,552	$612,053,552	$1,355,291,607
Church/Welfare	447	390	$142,080,803	$650,420,965	$650,420,965	$1,442,922,733
Industrial	1,521	1,224	$676,803,668	$1,906,326,917	$2,859,490,382	$5,442,620,950
Miscellaneous	3,065	22	$11,236,375	$687,333	$687,333	$12,611,041
Office	1,376	1,238	$505,800,635	$1,473,168,355	$1,473,168,355	$3,452,137,345
Public/Utilities	519	1	$1,229,157	$1,483,565	$1,483,565	$4,196,287
Recreational	190	120	$62,247,933	$112,216,723	$112,216,723	$286,681,379
Residential	161,401	159,948	$14,405,987,586	$34,696,398,449	$17,348,198,949	$66,450,585,111
Retail/ Commercial	2,237	2,088	$1,274,775,119	$2,381,412,521	$2,381,412,521	$6,037,600,161
Unknown	8	7	$79,424	$517,602	$0	$597,026
Vacant	4,576	301	$706,365,952	$31,555,095	$0	$737,921,047
No Threat Total	**177,427**	**166,843**	**$18,530,052,644**	**$42,474,458,779**	**$26,047,350,047**	**$87,051,861,580**

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unincorporated Sacramento County Total	**183,049**	**169,427**	**$19,422,480,231**	**$43,355,681,994**	**$26,570,892,145**	**$89,349,054,509**

Source: CAL FIRE, Sacramento County 2020 Parcel/Assessor's Data

Population at Risk

A separate analysis was performed to determine population that reside in both FHSZs and Fire Threat Zones. Using GIS, the CAL FIRE FHSZ and Fire Threat datasets were overlayed on the improved residential parcel data. Those parcel centroids that intersect each FHSZ were counted and multiplied by the Census Bureau average household size; results were tabulated by FHSZ (see Table 4-111). According to this analysis, there is a population of 74,473 in the Moderate FHSZ, 6,988 in the High FHSZ, and 235 in the Very High FHSZ in the County.

Table 4-111 Sacramento County Planning Area – Residential Populations at Risk in Moderate or Higher FHSZs

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Citrus Heights	0	0	0	0	0	0
Elk Grove	0	0	0	0	3,991	12,771
Folsom	0	0	2,657	6,988	3,494	9,189
Galt	0	0	0	0	430	1,359
Isleton	0	0	0	0	0	0
Rancho Cordova	0	0	0	0	4,437	9,495
City of Sacramento	0	0	0	0	2,846	7,570
Unincorporated Sacramento County	85	235	0	0	12,351	34,089
Total	**85**	**235**	**2,657**	**6,988**	**27,549**	**74,473**

Source: CAL FIRE, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Rancho Cordova (2.14): and unincorporated Sacramento County (2.76)

Results were also tabulated by Fire Threat Zone (see Table 4-112). According to this analysis, there is a population of 7,284 in the Moderate, 3,897 in the High, and 207 in the Very High Fire Threat Zones in the County.

Table 4-112 Sacramento County Planning Area – Residential Populations at Risk in Moderate or Higher Fire Threat Areas

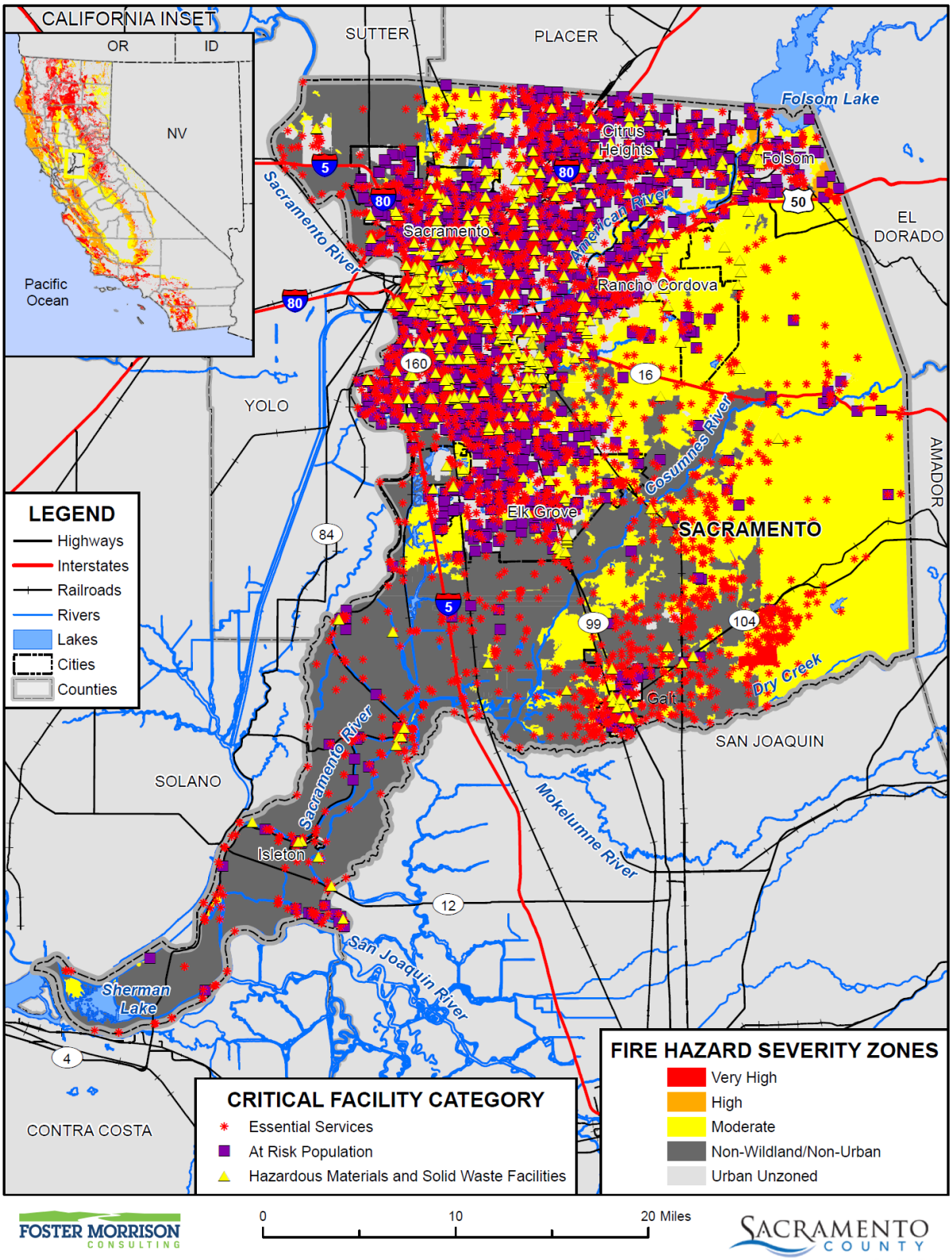
Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Citrus Heights	0	0	81	130	15	38
Elk Grove	0	0	1	3	260	832
Folsom	62	163	698	1,836	269	707
Galt	0	0	0	0	75	237
Isleton	0	0	0	0	0	0
Rancho Cordova	0	0	1	2	254	544
City of Sacramento	0	0	65	173	335	891
Unincorporated Sacramento County	16	44	635	1,753	1,462	4,035
Total	**78**	**207**	**1481**	**3,897**	**2,670**	**7,284**

Source: CAL FIRE, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Rancho Cordova (2.14): and unincorporated Sacramento County (2.76)

Critical Facilities at Risk

A separate analysis was performed on the critical facility inventory in Sacramento County to determine critical facilities in both the FHSZs and Fire Threat Zones. Using GIS, the CAL FIRE, FHSZ and Fire Threat Zones were overlayed on the critical facility GIS layer. Figure 4-118 shows critical facilities, as well as the FHSZs. Table 4-113 details critical facilities by facility type and count for the Sacramento County Planning Area, while Table 4-114 details the critical facilities by facility type and count for unincorporated Sacramento County. Details of critical facility definition, type, name and address by FHSZ are listed in Appendix F.

Figure 4-118 Sacramento County– Critical Facilities in FHSZs



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 4-113 Sacramento County Planning Area– Critical Facilities in FHSZs

FHSZ/Critical Facility Class	Facility Count
Very High	
Essential Services Facilities	24
At Risk Population Facilities	0
Hazardous Materials and Solid Waste Facilities	0
Total	**24**
High	
Essential Services Facilities	31
At Risk Population Facilities	4
Hazardous Materials and Solid Waste Facilities	0
Total	**35**
Moderate	
Essential Services Facilities	932
At Risk Population Facilities	100
Hazardous Materials and Solid Waste Facilities	37
Total	**1,069**
Urban Unzoned	
Essential Services Facilities	2,928
At Risk Population Facilities	2,195
Hazardous Materials and Solid Waste Facilities	447
Total	**5,570**
Non-Wildland/Non-Urban	
Essential Services Facilities	**812**
At Risk Population Facilities	**958**
Hazardous Materials and Solid Waste Facilities	**16**
Total	**1,789**
Grand Total	**7,585**

Source: Sacramento County GIS, CAL FIRE

Table 4-114 Unincorporated Sacramento County– Critical Facilities in FHSZs

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
Very High		
Essential Services Facilities	Microwave Service Towers	20
	Water Well	4
	Total	**24**

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
Very High Total		**24**
Moderate		
Essential Services Facilities	Bridge	3
	Cellular Tower	11
	Emergency Evacuation Center	4
	EMS Stations	10
	FDIC Insured Banks	1
	Fire Station	12
	Law Enforcement	3
	Microwave Service Towers	340
	Power Plants	9
	Pump Station	1
	Sewage Treatment Plant	3
	Water Well	320
	Total	**717**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	1
	Day Care Center	6
	Mobile Home Parks	1
	Places of Worship	20
	School	30
	Total	**58**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	2
	EPA ER TSCA Facility	1
	Leaky Underground Storage Tank	10
	Solid Waste Facility	8
	Total	**21**
Moderate Total		**796**
Non-Wildland/Non-Urban		
Essential Services Facilities	Bridge	38
	Cellular Tower	7
	Emergency Evacuation Center	1
	EMS Stations	2
	Fire Station	2
	Law Enforcement	1
	Microwave Service Towers	329
	Port Facilities	46

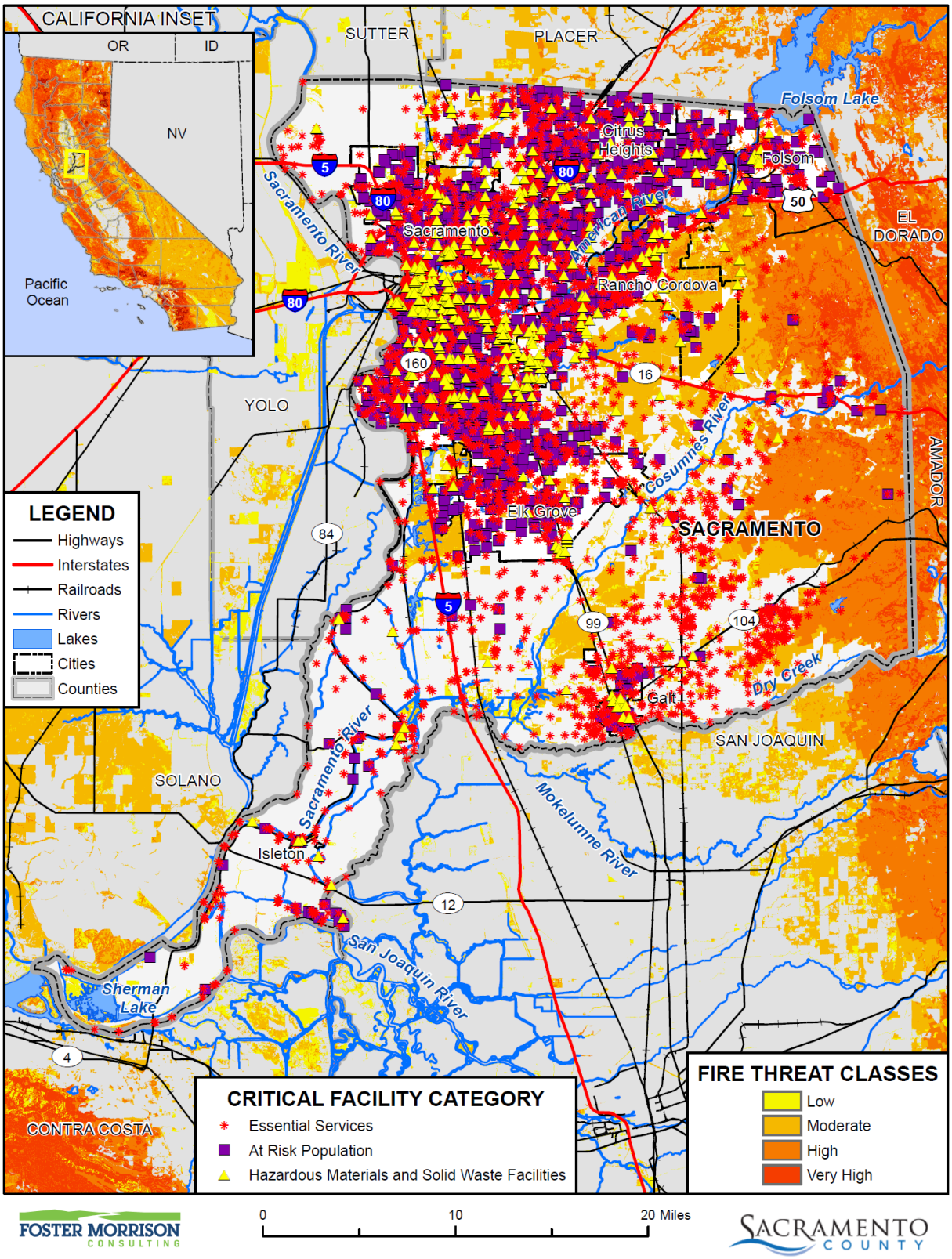
Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
	Power Plants	22
	Water Well	303
	Total	**751**
At Risk Population Facilities	Day Care Center	1
	Mobile Home Parks	13
	Places of Worship	8
	School	12
	Total	**34**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	5
	Solid Waste Facility	8
	Total	**13**
Non-Wildland/Non-Urban Total		**798**
Urban Unzoned		
Essential Services Facilities	Airport	3
	Bridge	10
	Cellular Tower	5
	Emergency Evacuation Center	49
	EMS Stations	37
	FDIC Insured Banks	57
	Fire Station	43
	Hospital or Urgent Care	4
	Law Enforcement	22
	Microwave Service Towers	329
	Power Plants	9
	Public Transit Stations	7
	Pump Station	6
	Sandbag Site	3
	Sewage Treatment Plant	1
	State Government Buildings	3
	Water Well	472
	Total	**1,060**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	11
	Community Center	4
	Day Care Center	133
	Mobile Home Parks	51
	Places of Worship	386

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
	School	275
	Total	**860**
Hazardous Materials and Solid Waste Facilities Total	EPA ER FRP Facility	2
	EPA ER TRI Facility	21
	Leaky Underground Storage Tank	112
	Solid Waste Facility	6
	Waste Transfer Station	1
		142
Urban Unzoned Total		**2,062**
Unincorporated Sacramento County Total		**3,680**

Source: Sacramento County GIS, CAL FIRE

Figure 4-119 shows critical facilities, as well as the Fire Threat Zones in the County. Table 4-115 details critical facilities by facility type and count for the Fire Threat Zones in the Sacramento County Planning Area, while Table 4-116 details the critical facilities by facility type and count for unincorporated Sacramento County. Details of critical facility definition, type, name and address by Fire Threat Zone are listed in Appendix F

Figure 4-119 Sacramento County– Critical Facilities in Fire Threat Zones



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 4-115 Sacramento County Planning Area– Critical Facilities in Fire Threat Zones

Fire Threat Area/Critical Facility Class	Facility Count
Very High	
Essential Services Facilities	6
At Risk Population Facilities	0
Hazardous Materials and Solid Waste Facilities	0
Total	**6**
High	
Essential Services Facilities	92
At Risk Population Facilities	6
Hazardous Materials and Solid Waste Facilities	4
Total	**102**
Moderate	
Essential Services Facilities	197
At Risk Population Facilities	6
Hazardous Materials and Solid Waste Facilities	13
Total	**216**
Essential Services Facilities	158
At Risk Population Facilities	7
Hazardous Materials and Solid Waste Facilities	15
Total	**180**
No Threat	
Essential Services Facilities	4,347
At Risk Population Facilities	2,339
Hazardous Materials and Solid Waste Facilities	480
Total	**7,166**
Grand Total	**7,585**

Source: Sacramento County GIS, CAL FIRE

Table 4-116 Unincorporated Sacramento County– Critical Facilities in Fire Threat Zones

Jurisdiction / Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
High		
Essential Services Facilities	Cellular Tower	4
	Microwave Service Towers	42
	Power Plants	2

Jurisdiction / Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
	Water Well	34
	Total	**82**
At Risk Population Facilities	Day Care Center	1
	Mobile Home Parks	1
	Places of Worship	1
	School	3
	Total	**6**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	1
	EPA ER TSCA Facility	1
	Solid Waste Facility	2
	Total	**4**
High Total		**92**
Low		
Essential Services Facilities	Bridge	7
	Cellular Tower	2
	Emergency Evacuation Center	1
	Microwave Service Towers	18
	Sewage Treatment Plant	1
	Water Well	27
	Total	**56**
At Risk Population Facilities	Mobile Home Parks	3
	Places of Worship	3
	Total	**6**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	1
	Solid Waste Facility	1
	Total	**2**
Low Total		**64**
Moderate		
Essential Services Facilities	Bridge	2
	EMS Stations	1
	Fire Station	1
	Microwave Service Towers	37
	Power Plants	2
	Sewage Treatment Plant	1
	Water Well	101
	Total	**145**
At Risk Population Facilities	School	3

Jurisdiction / Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
	Total	**3**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	1
	Leaky Underground Storage Tank	2
	Solid Waste Facility	5
	Total	**8**
Moderate Total		**156**
No Threat		
Essential Services Facilities	Airport	3
	Bridge	42
	Cellular Tower	17
	Emergency Evacuation Center	53
	EMS Stations	48
	FDIC Insured Banks	58
	Fire Station	56
	Hospital or Urgent Care	4
	Law Enforcement	26
	Microwave Service Towers	921
	Port Facilities	46
	Power Plants	36
	Public Transit Stations	7
	Pump Station	7
	Sandbag Site	3
	Sewage Treatment Plant	2
	State Government Buildings	3
	Water Well	933
	Total	**2,265**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	12
	Community Center	4
	Day Care Center	139
	Mobile Home Parks	61
	Places of Worship	410
	School	311
	Total	**937**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	2
	EPA ER TRI Facility	21
	Leaky Underground Storage Tank	124

Jurisdiction / Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
	Solid Waste Facility	14
	Waste Transfer Station	1
	Total	**162**
No Threat Total		**3,364**
Very High		
Essential Services Facilities	Water Well	4
	Total	**4**
Very High Total		**4**
Unincorporated Sacramento County Total		**3,680**

Source: Sacramento County GIS, CAL FIRE

Overall Community Impact

The overall impact to the community from a severe wildfire includes:

- Injury and loss of life;
- Commercial and residential structural and property damage;
- Decreased water quality in area watersheds;
- Increase in post-fire hazards such as flooding, sedimentation, and debris flows/mudslides;
- Damage to natural resource habitats and other resources, such as crops, timber and rangelands;
- Loss of water, power, roads, phones, and transportation, which could impact, strand, and/or impair mobility for emergency responders and/or area residents;
- Economic losses (jobs, sales, tax revenue) associated with loss of commercial structures;
- Negative impact on commercial and residential property values;
- Loss of churches, which could severely impact the social fabric of the community;
- Loss of schools, which could severely impact the entire school system and disrupt families and teachers, as temporary facilities and relocations would likely be needed; and
- Impact on the overall mental health of the community.

Future Development

Population growth and development in Sacramento County is on the rise. Additional growth and development within the WUI or high fire risk areas of the County would place additional assets at risk to wildfire. County building codes are in effect to reduce this risk.

GIS Analysis

Sacramento County's 2020 Parcel/Assessor's data and data from the County planning department were used as the basis for the unincorporated County's inventory of parcels and acres of future development areas. Using the GIS parcel spatial file and the APNs, the seven future development projects were mapped. For the wildfire analysis of future development areas, the parcel data was converted to a point layer using a centroid conversion process, in which each parcel was identified by a central point and linked to the

Assessor's data. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each FHSZ. FHSZs and future development areas are shown on Figure 4-120 and parcels and acreages in those areas are shown in Table 4-117. Fire threat areas and future development areas are shown on Figure 4-121 and parcels and acreages in those areas are shown in Table 4-118.

Figure 4-120 Unincorporated Sacramento County – Future Development in FHSZs

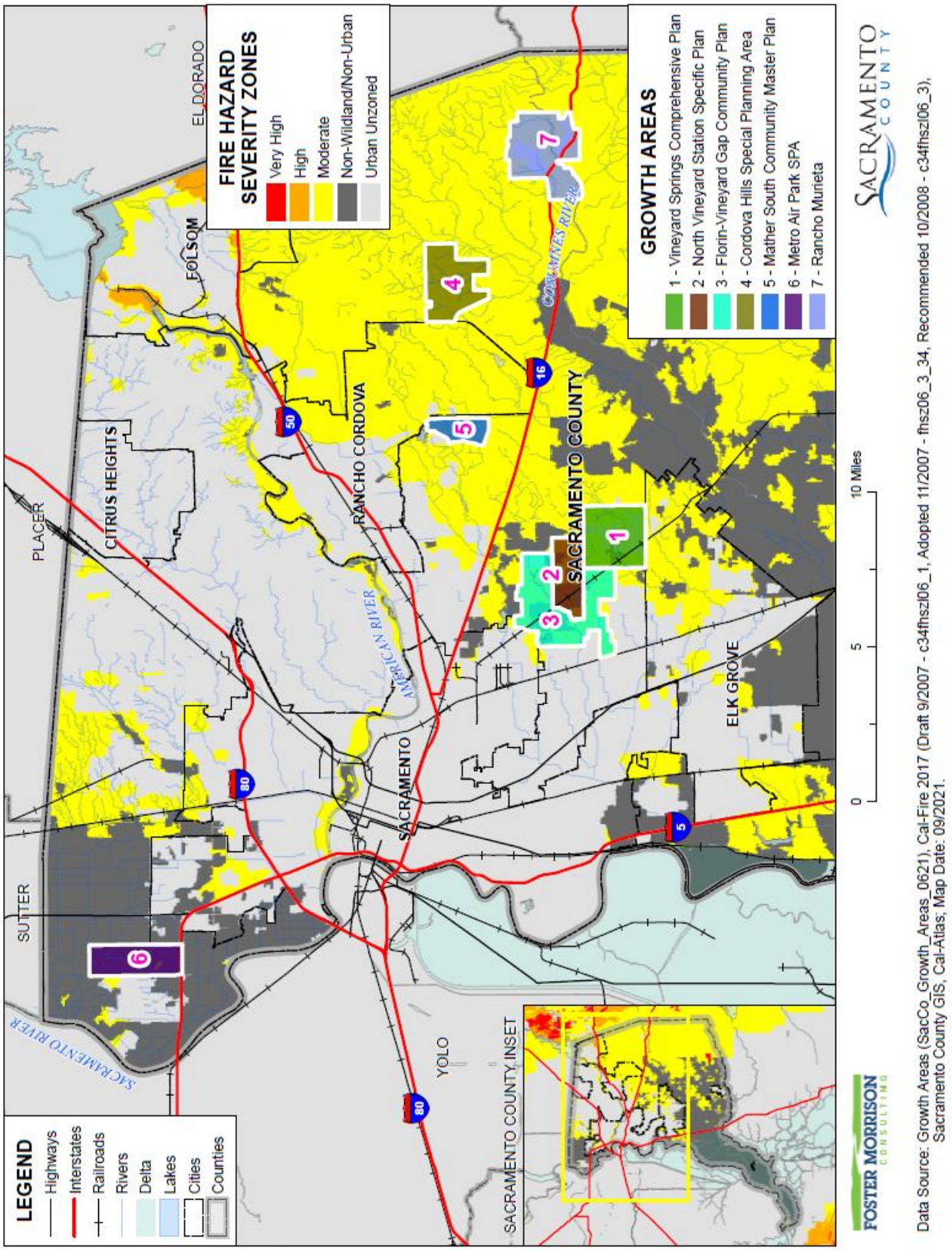


Table 4-117 Unincorporated Sacramento County – Future Development in FHSZs

Fire Hazard Severity Zone/ Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Moderate			
Cordova Hills Special Planning Area	14	0	2,406
Florin-Vineyard Gap Community Plan	774	610	2,580
Mather South Community Master Plan	4	0	1,007
Metro Air Park SPA	2	0	27
North Vineyard Station Specific Plan	395	305	896
Rancho Murieta	1,445	1,171	2,627
Vineyard Springs Comprehensive Plan	927	833	1,380
Moderate Total	**3,561**	**2,919**	**10,923**
Non-Wildland/Non-Urban			
Florin-Vineyard Gap Community Plan	103	68	782
Metro Air Park SPA	70	4	1,780
North Vineyard Station Specific Plan	1,455	1,161	601
Vineyard Springs Comprehensive Plan	149	140	120
Non-Wildland/Non-Urban Total	**1,777**	**1,373**	**3,284**
Urban Unzoned			
Florin-Vineyard Gap Community Plan	159	143	338
Metro Air Park SPA	2		1
Rancho Murieta	1,498	1,421	596
Vineyard Springs Comprehensive Plan	1,708	1,618	853
Urban Unzoned Total	**3,367**	**3,182**	**1,788**
Grand Total	**8,705**	**7,474**	**15,994**

Source: Sacramento County, CAL FIRE

Figure 4-121 Unincorporated Sacramento County – Future Development in Fire Threat Areas

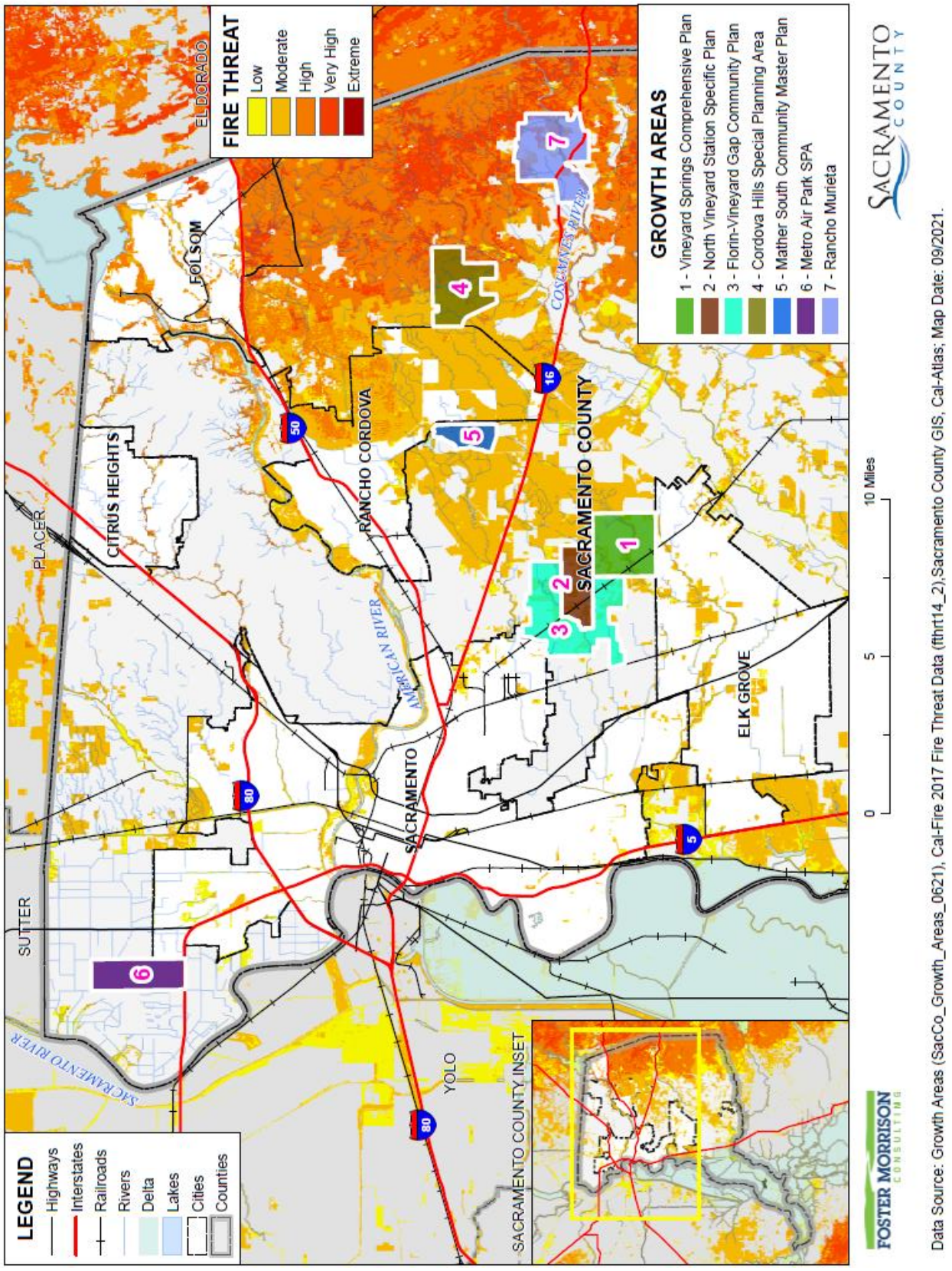


Table 4-118 Unincorporated Sacramento County – Future Development in Fire Threat Areas

Fire Threat/Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Very High			
Rancho Murieta	21	15	157
Very High Total	**21**	**15**	**157**
High			
Cordova Hills Special Planning Area	7	0	1,299
Rancho Murieta	215	152	897
High Total	**222**	**152**	**2,196**
Moderate			
Cordova Hills Special Planning Area	7	0	1,107
Florin-Vineyard Gap Community Plan	112	53	945
Mather South Community Master Plan	4	0	1,007
North Vineyard Station Specific Plan	357	239	818
Rancho Murieta	113	109	225
Vineyard Springs Comprehensive Plan	183	154	505
Moderate Total	**776**	**555**	**4,607**
Low			
Florin-Vineyard Gap Community Plan	10	7	28
North Vineyard Station Specific Plan	44	26	41
Rancho Murieta	32	28	13
Vineyard Springs Comprehensive Plan	17	16	36
Low Total	**103**	**77**	**118**
No Threat			
Florin-Vineyard Gap Community Plan	914	761	2,726
Metro Air Park SPA	74	4	1,807
North Vineyard Station Specific Plan	1,449	1,201	638
Rancho Murieta	2,562	2,288	1,932
Vineyard Springs Comprehensive Plan	2,584	2,421	1,813
No Threat Total	**7,583**	**6,675**	**8,917**
Grand Total	**8,705**	**7,474**	**15,994**

Source: Sacramento County, CAL FIRE

4.3.19. Natural Hazards Summary

Table 4-119 summarizes the results of the hazard identification, hazard profile, and vulnerability assessment for the Sacramento County Planning Area based on hazards data and input from the HMPC. For each

hazard profiled in Section 4.3, this table includes the likelihood of future occurrence and whether the hazard is considered a priority hazard for mitigation actions (as discussed in Chapter 5 of this Plan Update) in the Sacramento County Planning Area.

Priority Hazards

As detailed in the hazard identification section, those hazards identified as a high or medium significance in Table 4-3 are considered priority hazards for mitigation planning. Those hazards identified as a high or medium significance are considered priority hazards for mitigation planning. Those hazards that occur infrequently or have little or no impact on the Planning Area were determined to be of low significance and not considered a priority hazard. Significance was determined based on the hazard profile, focusing on key criteria such as frequency, extent, and resulting damage, including deaths/injuries and property, crop, and economic damage. The ability of a community to reduce losses through implementation of existing and new mitigation measures was also considered as to the significance of a hazard. This assessment was used by the HMPC to prioritize those hazards of greatest significance to the Sacramento County Planning Area, enabling the County to focus resources where they are most needed.

Table 4-119 Hazard Identification/Profile Summary and Determination of Priority Hazards

Hazard	Likelihood of Future Occurrence	Priority Hazard
Climate Change	Likely	Y
Dam Failure	Occasional	Y
Drought & Water Shortage	Likely	Y
Earthquake	Occasional	Y
Earthquake Liquefaction	Occasional	Y
Floods: 1%/0.2% annual chance	Likely	Y
Floods: Localized Stormwater	Highly Likely	Y
Landslides, Mudslides, and Debris Flow	Occasional	N
Levee Failure	Occasional	Y
Pandemic	Likely	Y
Severe Weather: Extreme Cold and Freeze	Highly Likely	Y
Severe Weather: Extreme Heat	Highly Likely	Y
Severe Weather: Heavy Rains and Storms	Highly Likely	Y
Severe Weather: Wind and Tornado	Highly Likely	Y
Subsidence	Highly Likely	Y
Volcano	Unlikely	N
Wildfire	Highly Likely	Y

4.4 Capability Assessment

Thus far, the planning process has identified the natural hazards posing a threat to the Sacramento County Planning Area and described, in general, the vulnerability of the County to these risks. The next step is to assess what loss prevention mechanisms are already in place. This part of the planning process is the mitigation capability assessment. Combining the risk assessment with the mitigation capability assessment results in the County's net vulnerability to disasters, and more accurately focuses the goals, objectives, and proposed actions of this LHMP Update.

A two-step approach was used to conduct this assessment for the County. First, an inventory of common mitigation activities was made through the use of matrixes. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken if deemed appropriate. Second, an inventory and review of existing policies, regulations, plans, and programs was conducted to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses.

This section presents the County's mitigation capabilities that are applicable to the County. These are in addition to, and supplement, the many plans, reports, and technical information reviewed and used for this LHMP Update as identified in Chapter 3 and in Chapter 4.

Similar to the HMPC's effort to describe hazards, risks, and vulnerability of the County, this mitigation capability assessment describes the County's existing capabilities, programs, and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This assessment is divided into four sections: regulatory mitigation capabilities are discussed in Section 4.4.1; administrative and technical mitigation capabilities are discussed in Section 4.4.2; fiscal mitigation capabilities are discussed in Section 4.4.3; mitigation education, outreach, and partnerships are discussed in Section 4.4.4, and other mitigation efforts are discussed in Section 4.4.5.

4.4.1. Sacramento County's Regulatory Mitigation Capabilities

Table 4-120 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Sacramento County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

Table 4-120 Sacramento County Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
General Plan	Y 2017	Plan addresses hazards and identifies projects and mitigation actions for them. See the discussion below this table.

Capital Improvements Plan	Y	The County has a Five-Year Capital Improvement Plan (CIP) that is prepared by the County Executive's Office. It is updated annually. New projects added to the CIP are examined for consistency with the General Plan including the LHMP which will be adopted by reference into the Safety Element. The projects contained within the CIP are dependent upon the individual departments. Water Resources has a storm drain system capital improvement plan
Economic Development Plan	Y	The Planning and Environmental Review Division maintains the General Plan which has an Economic Development Element, but many of the items identified within the Element are the responsibility of the Office of Economic Development & Marketing. The Element does not address hazards.
Local Emergency Operations Plan	Y 2017	County Emergency Operations. This plan contains numerous annexes for hazards, support and function.
Operational Area Plan	Y 2019	
Continuity of Operations Plan	Y 2020	Plan addresses natural and man-made hazards.
Transportation Plan	Y	The Planning and Environmental Review Division maintains the General Plan which has Circulation Element (including a Transportation Plan), but many of the items identified within the Element are the responsibility of SACDOT. The Element does not address hazards, but does include a policy to reduce the heat island effect.
Stormwater Management Plan/Program	Y	Hydrology Standards 1996; update in process to consider recent historic storms and climate change Stormwater Guidance Manual
Engineering Studies for Streams	Y	
Community Wildfire Protection Plan	Y 2014	Sacramento Metropolitan Fire District Community Wildfire Protection Plan
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y 2011	The Climate Action Plan Strategy and Framework Document was adopted with the General Plan update in 2011. Chapter 2 discusses the County's vulnerability to climate change and identified potential impacts to human, natural and built systems. It also proposed actions to address climate change. In 2017, the County published a vulnerability assessment (https://planning.saccounty.net/PlansandProjectsIn-Progress/Pages/CAP.aspx) as part of the preparation of a Communitywide Climate Action Plan (CAP). A public review draft CAP has been released and adoption is expected in early 2022. The CAP includes an adaptation plan.
	Y	This LHMP will be the 4th multi-jurisdictional LHMP developed by Sacramento County as the lead, since 2005.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: 2019 CBC
Building Code Effectiveness Grading Schedule (BCEGS) Score	Y	Score: 3/3

Fire department ISO rating:	Y	Rating: 2/9 Class 2 applies to all risks that are both: I) within 5 road miles of a recognized fire station AND II) within 1000 feet of a recognized fire hydrant. Class 9 would apply to those risks that are: I) within 5 road miles of a recognized fire station, but without a fire hydrant within 1000 feet.
Site plan review requirements	Y	The County operates a public counter for review of all development applications. DWR drainage division staff evaluates new development proposals for compliance with County standards, drainage ordinances, and floodplain development policies and provide flood zone information.
Land Use Planning and Ordinances		
Zoning ordinance	Y	Generally, the zoning ordinance separates hazardous land uses from sensitive land uses and addresses risks e.g. flood, erosion and traffic. The zoning ordinance contains a Flood (F) Combining Zoning District and Tributary Standards, and Natural Streams (NS) Combining Zoning District to reduce the impacts of flood hazards. Additionally, the ordinance contains a Parkway Corridor (PC) Combining Zoning District to ensure that bluff development does not create erosion or geologic instability.
Subdivision ordinance	Y	County Code Title 22 Land Development is the County's subdivision ordinance. The ordinance does not address hazards.
Floodplain ordinance	Y	Minor revisions in 2010 and 2014, major in 2007 reviewed by FEMA Region 9. Additional revisions were completed in 2017. The floodplain ordinance can be found at www.stormready.org.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	Improvement Standards
Flood insurance rate maps	Y	County maintains a library of past and current FIRMS.
Elevation Certificates	Y	Comprehensive record of elevation certificates
Acquisition of land for open space and public recreation uses	Y	Land acquisition is on-gong for purposes of flood control, species conservation, open space preservation and recreation.
Erosion or sediment control program	Y	County Improvement Standards, 2010
Other	Y Y Y	Evacuation Plan, The South Sacramento Habitat Conservation Plan is a regional approach to addressing issues related to urban development, habitat conservation and agricultural protection. Regional Watershed Management plan recently updated and appended to this LHMP.
How can these capabilities be expanded and improved to reduce risk?		
Complete the CAP, begin new General Plan Update which integrates a Carbon Neutral CAP for 2030 and beyond. Other areas identified for improvement include: Keeping the County GIS layers updated; keeping the Ordinances and Codes updated; Conduct cross-training between County Departments related to hazard mitigation; Encourage others to become certified floodplain managers – a certificate from the Association of State Floodplain Managers.		

As indicated in the tables above, Sacramento County has several plans and programs that guide the County's mitigation of development of hazard-prone areas. Starting with the Sacramento County General Plan, which is the most comprehensive of the County's plans when it comes to mitigation, some of these are described in more detail below.

Sacramento County General Plan (2011 – many sections amended in 2017)

A general plan is a legal document, required by state law, that serves as a community's "constitution" for land use and development. The plan must be a comprehensive, long-term document, detailing proposals for the "physical development of the county or city, and of any land outside its boundaries which in the planning agency's judgment bears relation to its planning" (Government Code §65300 et seq.). Time horizons vary, but the typical general plan looks 10 to 20 years into the future. The law specifically requires that the general plan address seven topics or "elements." These are land use, circulation (transportation), housing, conservation, open space, noise, and safety. The plan must analyze issues of importance to the community, set forth policies in text and diagrams for conservation and development, and outline specific programs for implementing these policies.

Goals and policies related to mitigation from the General Plan include the following:

Conservation Element

The County recognizes the need for effective conservation practices which allow for the maintenance and preservation of its natural environment and efficient use of its resources. The State mandates that the County's General Plan include a Conservation Element which will enable the County to analyze its resources and determine policies for their use and conservation. State law requires that the element address the management and protection of specific resources:

- The Water Resources section addresses the County's objectives with respect to the use of ground, surface, and recycled water for residential, commercial, industrial, agricultural, and recreational purposes. The section assesses how and from where the County intends to secure its future water supply and provides guidelines for the County's policies on water quality, ground and surface water use, and water conservation.
- The Mineral Resources section delineates the County's policies on the protection of mineral resources for economic extraction while providing guidelines on how, when, and where mineral resources can be extracted to avert adverse impacts on the environment.
- The Materials Recycling section specifies the County's plan of reducing the amount of solid waste that is produced. It includes policies and programs which will encourage participation in the recycling of materials and supports a sustainable market for recycled materials.
- The Soil Resources section discusses the management and protection of county soils for purposes of maintaining its resource value and agricultural potential. The section deliberates on the County's future plans in dealing with the loss of agriculturally productive soils and discusses policies and programs which will encourage the utilization of effective soil conservation practices.
- The Vegetation and Wildlife section consist of four main subsections, each of which discusses the preservation and management of biotic resources. The Habitat Protection and Management subsection includes many overarching policies that address habitat mitigation; habitat preserves and management; and habitat protection and project review. The Special Status Species and their Respective Habitats

subsection includes policies and measures to protect and manage habitats for the protection of special status species. Aquatic Resources, the third subsection, covers the protection of vernal pools, rivers and streams and fisheries. Lastly, the Terrestrial Resources subsection addresses the protection and preservation of native vegetation, landmark and heritage trees and the urban forest while also promoting new trees in the urban landscape.

- The Cultural Resources section discusses County objectives with respect to the protection and preservation of important cultural resources and plans for increasing public awareness and appreciation of them.

Water Resources

GOAL:	Ensure that a safe, reliable water supply is available for existing and planned urban development and agriculture while protecting beneficial uses of Waters of the state of California, including important associated environmental resources.
Objective:	Optimize the use of available surface water in all types of water years (wet/normal, dry and driest);
Objective:	Manage groundwater to preserve sustainable yield.
Objective:	Ensure the most efficient use of water in urban and agricultural areas.
Objective:	Manage water supply to protect valuable water-supported ecosystems.
Objective:	Manage the quality and quantity of urban runoff to protects the beneficial uses of surface water and groundwater.
Objective:	Manage municipal and industrial (M&I) water supplies efficiently to serve existing and proposed development within the Urban Policy Area.

Soil Resources

GOAL:	Preserve and protect long-term health and resource value of agricultural soils.
Objective:	Agriculturally productive Delta soils protected from the effects of oxidation, shrinkage, and erosion.
Objective:	Mining of topsoil to have minimal effect on soil productivity.

Aquatic Resource

Aquatic resources in Sacramento County include vernal pools, wetlands, rivers, streams, creeks, riparian habitat, in-channel habitat, fisheries and their macroinvertebrate food sources. Protection of these resources from impacts related to development is critical due to their importance to wildlife habitat, water purification, scenic values, and unique and sensitive plant life. Many preservation efforts are currently underway to protect and restore aquatic resources and include the South Sacramento Habitat Conservation Plan, the American River Parkway Plan, the Dry Creek Master Plan, the Sacramento River Floodway Corridor Planning Forum, the Cosumnes River Preserve and the Upper Laguna Creek Collaborative. However, as the County continues to see growth and development, expanded and new preservation measures must be achieved to ensure the health and integrity of these valuable resources. The following goals are ou

GOAL:	Preserve, protect, and enhance natural open space functions of riparian, stream and river corridors.
Objective:	Manage riparian corridors to protect natural, recreational, economic, agricultural and cultural resources as well as water quality, supply and conveyance.
Objective:	Maintain the natural character of the 100-year floodplain by limiting fill and excavation.
Objective	Maintain levee protection, riparian vegetation, function and topographic diversity by stream channel and bank stabilization projects. AND Stabilize riverbanks to protect levees, water conveyance and riparian functions.
Objective	Conserve and protect the Sacramento, Cosumnes, Mokelumne and American Rivers to preserve natural habitat and recreational opportunities.
Objective	Protect and restore natural stream functions.
Objective	Land uses within and development adjacent to stream corridors are to be consistent with natural values.
Objective	Properly manage and fund the maintenance of rivers and streams to protect and enhance natural functions.
Objective	Restore concrete sections of rivers and streams to increase natural functions.

Delta Protection Element

Recognizing the threats to the Primary Zone of the Delta from potential urban and suburban encroachment and the need to protect the area for agriculture, wildlife habitat, and recreation uses, the California Legislature passed and the Governor signed into law on September 23, 1992, the Delta Protection Act of 1992 (SB 1866). The Act directs the Delta Protection Commission to prepare a comprehensive resource management plan for land uses within the Primary Zone of the Delta (Plan).

The planning conducted by the Delta Protection Commission involved preparation and public review of nine background reports: Environment; Utilities and Infrastructure; Land Use and Development; Water; Levees; Agriculture; Recreation and Access; Marine Patrol, Boater Education, and Safety Programs; and Implementation. These reports provided the information base for the Plan findings and policies, as well as allowing opportunities for public review and comment through circulation and public hearings before the Commission.

Land Use

- Goal: Protect the unique character and qualities of the Primary Zone by preserving the cultural heritage and strong agricultural base of the Primary Zone. Direct new residential, commercial, and industrial development within the existing communities as currently designated and where appropriate services are available.

Agriculture

- Goal: To support long-term viability of commercial agriculture and to discourage inappropriate development of agricultural lands.

Natural Resources

- Goal: Preserve and protect the natural resources of the Delta, including soils. Promote protection of remnants of riparian habitat. Encourage compatibility between agricultural practices and wildlife habitat.

Recreation and Access

- Goal: To promote continued recreational use of the land and waters of the Delta; to ensure that needed facilities that allow such uses are constructed, maintained, and supervised; to protect landowners from unauthorized recreational uses on private lands; and to maximize dwindling public funds for recreation by promoting public-private partnerships and multiple use of Delta lands.

Water

- Goal: Protect long-term water quality in the Delta for agriculture, municipal, industrial, water-contact recreation, and fish and wildlife habitat uses, as well as all other designated beneficial uses.

Levees

- Goal: Support the improvement, emergency repair, and long-term maintenance of Delta levees and channels. Promote levee rehabilitation and maintenance to preserve the land areas and channel configurations in the Delta as consistent with the objectives of the Delta Protection Act.

Utilities and Infrastructure

- Goal: Protect the Delta from excessive construction of utilities and infrastructure facilities, including those that support uses and development outside the Delta. Where construction of new utility and infrastructure facilities is appropriate, ensure the impacts of such new construction on the integrity of levees, wildlife, and agriculture are minimized.

Land Use Element

The Land Use Element is the central focus of the General Plan. This Element sets policy for land uses in the unincorporated county for the next 25 years, establishing the foundation for future land use and development. The Land Use Element designates the distribution of land uses, such as residential, commercial, industrial, agricultural, open space, recreation and public uses. It also addresses the permitted density and intensity of the various land use designations as reflected on the County's General Plan Land Use Diagram. The overall goal of the land use element is:

- An orderly pattern of land use that concentrates urban development, enhances community character and identity through the creation and maintenance of neighborhoods, is functionally linked with transit, promotes public health and protects the County's natural, environmental and agricultural resources.

The County's land use strategy is illustrated in four sections. Each section contains objectives and policies that are intended to guide the County toward a more compact urban character by concentrating growth

within existing urbanized areas and strategically-located new growth areas, thereby utilizing land resources as efficiently as possible.

Section 1: Logical Progression of Urban Development

GOAL:	Direct new growth to previously urbanized areas, planned growth areas and strategically located new growth areas to promote efficient use of land, to reduce urban sprawl and its impacts, to preserve valuable environmental resources, and to protect agricultural and rangeland operations.
Objective:	Reserve the land supply to amounts that can be systematically provided with urban services and confines the ultimate urban area within limits established by natural resources.
Objective:	Coordinated near- and long-term planning efforts for the development of the greater Jackson Highway area that creates cohesive and complete communities while protecting environmental resources.

Section 2: Growth Accommodation

GOAL:	Accommodate projected population and employment growth in areas where the appropriate level of public infrastructure and services are or will be available during the planning period.
Objective:	On average, achieve buildout of vacant and underutilized infill parcels at existing zoned densities, while recognizing that individual projects may be approved or denied at higher or lower densities based on their community and site suitability.
Objective:	Buildout of planned communities consistent with their approved plans.
Objective:	New retail and employment opportunities in targeted corridors to support community economic health and vitality, and additional residential dwelling units to support these stores and jobs.
Objective:	New communities that feature a mix of housing, jobs and retail development configured in a compact and transit supportive manner, that incorporate mixed use development (both vertical and horizontal), and that protect environmental resources and preserve open space.
Objective:	Historical rate of Agricultural-Residential development accommodated through build-out and limited expansion of existing Agricultural-Residential communities.

Section 3: Growth Management and Design

GOAL:	Land use patterns that maximize the benefits of new and existing development while maintaining the quality, character, and identity of neighborhood and community areas.
Objective:	Urban design that is functional, aesthetically pleasing, and distinctive.
Objective:	New development that maintains and/or enhances community identity while remaining compatible with existing neighborhoods.
Objective:	Neighborhoods with a mix of employment opportunities, commercial amenities, neighborhood services, and a variety of housing types and sizes.
Objective:	Compact, mixed use developments concentrated in nodes around transit stops, in community centers, and along commercial and transportation corridors.
Objective:	New development in existing communities, in new growth areas and improvements to existing buildings and housing stock that are designed and constructed to be energy efficient and incorporate renewable energy technologies where cost-effective and feasible.
Objective:	Reduced levels of light pollution in both new and existing communities.

GOAL:	Land use patterns that maximize the benefits of new and existing development while maintaining the quality, character, and identity of neighborhood and community areas.
Objective:	A community wide pattern of development with the most intensive land uses in close proximity to transit stops.
Objective:	High intensity, mixed use neighborhoods that provide a pedestrian environment and are closely linked to transit.
Objective:	Communities, neighborhoods, and single projects that promote pedestrian circulation and safety through amenities, good design, and a mix of different land uses in close proximity.
Objective:	A sufficient, yet efficient supply of parking.
Objective:	Improved housing affordability for residents earning below median incomes, and a continued supply of affordable housing units.
Objective:	Viable commercial services and a diversity of employment opportunities located in proximity to residents.
Objective:	Efficient build-out of existing Agricultural-Residential areas within the USB to meet rural residential demand without contaminating or overdrafting groundwater aquifers.
Objective:	Coordinate private development with the provision of adequate public facilities and services.
Objective:	Limited urban growth in rural towns consistent with infrastructure capacity, natural constraints, and the economic base.
Objective:	Limited agricultural-residential land use expansion outside the USB that does not compromise objectives for protecting prime agricultural lands and open space, and avoids groundwater overdraft and contamination.
Objective:	Important farmlands protected to ensure the continuation of agricultural production and to preserve open space.

Section 4: Built Environment Preservation and Enhancement

Sacramento County is unique in being a county that has a large percentage of urbanized and built out land under its jurisdiction, along with vast areas of open space, agriculture and rural development. Urban areas, ranging from new peripheral development to older existing communities, serve as the County's economic and employment backbone and are home to the majority of residents living in the unincorporated areas.

GOAL:	Reinvestment in and revitalization of existing communities through comprehensive and coordinated planning strategies and public participation that addresses housing, economic development, commercial development, employment opportunities, public facilities and infrastructure improvements.
Objective:	Revitalized commercial corridors that will enhance community image and stimulate private reinvestment, that support provision of enhanced public transit, and that will encourage new economic and commercial development and improvements to housing and infrastructure.
Objective:	Targeted planning efforts that focus on distinct districts within existing communities.
Objective:	Maximize compact, mixed use development opportunities along transportation corridors.
Objective:	Preserve and enhance the quality and character of the County's unique communities.
Objective:	Decentralized municipal services that will improve services, enhance and localize service delivery, and increase public involvement and authority in the planning process.
Objective:	Create and maintain a diversity of housing within existing communities, varying in terms of type, cost, design, size and tenure.

GOAL:	Reinvestment in and revitalization of existing communities through comprehensive and coordinated planning strategies and public participation that addresses housing, economic development, commercial development, employment opportunities, public facilities and infrastructure improvements.
Objective:	Promote development in established communities that integrates well into the community and minimizes impacts to surrounding neighborhoods.
Objective:	Create and enhance dynamic, identifiable places unique to each community.
Objective:	Enhance the quality of life and economic vitality of each community area through strategic redevelopment, infill development and revitalization.
Objective:	Habitat enhancement, open space protection, and cohesive urban design accomplished by local, state, and federal agency coordination.
Objective:	Zoning consistent with the adopted General Plan Land Use Diagram.
Objective:	Accommodate land use proposals which are in the interest of the public health, safety, and welfare of the residents of Sacramento County.

Open Space Element

The Open Space Element is in many ways a plan for implementing other Elements of the General Plan. For example, maintaining intact habitat, productive soils, and mineral resource availability as open space is essential to resource conservation. Keeping floodplains undeveloped is likewise an important way to implement flood protection goals in the Safety Element. And preserving open space areas within the fabric of urban development can address Land Use Element policies relating to neighborhood identity and land use conflicts. Indeed, the key role that open space plays in synthesizing land use objectives lends it the distinction as the only Element where an action plan is specifically required by state law.

GOAL:	Open space lands in Sacramento permanently protected through coordinated use of regulation, education, acquisition, density transfer and incentive programs.
Objective:	Effective open space preservation strategy that supports the Open Space Vision Diagram.
Objective:	Establishment of trails and greenbelts to provide for recreational opportunities and community separators.
Objective:	Appropriate urban and rural development clustered to provide open space resource protection.

Public Facilities Element

The Water Facilities Section addresses how future water supply facilities might be financed and provided for in an equitable fashion, while minimizing impacts on ground and surface water resources, as well as riverine and wetland environments. These facilities are a vital part of ensuring that enough public water is available to serve both existing residents as well as anticipated growth through 2030. This section describes policies and programs under two objectives:

- Environmentally sensitive and cost efficient placement of water treatment and distribution facilities.
- Timely and equitable financing of new water facilities

Safety Element

The purpose of the Safety Element is to identify and assess the potential for hazards to occur in Sacramento County and to formulate measures that provide adequate public protection. Sacramento County's physical setting and the projected rate of urban expansion create a potential for the residents of the County to be greatly affected by several hazards. Hazards can result from the action of nature, as in the case of earthquakes and floods; they can be man-made, as in the case of fires caused by arson or through carelessness. They can also originate from a combination of both natural and man-made causes, such as dam failure that results from an earthquake. This element examines both natural and man-made hazards, including seismic events, flooding, and fires. Minimizing and preventing these hazards are the focus of this Element.

Seismic and Geologic Hazards

- Goal: Minimize the loss of life, injury, and property damage due to seismic and geological hazards.

Flooding

- Goal: Minimize the loss of life, injury, and property damage due to flood hazards.

Fire Hazards

- Goal: Minimize the loss of life, injury, and property damage due to fire hazards.

Emergency Response

- Goal: An Emergency Preparedness System that can effectively respond in the event of a natural or manmade disaster.

Other Sacramento County Plans/Studies/Programs

Sacramento County Emergency Operations Plan (April 2017)

The purpose of the County of Sacramento EOP and its Functional Annexes is to provide the basis for a coordinated response before, during and after a disaster incident affecting the County of Sacramento.

This plan is the principal guide for the County's response to, and management of real or potential emergencies and disasters occurring within its designated geographic boundaries. Specifically, this plan is intended to:

- Facilitate multi-jurisdictional and interagency coordination in emergency operations, particularly between local government, private sector, operational area (geographic county boundary), and state response levels, and appropriate federal agencies.
- Serve as a county plan, a reference document, and when possible, may be used for pre-emergency planning in addition to emergency operations.
- To be utilized in coordination with applicable local, state and federal contingency plans.

- Identify the components of an Emergency Management Organization (EMO), and establish associated protocols required to effectively respond to, manage and recover from major emergencies and/or disasters.
- Establish the operational concepts and procedures associated with field response to emergencies, and EOC activities.
- Establish the organizational framework of the California Standardized Emergency Management System (SEMS), and the National Incident Management System (NIMS), within the County of Sacramento.

Sacramento Operational Area Alert and Warning Annex (2017)

Emergency communications to the public, commonly known as Alert and Warning continues to change with advancements in technology. Essential to all jurisdictions is an effective alert and warning strategy to support the distribution of information to the public. In an emergency/disaster, the strategies and systems used become critical. The magnitude of a particular emergency situation will determine the degree to which systems are utilized.

The Sacramento Operational Area (OA) contains many jurisdictions such as cities, numerous special districts, state and private agencies which support a number of systems including the unincorporated areas of the county. The various Alert & Warning systems and methods used together during a disaster/emergency can ensure widespread distribution of information to a greater number of residents than could be reached by any one system.

The Sacramento OA Alert and Warning Annex establishes guidelines for use in partnership with the jurisdictions within the Sacramento OA and the surrounding counties. The alert and warning program provides public notification of protective actions to take before, during, and after threats or emergencies and to disseminate other kinds of messages to community members who have opted in to receive such messages.

Sacramento County Drought and Climate Change Hazard Annex (January 2020)

It is the purpose of this annex to:

- Define drought and climate change-related implications for the County, including the interrelationships of associated hazards.
- Identify hazard vulnerability and response issues for high-risk populations, in particular to climate-related events.
- Define target capabilities potentially needed for hazard response.
- Provides action checklists to monitor and respond within the County of Sacramento.
- Provides sample communication message templates.
- Identify key partners and roles within County of Sacramento.

This annex supports the County of Sacramento in preparedness and response to drought and climate hazards and references the interface with community- and faith-based organizations and private sector. This annex specifically addresses drought and other climate-induced hazards in the County of Sacramento, specifically in the following five areas:

- Drought
- Flood, storm and water quality
- Wildfire, smoke and air quality
- Extreme heat
- Public health, agriculture, economic and natural eco-system health

This annex builds upon many key findings detailed in the Sacramento County Climate Action Plan (CAP). It uses using the CAP data as a key foundation and starting point. The Annex builds upon expanded research and conceptual approaches specific to climate change-related threats and hazards for which climate change is considered to be a root cause. This Annex further integrates new data and perspectives supplied through stakeholder contributions, and importantly, builds distinctly new hazard interrelationships and social intersectionality of root-cause climate impacts for crafting response approaches and considerations.

Sacramento County Operational Area Evacuation Annex (2018)

The purpose of this Sacramento Operational Area (OA) Evacuation Annex is to provide strategies and procedures to document the agreed upon strategy for the Operational Area's response to emergencies that involve the evacuation of people from an impacted area. This involves coordination and support for the safe and effective evacuation of the population, including people with disabilities and access and functional needs who may need additional support to evacuate. Focus areas within this evacuation annex include public alert and warning, transportation, and evacuation triggers. Organizations, operational concepts, responsibilities, and a documented process to accomplish an evacuation are defined within this Annex. The Annex outlines local government (Cities and Special Districts), the Sacramento Operational Area, and State responsibilities for the managed movement of people.

This Annex was developed as a functional support document to the Sacramento County Emergency Operations Plan (EOP); and is consistent with the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS). It is coordinated with the County Emergency Support Function (ESF) – 13 Law Enforcement and works in conjunction with other functional Annexes. It is also consistent with the State's emergency plans and is applicable to all locations and to all agencies, organizations, and personnel with evacuation and evacuation support function responsibilities.

The Sacramento OA Evacuation Annex applies to mass evacuation preparedness, response, and recovery operations during local emergencies or major disasters and to all Sacramento OA public, private, and nongovernmental organizations (NGOs) with operational responsibilities in a mass evacuation event. The Operational Area is defined as an intermediate level of the state emergency services organization, consisting of a county and all political subdivisions within the county area. Each county geographic area is designated as an operational area as defined in Government Code s8559(b) & s8605.

This document is intended to provide evacuation strategies and protocols for medium to high-level (catastrophic) evacuation events in the OA, and is developed with consideration to predominant threats and hazards impacting Sacramento County. This Annex is intended to support activation of the Sacramento County OA EOC and other county Departmental Operations Centers (DOCs) and can be used by other jurisdictions within the OA, such as the Cities, if warranted. This plan also provides overall operational guidance for public alert and warning, movement of evacuees; it provides a concept of operations and

provides the roles of key departments and agencies during an evacuation. It does not provide or replace operational plans for specific departments or specific functions, such as shelter management.

In small-scale evacuations, such as those occurring during local fires, at crimes scenes, or due to a localized hazardous materials spill. This annex assumes that such events will be managed by local first responders in the field Incident Command Post (ICP), typically without an activation of the OA EOC and without an activation of this Annex.

Sacramento County Healthcare Evacuation Coordination Annex (October 2018)

This Healthcare Facility Evacuation Coordination Plan has been developed as an annex to the Sacramento County Evacuation Annex, which is itself an annex to the Sacramento County Emergency Operations Plan. As such, the intended end-user for the Healthcare Facility Evacuation Coordination Plan is County emergency management staff and other departmental officials who have the responsibility to support the evacuation of persons from healthcare facilities (HCFs) located in Sacramento County.

The scope of this plan includes identifying roles and responsibilities of, and strategies for, officials from the Department of Health Services, Division of Public Health (including the Emergency Medical Services), the County Office of Emergency Services, and others who will be coordinating evacuations from the County's Emergency Operations Center (EOC), from various Departmental Operations Centers (DOC), and other potential control points.

Sacramento County Operational Area Power Outage Hazard Annex (July 2020)

The Severe Power Outage Hazard Annex supports the Sacramento County Emergency Operations Plan (EOP). This annex outlines Sacramento County's planned response to a severe power outage (defined as a power outage in all or part of the county of a duration of seven days or longer). It is the intent of this annex to create a framework for preparations and response within existing statutory obligations and limitations. This annex does not apply to normal day-to-day emergencies; rather, it focuses on long-lasting power outages (due to any cause) that can generate unique situations requiring unusual responses.

Since this annex outlines responses to power outages that can be caused by any number of disasters (earthquakes, high winds, cyber-attack, etc.) it is envisioned that 106 this annex will often be implemented alongside an annex dealing with the specific type of disaster that causes the power outage. Therefore, this annex focuses on specific activities and concerns that relate to the lack of electrical power ONLY.

Sacramento County Operational Area Draft 2019 Novel Coronavirus Event (June 2020)

Sacramento County Public Health began tracking the Novel Coronavirus in early January 2020 after the World Health Organization first reported a novel virus strain presenting as pneumonia cases in Wuhan, Hubei Province, China. A WebEOC incident was opened by Sacramento County Office of Emergency Services to ensure shared resources and information.

Following the first travel-related case within Sacramento County on February 21, 2020 the County proclaimed both a Local Public Health Emergency and Local Emergency on March 5, 2020 which was later ratified on March 10, 2020.

This document continues to be updated.

Sacramento County Climate Change and Health Profile Report (2017)

The Climate Change and Health Profile Report seeks to provide a county-level summary of information on current and projected risks from climate change and potential health impacts. This report represents a synthesis of information on climate change and health for California communities based on recently published reports of state agencies and other public data.

The content of this report was guided by a cooperative agreement between CDPH and the CDC Climate-Ready States and Cities Initiative's program Building Resilience Against Climate Effects (BRACE). The goals of BRACE are to assist state health departments to build capacity for climate and health adaptation planning. This includes using the best available climate science to project likely climate impacts, identifying climate-related health risks and populations vulnerable to these impacts, assessing the added burden of disease and injury that climate change may cause, identifying appropriate interventions, planning more resilient communities, and evaluating to improve the planning effort. Communities with economic, environmental, and social disadvantages are likely to bear disproportionate health impacts of climate change.

This Climate Change and Health Profile Report is intended to inform, empower, and nurture collaboration that seeks to protect and enhance the health and well-being of all California residents. This report is part of a suite of tools that is being developed by the California Department of Public Health to support local, regional, and statewide efforts of the public health sector to build healthy, equitable, resilient, and adaptive communities ready to meet the challenges of climate change. Along with a county-level climate change and health vulnerability assessment and state guidance documents, such as Preparing California for Extreme Heat: Guidance and Recommendations, the profile provides a knowledge base for taking informed action to address climate change.

4.4.2. Sacramento County's Administrative/Technical Mitigation Capabilities

Table 4-121 identifies the County personnel responsible for activities related to mitigation and loss prevention in the County.

Table 4-121 Sacramento County Administrative/Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	Y	Every five years hazards are reviewed by committee of officials from Countywide departments Planning, Stormwater, Agriculture, Transportation and more. Mitigation is planned and recorded.

Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Drainages throughout the County are cleared during routine maintenance, and inspected and cleared immediately before storms. Fire fuel (vegetative litter) is cleared though a grant funded program to prevent wildfires.
Mutual aid agreements	Y	Multiple mutual aid agreements between county and state and local entities.
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	Y FT	
Floodplain Administrator	Y FT	There are five CFM in DWR and all staff are knowledgeable with the Floodplain Ordinance. Coordination between departments is effective and is ongoing for all permitted uses in the floodplain.
Chief of Emergency Services	Y FT	The Office of Emergency Services shall be headed by the Chief of Emergency Services which position is designated as the Deputy Director of Emergency Services. There are two Emergency Operations Coordinators and one Assistant Emergency Operations Coordinator assigned to the office.
Community Planner	Y FT	The Office of Planning and Environmental Review has multiple planners assigned to maintenance of the General Plan and plan checking. One management level planner is qualified as a Cal OES Type II Planning and Intelligence Chief for work in Emergency Operations Centers and is a member of the Sacramento Regional Incident Management Team.
Civil Engineer	Y FT	County DWR –drainage unit has six staff that are licensed Civil Engineers who are all educated in hazards & mitigation. Staffing is adequate. There are currently five certificed floodplain managers in the County.
GIS Coordinator	Y FT	
Other	Y	Sacramento County is a large County with multiple staff from numerous departments all playing a role, to different degrees, in natural hazard mitigation.
Technical	**Y/N**	**Describe capability Has capability been used to assess/mitigate risk in the past?**
Emergency Alert System: Sacramento-Alert	Y	A tri-county system comprised of Sacramento, Placer and Yolo Counties is available as a subscription based alerting system. Wireless Emergency Alert (WEA) messages may be disseminated with this system. This system is used regularly for alerting, evacuation and other needs. The Office of Emergency Services is the primary Alert Originator for Sacramento County. The County currently uses the Everbridge system.
Hazard data and information	Y	Documented through this LHMP, and the County's EOP and annexes. Also as on file with County OES.

Grant writing	Y FT	
Hazus analysis	N	Hazus runs are not an inhouse capability. The LHMP consultant has used this tool in the LHMP earthquake analysis.
Other	Y	Dam Failure
How can these capabilities be expanded and improved to reduce risk?		
These capabilities can be expanded through the establishment of a County sustainability office/manager responsible for overseeing the measures contained in the draft CAP expected to be approved early 2022. The sustainability manager would be responsible for not only assuring the implementation of the CAP but also for the periodic updating of CO2 inventories and the re-evaluation of measures. This would also include developing a new CAP to to achieve carbon neutrality consistent with the Board Adopted Climate Emergency. Both the Climate Action plan and Environmental Justice Element of the General Plan call for enhanced communication plans to target the County's diverse and sometimes disenfranchised communities. Emergency communication and coordination could be enhanced by culturally competent and pre-established interpreters and translators who are already trained and imbedded with our communities and who will be received as trusted spokespeople. Other areas identified for improvement include: Conducting emergency management exercises, Providing incident management training, Educate staff on the value and mindset of pre-disaster mitigation; Conduct evacuation planning, Continue planning for better public outreach and disaster warning systems; train and educate newer staff.		

4.4.3. Sacramento County's Fiscal Mitigation Capabilities

Table 4-122 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

Table 4-122 Sacramento County Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Sacramento County has a Storm Water Utility that serves to make improvements to the existing storm drainage systems. The Sacramento County Water Agency has trunk drainage developer impact fee programs that fund installation of drainage systems serving 30(+) acre watershed.
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	Y	
Storm water utility fee		
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	Y	
Community Development Block Grant	Y	

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Other federal funding programs	Y	FEMA mitigation grants have been used to mitigate flood risk through home elevations and acquisitions. These programs have been successful and will be applied in the future when available.
State funding programs	Y	Cal DWR provided funding for the Small Communities Grant Projects to identify flood risk reduction measures for these communities.
Other		
How can these capabilities be expanded and improved to reduce risk?		
The County could develop a county-wide grant coordinator training office to take advantage of the multiple new grant opportunities available due to climate and social equity initiatives. or combine with the duties of new sustainability manager. Other areas for improvement include: Update and maintain fee plans; Seek state and federal grants, create mitigation related local funding districts, cooperate in the multi-agency Silver Jackets program.		

4.4.4. Sacramento County Mitigation Education, Outreach, and Partnerships

Table 4-123 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 4-123 Sacramento County Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	Non-profits such as La Familia, WIC (Dept of Public Health) and food programs exist that could be used to implement mitigation activities or communicate hazard information. They currently are not being used in this capacity. Other groups such as the Environmental Justice Coalition for Water could assist.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes.	Non-profit organizations and government agencies Countywide do ongoing public education for preparedness on the topics of fire, flood and water use.
Natural disaster or safety related school programs	N	
StormReady certification	Yes	The County maintains a StormReady program and does public outreach regularly though radio, website, local events and the County's public counter.

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	Yes	Capital Region Climate Readiness Collaborative could be used to inform mitigation activities and communicate hazard-related information.
Other		
How can these capabilities be expanded and improved to reduce risk?		
Social media to connect with most vulnerable populations in various languages (some rural areas do not have broadband, many do not watch tv/cable to get messages) Coordinate with public and mental health departments, service providers and organizations in providing information and utilizing their communication tools to connect with clients 2-1-1 is an effective resource in some areas but not all. Need to make it more robust so people know to use it and that it has reliable and timely information. Utilize neighborhood associations, schools, community watch groups to distribute information. Utilize "NextDoor" site to convey information Develop a county-wide communications and outreach program consistent with Policy EJ-2 and its supporting implementation measure: EJ-2. The County supports an equitable and comprehensive approach to civic engagement and public outreach on all aspects of County governance and delivery of services. Implementation Measures (Countywide) The County of Sacramento will create a comprehensive Community Outreach Strategy that serves as a framework for all departments to participate in meaningful two-way communication with the public on all aspects of County governance and delivery of services. (PUBLIC INFORMATION OFFICE, PLANNING AND ENVIRONMENTAL REVIEW WITH SUPPORT FROM ALL OPERATING DEPARTMENTS) Other areas for improvement include: Conducting more emergency management exercises; Continue local hazard mapping efforts; Conduct more creative outreach efforts such as hazard warning signs – "if the levee breaks – water will be this high".		

4.4.5. Other Mitigation Efforts

The County is pursuing multiple other mitigation efforts not captured in this plan. These include:

Climate Change Mitigation Efforts

The 2017 Sacramento County CAP and the 2021 Draft Sacramento County CAP noted many efforts to adapt to and mitigation climate change. On a planning level, Sacramento County addresses current and future impacts related to existing natural hazards, as evidenced by the County's LHMP adopted in December 2004 and recently updated in December 2016. The 2016 LHMP identifies current hazard risks and mitigation strategies for climate change, flooding, levee failure, drought/water shortage, severe weather, and wildfires. Furthermore, the County's General Plan 2005-2030 includes policies aimed at reducing local contributions to global climate change and encourages sustainable building practices (e.g., Cool Communities programs, which emphasize building practices to reduce UHIE through incorporation of urban forests, rooftop gardens, and cool roofs and pavements), efficient use of resources (i.e., water, land, and energy), and ecological stewardship. The Human Services Element also includes goals to ensure that human services are available to all residents, and policies aimed to protect its aging population, which

are more vulnerable to health-related effects of climate change impacts and require better access to public services and housing (Sacramento County 2011a). Further, effective September 2015 and updated in 2016, sustainable building practices were codified in the Sacramento County Zoning Code and apply to all land, buildings, structures, and uses thereof located within the unincorporated County.

In addition to planning efforts, other climate adaptation-related work is ongoing in Sacramento County. These efforts are discussed in detail in the following sections.

Adaptive Efforts Related to Increased Temperature

Efforts occurring in Sacramento County to adapt to or reduce the impacts of extreme heat days and waves are summarized below:

- In 2012, Sacramento County adopted the Sacramento Operational Area Severe Weather Guidance as an annex to the Sacramento Emergency Operations Plan. The guidance describes operations during severe weather conditions such as excessive heat. The guidance defines excessively hot weather for 3 days accompanied by nighttime temperatures of 75 ºF or more as a severe weather alert (Phase III), and a heat index of over 105 ºF for more than 3 days with similar nighttime criteria as a severe weather emergency (Phase IV). Phase VI conditions initiate deployment of emergency services including mobilization of cooling centers, issuance of a Health Emergency, and increased public outreach to inform citizens of the availability of resources (Sacramento County 2012).
- The Sacramento County Office of Emergency Services (SacOES) provides community-wide information for how to stay safe during periods of extreme heat through their Sacramento Ready Program. The Program also designates public cooling centers in the event of a heat emergency. Cooling centers can include senior centers, community centers, shopping malls, churches, public pools, and other places that fit the appropriate criteria.
- Sacramento County is participating in several Property Assessed Clean Energy (PACE) financing programs, including Ygrene and the Home Energy Renovation Opportunity (HERO). PACE programs help homeowners finance home energy and water efficiency upgrades and save money on energy and water bills through special financing options, while also creating jobs for registered contractors in the County. By enabling homeowners to retrofit their homes and install upgrades, this program helps to build adaptive capacity by increasing home comfort and mitigating higher energy costs associated with increasing temperatures and extreme heat events and heat waves. It should be noted that PACE programs are only available to homeowners and cannot be used by renters or occupants of multi-family housing.
- The regional leadership organization, Valley Vision, has launched the Business Resiliency Initiative (BRI) to help reduce risks and economic impacts of potential disasters related to extreme weather, including extreme heat. BRI aids SMBs in preparing for the effects of natural disasters by helping develop adaptive capacity and manage risks from weather-related disaster threats. Through the BRI, Valley Vision and its partners stimulate wide-ranging leadership support from cross-sector stakeholders to aid SMBs build the capacity to handle weather-related crisis. BRI provides a toolkit of interventions, including five steps geared to developing a comprehensive plan to understand risk, assess your readiness, take action, test and update plans, and engage community partners.
- The U.S. Department of Energy (DOE) Weatherization Assistance Program (WAP) provides grants to states, territories, and Indian tribes to improve the energy efficiency of low-income homes. Recipients then contract with local governments and nonprofit agencies to provide weatherization services to low-

income homes in need of energy upgrades. The California WAP program allocates funds to various local governments, which provide grants to the entities that apply for them. WAP-related upgrades (e.g., replacing windows, weather-stripping, insulating attics and water heaters) in Sacramento County are provided by various organizations such as the Community Resource Project, Inc. and GRID Alternatives. Increasing the affordability of energy appliances provides low-income residents the financial capacity to air condition their homes during times of high heat. The State Greenhouse Gas Reduction Fund (GGRF) also provided funding for weatherization, residential rooftop solar and tree planting in disadvantaged communities.

- Urban greening and urban forestry in Sacramento County are supported by numerous organizations and agencies. The planting of trees in urban areas reduces the impacts of the UHIE. Urban forestry involves the planting of trees to mitigate these impacts. Trees provide shade for homes, roadways, parking lots, and provide relief during periods of extreme heat. Further, ground-level ozone produced from excessive heat can filtered by certain tree species, which improves local air quality. Tree coverage also reduces energy demand; the Sacramento Tree Foundation estimates that Sacramento County's current tree canopy saves 11.6 percent of the County's total annual energy usage. Efforts to plant trees are supported by the County, PG&E, SMUD, the Sacramento Tree Foundation, and other organizations. In 2015, the Sacramento Tree Foundation's Sacramento Shade program, funded by SMUD, delivered more than 10,000 shade trees to property owners, planted 2,537 replacement trees, enhanced 43.7 acres of habitat, and monitored and cared for 5,633 native trees totaling $1,744,390 in expenses. Further, Sacramento County's 30K Trees Campaign has received funding from PG&E to promote the region's goal of planting 30,000 trees.
- The County completed construction on its first green complete street in 2013. The County advanced climate resiliency in the 2015 update of the Zoning Code and Countywide Design Guidelines. Cool roofs, energy efficiency, walking and biking and urban greening were measures and elements included in the design guidelines. Urban greening measures include landscaping elements that improve air and water quality, provide shade during summer months and lowers temperatures reducing urban heat island effects (UHIE), which occur when city or metropolitan areas are significantly warmer than the general region due to land use and development patterns.
- Through their Cool Roof Incentive program, PG&E and SMUD offer rebates to their customers that qualify. The program uses a point system to evaluate the price of rebates, and incentives costumers to upgrade their homes with cool roof measures (e.g., efficient insulation, water heaters). The rebates are not available for commercial land uses, but may be applied to single-family homes and multi-family buildings.
- The SMUD 2016 Climate Readiness Report lists several on-going or planned climate change-related initiatives that target increased resiliency to periods of extreme heat. Several initiatives will serve to improve Sacramento County's adaptive capacity across all sectors; however, specific initiatives, such as the Regional Urban Heat Island Initiative (to commence in 2017), will focus on reducing UHIE through identification of areas prone to UHIE and projected impacts on electrical load and health. The effort will enable adaptive efforts (e.g., cool roofs and pavements, urban greening) to be targeted more effectively yielding the greatest benefit. The Initiative will be managed by CRCRC, SMAQMD, the Sacramento Tree Foundation, and local roofing industries and local governments.

Adaptive Efforts Related to Changes in Precipitation Patterns

Efforts occurring in Sacramento County to adapt to or reduce the impacts of changes in precipitation patterns are summarized below:

- Sacramento County adopted a Water Efficient Landscape Ordinance to the Sacramento County Code in 1990 consistent with the California Water Conservation in Landscaping Act of 1990. The Ordinance is intended to promote the conservation and efficient use of water in landscaping-related activities while recognizing that landscaping enhances quality of life in California. The County is currently in the process of updating the Ordinance to reflect the goals of Assembly Bill (32), the California Global Warming Solutions Act of 2006 (Sacramento County 2016d). As part of the Countywide Design Guidelines, all development must adhere to the landscaping guidelines that among many things require use of the River Friendly Landscape Guidelines.
- The Sacramento County Water Agency (SCWA), as well several of the other 21 active water purveyors operating within the county (e.g., California-American Water Company, Golden State Water Company), support programs and conservation activities intended to help water customers voluntarily conserve approximately 10 percent over time. These water agencies use incentive programs (i.e., turf rebates, water efficiency rebates, and home water audits) to aid customers in identifying ways to reduce water use. SCWA also enforces State Water Resources Control Board prohibited activities for water use and recommends a watering schedule for landscaping. On May 5, 2015 the State Water Resources Control Board (SWRCB) approved their framework for achieving a 25 percent statewide reduction in urban water use. SCWA reduced its water use over 32 percent from June 2015 through February 2016 when compared to 2013. Sacramento County also recently implemented water metering to incentivize water conservation throughout the County. SCWA also runs a water waste prohibition program which increases customer awareness of wasteful water practices. County staff investigate public complaints and look for cases of water waste.
- SCWA participates in the Sacramento Area Water Forum (Water Forum), a consensus-based, stakeholder process involving over 40 representatives of water purveyors, businesses, and environmental, and public interest groups in the region. The co-equal objectives of the Water Forum are to provide a reliable and safe water supply for the region's economic health and planned development through the year 2030 and to preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River.
- The Sacramento Groundwater Authority (SGA) oversees groundwater in Sacramento County north of the American River, and adopted a revised groundwater management plan in December 2014 in compliance with Water Code Section 10753.7. SGA has the authority to regulate groundwater within the County and the cities of Citrus Heights, Folsom, and Sacramento. The plan contains components of a Groundwater Sustainability Plan consistent with the Sustainable Groundwater Management Act (SGMA) of 2014 (SGA 2014). SGMA went into effect in January 2016, and is California's new comprehensive statewide groundwater management law designed to provide for local management of groundwater resources. Sacramento Central Groundwater Authority (SCGA) oversees the portion of Sacramento County from south of the American River to mid-stream of the Cosumnes River. SGA and SCGA are currently working on developing groundwater management plans that are tailored to the resources and needs of their communities that meet the requirements of SGMA and must be adopted by 2022. These plans will provide a buffer against drought and climate change, and contribute to reliable water supplies regardless of weather patterns. California depends on groundwater for a major portion of its annual water supply, and sustainable groundwater management is essential to a reliable and resilient water system. Groundwater in Sacramento County is also being regulated by other recently formed Groundwater Sustainability Agencies, such as Omochumne Hartnell Water District and Sloughhouse Resource Conservation District.
- Sacramento County is also part of the Sacramento Stormwater Quality Partnership (SSWQP). The SSWQP is a multi-jurisdictional program made of Sacramento County and the incorporated cities of

Sacramento, Citrus Heights, Elk Grove, Folsom, Galt, and Rancho Cordova whose purpose is to educate and inform the public about urban runoff pollution, work with industries and businesses to encourage pollution prevention, require construction activities to reduce erosion and pollution and require developing projects to include pollution controls that will continue to operate after construction is complete. SSWQP supports River-Friendly Landscaping, which entail gardening strategies to reduce water consumption, yard waste, and pollution. Another effort of SSWQP is to promote River-Friendly Carwashing and educate car-owners of the impacts of carwash runoff in residential areas.

- Sacramento County is participating in several Property Assessed Clean Energy (PACE) financing programs, including the county-wide Ygrene program and the Home Energy Opportunity (HERO) program. PACE programs help homeowners and business owners finance home energy and water efficiency upgrades and save money on energy and water bills through special financing options, while also creating jobs for registered contractors in the County.
- Sacramento Regional County Sanitation District (SRCSD) has been providing a recycled water fill station since 2015. Residential and commercial customers can obtain recycled water from Regional San's Recycled Water Fill Station during the dry season (spring through early fall). Recycled water produced at the Sacramento Regional Wastewater Treatment Plant in Elk Grove can be used for watering lawns, gardens and landscaping, as well as dust control, and is available free of charge. Additionally, SRCSD is undertaking a monumental effort—called the EchoWater Project—to take our region's wastewater treatment to a whole new level. In 2010, Regional San was issued stringent new treatment requirements from the State of California required them to make the most significant upgrade to the wastewater treatment plant since its original construction. This new system, which must be in place by 2021-2023, will produce cleaner water for discharge to the Sacramento River, as well as expanded opportunities for recycled water (e.g., for landscape, park and agricultural irrigation).
- The SMUD 2016 Climate Readiness Report list several on-going or planned climate change-related initiatives that target increased resiliency to periods of drought and extreme storm events. For example, in 2016, SMUD began the permitting, design, and construction of a recycled water interconnection and appropriate plant facilities at the Sacramento Power Authority (SPA) cogeneration plant through the County Recycled Water Reclamation Contract. The project will allow for the use of the Sacramento Regional County Sanitations District's Title 22 recycled water for plant cooling and fire protection, saving millions of gallons of potable water per day.

Drought

As listed above, Sacramento County has several programs in place to conserve municipal water supply. Sacramento County citizens can engage in rebate programs provided by SCWA and other water purveyors (e.g., Golden State Water Company, California-America Water Company), SMUD, and PG&E to improve the water efficiency of home appliances and replace water-demanding landscapes. Further, PACE financing programs can also help homeowners finance upgrades to their homes and landscapes to improve water efficiency along with energy efficiency. Deployment of these efforts can help to lower Sacramento County's overall municipal water usage thereby helping ensure that Sacramento County residents continue to have a reliable source of potable water in the face of future dry years. Additionally, through the SCWA, citizens can report wasteful water usage.

Sacramento County's involvement in the Water Forum provides an ongoing discussion of water demand and supply in the County. This process promotes the development of an integrated water system that functions on private and public stakeholder input. The Water Forum focuses on surface water diversion,

groundwater management, habitat conservation and restoration, and adaptation to drier years. The efforts of the Water Forum provide Sacramento County with proactive actions to adapt to deviations in precipitation patterns. The Water Forum Agreement (WFA) was signed in April 2000, and contains the objectives of providing a reliable and safe water supply for the region's economic health and planned development through the year 2030 and to preserve the fishery, wildfire, recreational, and aesthetic values of the lower American River (SFA 2014).

Water Forum 2.0 has recently started, which will update the 2000 agreements.

Further, groundwater in Sacramento County is regulated by SGA. The most recent groundwater management plan, adopted in 2014, details the SGA's goals, objectives, and policies to sustainably manage groundwater in the County. The in-process Sustainable Groundwater Management Plans will further inform and adopt policies and actions that will provide a buffer against drought and climate change, and contribute to reliable water supplies. With the potential for precipitation patterns to become more erratic and less predictable, groundwater may become a more significant resource for County residents currently relying on surface water resources. To function in drier years, groundwater resources must be reliable and quantity and quality.

The Sacramento County Water Efficient Landscaping Ordinance also reduces municipal water use associated with irrigation (e.g., lawns), and is currently in the process of being updated to reflect the water conservation goals contained in AB 32. Further, Sacramento County recently implemented a water metering system, which acts as a financial incentive to reduce municipal water use on a customer-by-customer basis. The reductions from these efforts reduces demand on water supplies which will support the overall goal of maintaining adequate water supplies for the County in the event of a dry year or a period of dry years.

Adaptive Efforts Related to Increased Wildfires

Efforts occurring in Sacramento County to adapt to or reduce the impacts of wildfire are summarized below:

- Sacramento County has adopted the 2013 California Fire Code, which incorporates the 2012 edition of the International Fire Code, which includes provisions to help prevent the accumulation of combustible vegetation or rubbish that can be found to create fire hazards and potentially impact the health, safety, and general welfare of the public. Provisions include ensuring that defensible spaces, which are adjacent to each side of a building or structure, are cleared of all brush, flammable vegetation, or combustible growth (Sacramento County Municipal Code Title 17 Chapter 17.04).
- Metro Fire's CWPP provides the Sacramento area with a comprehensive plan that results in the protection of human life and reduction in loss of property, critical infrastructure, and natural resources associated with wildfire. Through the CWPP, Metro Fire implements strategies to prevent and combat wildfire within its jurisdictional boundaries.
- The American River Parkway (ARP) Plan, a legislatively adopted document, guides all uses and activities allowed in the 22-mile long American River Parkway. This Plan was adopted by the County, the City of Sacramento, and the City of Rancho Cordova, the Sacramento Area Flood Control District, and the State of California Legislature. Currently fire resilient landscape planting is occurring in the Bushy Lake area and star thistle removal is being done by the American River Parkway Foundation and their partners. The American River Parkway Foundation in collaboration with the County Regional

Parks Department has proposed a project to develop an ARP Resource Management Plan (RMP). With funding, this RMP will support General Plan policies, and advances climate adaptation and greenhouse gas reductions. This RMP will coordinate with County and City departments and partners in reducing fire fuels, sustaining habitat, removing invasive species (in particular star thistle), advance fire resilient plantings/landscape, and amend the Parkway Plan as needed to support resource management and wildfire prevention.

- The SMUD 2016 Climate Readiness Report list several on-going or planned climate change-related initiatives that target increased resiliency to wildfire impacts. Commencing in 2017, SMUD will oversee a Forest Thinning, Stream and Revenue Flows Program in the Upper American River Project (UARP) reservoir system to establish specific forest thinning study areas for data collection, document baseline and post-treatment conditions, and evaluate results. The results will inform future cost/benefits associating with remote sensing technologies and forest management regimes.

Reduced Air Quality

Wildfires occurring outside of the County can impair air quality in the Sacramento and San Joaquin Valley. Actions to reduce wildfire-related air pollution would need to be executed by state (e.g., CAL FIRE, California Air Resources Board) and local agencies (e.g., air quality management districts) with the authority to do so. SMAQMD takes actions to reduce exposure to harmful pollutants related to wildfire (e.g., PM) by implementing no-burn days during periods of poor air quality. SMAQMD also provides resources to educate the public on the status of air quality on a daily basis, provides alerts on poor air quality days, and provides educational material on the health effects of air pollution. CRCRC is working with Sierra Climate Action and Mitigation Partnership (CAMP) and others statewide on the urban-rural interface (Alliance of Regional Collaboratives for Climate Adaptation 2016). Sierra CAMP's mission is to bring communities and decision-makers from a wide range of regions throughout California to make decisions regarding the future of the Sierra Nevada. Wildfires and forest management are critical components of this work that will help to protect and preserve the forests and contribute to improve water storage and management. The outcome of this work will inform where the State should make investments that will yield the greatest benefit.

Adaptive Efforts Related to Increased Flooding

Efforts occurring in Sacramento County to adapt to or reduce the impacts of flooding are summarized below:

- SAFCA provides regional flood control for the Sacramento region including Sacramento County, the City of Sacramento, Sacramento County, the American River Flood Control District, and Reclamation District 1000. Structures to control flooding (e.g., levees, dams, weirs, detention basins) have been built throughout Sacramento County along the Sacramento and American Rivers and their tributaries to protect against catastrophic flooding (SAFCA No Date). In August 2013, USACE judged the existing levee system as inadequate to meet the minimum NFIP requirements. SAFCA reviewed the affected levees and identified 10 miles of levees in need of improvements. In response, SAFCA established the Levee Accreditation Project as a means to meet the NFIP requirements and is engaged in upgrading levees along the Sacramento and American Rivers to achieve a valid status (SAFCA 2015).

- Several projects are underway to improve the capacity and flow of the American and Sacramento River levee systems. These include, but are not limited to, Mayhew Levee Improvement, Upper Levee Slope Protection, Sacramento Urban Area Levee Reconstruction Project, Folsom Dam spillway, and Sacramento Riverwall.
- In 2007, SAFCA formed a Consolidated Capital Assessment District (CCAD) to fund the local cost share for projects to protect Sacramento from extreme floods. Since then new Federal and State flood protection standards have been adopted that require additional improvements not anticipated by the CCAD. These additional improvements would address underseepage, erosion and encroachment issues that Federal studies have shown to be the most likely cause of levee failures. Without these improvements, the U. S. Army Corps of Engineers (Corps) has determined that many levees in Sacramento do not meet the current design standards to provide at least a 100-year level of flood protection. In order to fund the additional improvements, SAFCA proposed replacing the existing CCAD with a new assessment district (CCAD 2) that will increase annual assessments on homeowners by an average of about $42 in order to meet the state's 200-year flood protection requirements by 2025; and improve the resiliency and structural integrity of the flood control system to provide more than 200-year protection over time. Property owners voted via a mail balloting process and approved in May 2016 the formation of CCAD 2 and the new assessment.
- The County is completing its first concrete-lined creek naturalization project on Cordova Creek, which flows into the American River. This project removed the concrete lined channel, pulled back the banks and added naturalization features, water quality plants, floodplain enhancements and habitat restoration. This urban greening project will serve as an example of how new community development will provide similar features that will add to climate resiliency.
- The Central Valley Flood Protection District (CVFPD) adopted a Central Valley Flood Protection Plan (CVFPP) in June 2012. The CVFPP guides California's participation in managing flood risk along the Sacramento River and San Joaquin river systems. The CVFPP proposes a system-wide investment approach for sustainable, integrated flood management in areas currently protected by facilities of the State Plan of Flood Control. The CVFPP must be updated every 5 years (CVFPD 2012).
- The Sacramento Countywide Design Guidelines require flood protection and drainage facilities to be designed to provide multiple public benefits wherever possible. Facilities shall include multi-purpose improvements consisting of recreation, the environment, storm water runoff, water reclamation, flood control, etc. Attractive joint use basins, such as parks (in addition to Quimby land dedication requirements) or parkways with trails that also convey stormwater to water quality basins or similar facilities and provide some water quality treatment are examples of desired multiple public benefit facilities.
- SacOES coordinates the overall countywide response to large scale incidents and disasters through its Sacramento Ready Program. The Sacramento County Evacuation Plan contains measures and strategies to ensure evacuations are handled smoothly. The Plan outlines the appropriate procedures for handling potential catastrophic flooding in the County and provides specific recommendations depending on location in the floodplain (Sacramento County 2008).
- The Urban Level of Flood Protection Criteria was developed in response to the requirements from the Central Valley Flood Protection Act of 2008, enacted by SB 5. "Urban level of flood protection" means the level of protection necessary to withstand a 200-year flood in any given year. The criteria were developed by DWR as a systematic approach to assist affected cities and counties within the Sacramento-San Joaquin Valley in making findings related to an urban level of flood protection before approving certain land-use decisions. In response to the passage of SB 5, Sacramento County adopted the Floodplain Management Amendments to their General Plan and Zoning Code on December 13,

2016. These amendments ensure compliance with SB 5 and establishing setback along levees, developing a flood emergency response plan, building design standards, and enhancing natural floodplain management.

- The USBR Sacramento and San Joaquin Basins Climate Impact Assessment evaluates the potential effects climate change may have on the Sacramento and San Joaquin river basins. The report uses a menu of models of varying parameters to project future water supply and demand combined with the effects of climate change to predict potential future conditions within the basins. These projections can be used to inform the decision-making process and enhance adaptation planning.
- USACE has been implementing the Joint Federal Project at Folsom Dam and Reservoir. This includes an increased-capacity emergency spillway, flood gate improvements, and a three-foot dam and embankment raise for greater flood storage capacity. When completed, the flood protection capability of Folsom Dam and Reservoir will be enhanced for the lower American River (USACE 2007). Other planned or ongoing federally authorized projects include the Natomas Levee Improvement Project, American River Common Features, South Sacramento Streams Group Projects, and Sacramento River Bank Protection Program.
- The SMUD 2016 Climate Readiness Report list several on-going or planned climate change-related initiatives that target increased resiliency to flooding. For example, SMUD is executing a contract with DOE to receive grant funds from the REDI (Resilient Electricity Deliver Infrastructure) initiative as part of the Sacramento Resilient Initiative to improve grid resiliency by implementing smart grid technologies and strategies in the 100-year floodplain. The project includes installation and commissions of eight to ten automated 69 kilovolt (kV) switches within reinforced poles and supervisory control and data acquisition (SCADA) in selected flood prone areas and up to 20 low-voltage correction devices to demonstrate advanced conservation voltage reduction for peak load reduction on a select number of SCADA enabled substations.

Wildfire Efforts

For its 2021 Fire Fuel Reduction Action Plan, the Department of Regional Parks has lined up cattle, sheep and goat grazing contracts; is utilizing maintenance crews to maintaining fire breaks; and is issuing fuel break maintenance permits to properties bordering Park properties.

To decrease the number and size potential of wildfires in our parks system, the techniques used will be applicable for each area and will include:

Firebreaks – A combination of mowing, soil discing and targeted herbicides will be used where appropriate to create perimeters around open fields, along fence lines and behind neighborhoods. This work is scheduled to be completed by end of June.

Ladder Fuel Hand-Crews – In limited, hard to reach areas, hand-crews will remove vegetation that allows the potential for a fire to climb up or move into urban areas.

Grazing – There are hundreds of acres of undeveloped or protected land in our Regional Parks. This vegetation can be a costly and deadly fire hazard. Goats and sheep are ideal for vegetation management and are great at eating down weeds, bushes and grass that manned crews cannot get to. Grazing is expected to occur between May and the end of June.

Annual Encroachment Permits – Residents who live adjacent to Regional Parks properties are able to apply for free annual encroachment permits to maintain a fire break behind their property line. These allow residents to string-trim grass and weeds for up to 50 feet beyond their private property line.

Additionally, the Sacramento Metro Air Quality Management District has released new wildfire smoke guidance. This guidance goes into effect during times of high wildfire smoke (mostly from outside the County).

Chapter 5 Mitigation Strategy

Requirement §201.6(c)(3) and §201.7(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the mitigation strategy process and mitigation action plan for this Sacramento County Local Hazard Mitigation Plan (LHMP) Update. It describes how the County and participating jurisdictions met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

5.1 Mitigation Strategy: Overview

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the Hazard Mitigation Planning Committee (HMPC) led to the mitigation strategy and mitigation action plan for this LHMP Update. As part of the LHMP Update process, a comprehensive review and update of the mitigation strategy portion of the 2016 LHMP was conducted by the HMPC. Some of the initial goals and objectives from the 2016 Sacramento County LHMP were refined and reaffirmed, some goals were deleted, and others were added. The end result was a new set of goals, reorganized to reflect the completion of or progress towards the 2016 actions, the updated risk assessment and the new priorities of this 2021 LHMP Update. To support the new LHMP goals, the mitigation actions from 2016 were reviewed and assessed for their value in reducing risk and vulnerability to the Sacramento County Planning Area from identified hazards and evaluated for their inclusion in this LHMP Update (See Chapter 2 What's New). Section 5.2 below identifies the new goals and objectives of this LHMP Update and Section 5.4 details the new mitigation action plan.

Taking all of the above into consideration, the HMPC developed the following umbrella mitigation strategy for this LHMP Update:

- Communicate the hazard information collected and analyzed through this planning process as well as mitigation success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.
- Implement the action plan recommendations of this Plan.
- Use existing rules, regulations, policies, and procedures already in existence.
- Monitor multi-objective management opportunities so that funding opportunities may be shared and packaged, and broader constituent support may be garnered.

5.1.1. Continued Compliance with NFIP

Given the flood hazard in the Sacramento County Planning Area, an emphasis will be placed on continued compliance with the National Flood Insurance Program (NFIP) by all communities. Detailed below is a

description of Sacramento County's flood management program to ensure continued compliance with the NFIP. A brief description of the County's CRS program is also provided below. Also to be considered are the numerous flood mitigation actions contained in this LHMP Update that support the ongoing efforts by the County and participating jurisdictions to minimize the risk and vulnerability of the community to the flood hazard and to enhance their overall floodplain management program. A summary of the flood management programs and continued compliance with the NFIP for the incorporated communities are detailed in their jurisdictional annexes.

Sacramento County's Flood Management Program

Sacramento County has participated in the Regular Phase of the NFIP since 1979. Since then, the County has administered floodplain management regulations that meet the minimum requirements of the NFIP. Under that arrangement, residents and businesses paid the same flood insurance premium rates as most other communities in the country.

The County will continue to manage their floodplains in continued compliance with the NFIP. An overview of the County's NFIP status and floodplain management program is discussed on Table 5-1.

Table 5-1 Sacramento County NFIP Status

NFIP Topic	Comments
Insurance Summary	
How many NFIP policies are in the community? What is the total premium and coverage?	7,497 $4,578,149 $2,169,765,000
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	1,747 $24,741,813.70 137
How many structures are exposed to flood risk within the community?	4,603 (1% Annual Chance) 35,602 (0.2% Annual Chance)
Number of Repetitive Loss and Severe Repetitive Loss Structures?	390 RL structures 1 SRL structures
Describe any areas of flood risk with limited NFIP policy coverage	Per the 2020 PPI Annual Report, overall policies in forces have gone down, but the number of paid losses has gone up. Specific affected areas could not be determined.
Is the Community Floodplain Administrator or NFIP Coordinator certified?	Yes
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	Floodplain Management reviews and approves permits.
What are the barriers to running an effective NFIP program in the community, if any?	Public acknowledgment of the hazards
Compliance History	
Is the community in good standing with the NFIP?	Yes
Are there any outstanding compliance issues (i.e., current violations)?	No

NFIP Topic	Comments
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	August 22, 2018
Is a CAV or CAC scheduled or needed?	No
Regulation	
When did the community enter the NFIP?	1979
Are the FIRMs digital or paper?	Digital
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Meet and Exceed: See Appendix C for Details
Provide an explanation of the permitting process.	Clearly outlined in the floodplain ordinance. This process is strictly enforced.
Community Rating System (CRS)	
Does the community participate in CRS?	Yes
What is the community's CRS Class Ranking?	2
What categories and activities provide CRS points and how can the class be improved?	Sacramento County actively maintains programs that satisfy or surpass all CRS activities in the 300s, 400s, 500s and some 600s. These programs are regularly improved by staff for completeness. The County is trying to improve upon credits for Activity 630.
Does the plan include CRS planning requirements?	Yes, in accordance with the CRS Activity 510 requirements of the 2017 CRS Coordinator's Manual

Source: FEMA/Sacramento County 3/24/2020

The Community Rating System (CRS) was created in 1990. Sacramento County has been in the CRS program since 1992. The program is designed to recognize floodplain management activities that go above and beyond the NFIP's minimum requirements. CRS is designed to reward a community for implementing public information, mapping, regulatory, loss reduction and/or flood preparedness activities. On a scale of 10 to 1, Sacramento County is currently ranked Class 2 community, which gives a 40% premium discount to individuals in the Sacramento County Special Flood Hazard Area (SFHA), and a 10% discount to policyholders outside the SFHA. Sacramento County is one of very few CRS Class 2 communities, ranking them among one of the top CRS communities in California and the nation.

The activities credited by the CRS provide direct benefits to Sacramento County and its residents, including:

- Enhanced public safety;
- A reduction in damage to property and public infrastructure;
- Avoidance of economic disruption and losses;
- Reduction of human suffering; and
- Protection of the environment.

Based on their August 2018 Verification Visit and resulting 2019 Verification Report, the activities that Sacramento County implements and receives CRS credits include:

- **Activity 310 – Elevation Certificates**: The Water Resources Department maintains elevation certificates for new and substantially improved buildings. Copies of elevation certificates are made available upon request. Elevation Certificates are also kept for post-FIRM and pre-FIRM buildings. (61 points)
- **Activity 320 – Map Information Service:** Credit is provided for furnishing inquirers with basic flood zone information from the community's latest Flood Insurance Rate Map (FIRM). Credit is also provided for the community furnishing additional FIRM information, information about problems not shown on the FIRM, and historical flood information. The service is publicized annually and records are maintained. (90 points)
- **Activity 330 – Outreach Projects:** Credit is provided for informational outreach projects that include brochures in public buildings, general outreach projects that include mailer to the entire community, posts on social media and community events, and priority audience messages that include letters to repetitive loss areas and flood prone properties. These projects are disseminated annually. Credit is also provided for having a pre-flood plan for public information. Credit is enhanced by having a Program for Public Information (PPI), and by having the information disseminated by stakeholders outside the local government. (350 points)
- **Activity 340 – Hazard Disclosure**: Credit is provided for the local real estate agents disclosure of flood hazards to prospective buyers. Credit is also provided for state regulations requiring disclosure of flood hazards. Real estate agents provide a brochure advising prospective buyers about insurance and checking property flood hazards. Credit is enhanced by having a PPI (65 points)
- **Activity 350 – Flood Protection Information:** Documents relating to floodplain management are available in the reference section of the Sacramento Public Library. Credit is also provided for floodplain information displayed on the community's website. Credit is enhanced by having a PPI. (99 points)
- **Activity 360 – Flood Protection Assistance**: Credit is provided for offering one-on-one advice regarding property protection and making site visits before providing advice. Credit is enhanced by having a PPI. (100 points)
- **Activity 370 – Flood Insurance Promotion:** Credit is provided for assessing the community's current level of flood insurance coverage and assessing shortcomings. Credit is also provided for development and implementation of a coverage improvement plan. Credit for implementing a coverage improvement plan is enhanced by having a PPI and stakeholder involvement. (90 points)
- **Activity 410 – Floodplain Mapping**: Credit is provided for conducting and adopting flood studies for areas not included on the FIRM and that exceed minimum mapping standards. (37 points)
- **Activity 420 – Open Space Preservation:** Credit is provided for preserving approximately 52 percent of the Special Flood Hazard Area (SFHA) as open space and preserving open space land in a natural state. Credit is also provided for regulations and incentives that minimize development in the SFHA. Credit is enhanced by having a PPI. (1560 points)
- **Activity 430 – Higher Regulatory Standards:** Credit is provided for enforcing regulations that require development limitations, freeboard for new and substantial improvement construction, foundation protection, cumulative substantial improvement, enclosure limits and local drainage protection. Credit is also provided for the enforcement of building codes, a BCEGS Classification of 4/4, state mandated regulatory standards, and regulations administration. (621 points)
- **Activity 440 – Flood Data Maintenance**: Credit is provided for maintaining and using digitized maps in the day to day management of the floodplain. Credit is also provided for establishing and maintaining a system of benchmarks and maintaining copies of all previous FIRMs and Flood Insurance Study Reports. (272 points)
- **Activity 450 – Stormwater Management**: The community enforces regulations for stormwater management, low impact development, soil and erosion control, and water quality. Credit is also provided for watershed master planning. (260 points)
- **Section 502 – Repetitive Loss Category:** Based on the updates made to the NFIP Report of Repetitive Losses as of January 31, 2017, Sacramento County, CA has 65 repetitive loss properties and is a

Category C community for CRS purposes. The community is required to submit either a Repetitive Loss Area Analysis or Floodplain Management Plan. (No credit points are applicable to this section)

- **Activity 510 – Floodplain Management Planning:** Credit is provided for the adoption and implementation of the Sacramento County Local Hazard Mitigation Plan adopted on July 11, 2017. A progress report must be submitted on an annual basis. An update to the credited plan will be due by October 1, 2022. Credit is also provided for conducting a repetitive loss area analysis, and for the adoption and implementation of a Natural Floodplains Functions Plan. (497 points)
- **Activity 520** – Acquisition and Relocation: Credit is provided for acquiring and relocating 19 buildings from the community's regulatory floodplain. (74 points)
- **Activity 530 – Flood Protection:** Credit is provided for 81 buildings that have been elevated to protect them from flood damage. (160 points)
- **Activity** 540 – Drainage System Maintenance: A portion of the community's drainage system is inspected regularly throughout the year and maintenance is performed as needed. Credit is also provided for listing problem sites that are inspected more frequently, for implementing an ongoing Capital Improvements Program, and for maintaining storage basins. The community enforces a regulation prohibiting dumping in the drainage system, and annually publicizes the regulation. Credit is enhanced by having a PPI. (336 points)
- **Activity 610 – Flood Warning and Response:** Credit is provided for a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities. Credit is also provided for the designation as a Storm Ready Community by the National Weather Service. (269 points)
- **Activity 630 – Dams**: Credit is provided for a State Dam Safety Program. (37 points)
- **Activity 710 – County Growth Adjustment:** All credit in the 400 series is multiplied by the growth rate of the county to account for growth pressures. The growth rate for Sacramento County, CA is 1.06.

5.1.2. Integration of Mitigation with Post Disaster Recovery and Mitigation Strategy Funding Opportunities

Hazard Mitigation actions are essential to weaving long-term resiliency into all community recovery efforts so that at-risk infrastructure, development, and other community assets are stronger and more resilient for the next severe storm event. Mitigation measures to reduce the risk and vulnerability of a community to future disaster losses can be implemented in advance of a disaster event and also as part of post-disaster recovery efforts.

Mitigation applied to recovery helps communities become more resilient and sustainable. It is often most efficient to fund all eligible infrastructure mitigation through FEMA's Public Assistance mitigation program if the asset was damaged in a storm event. Mitigation work can be added to project worksheets if they can be proven to be cost-beneficial.

Integration of mitigation into post disaster recovery efforts should be considered by all communities as part of their post disaster redevelopment and mitigation policies and procedures. As detailed in Section 4.4, the Capability Assessment for the unincorporated County and in the Annex's for the other participating jurisdictions, post-disaster redevelopment and mitigation policies and procedures are evaluated and updated as part of the Emergency Operations Plan (EOP) updates and other emergency management plans for each community.

These EOP's, through its policies and procedures, seek to mitigate the effects of hazards, prepare for measures to be taken which will preserve life and minimize damage, enhance response during emergencies

and provide necessary assistance, and establish a recovery system in order to return the community to their normal state of affairs. Mitigation is emphasized as a major component of recovery efforts.

Mitigation Strategy Funding Opportunities

An understanding of the various funding streams and opportunities will enable the communities to match identified mitigation projects with the grant programs that are most likely to fund them. Additionally, some of the funding opportunities can be utilized together. Mitigation grant funding opportunities available pre- and post- disaster include the following.

FEMA HMA Grants

Cal OES administers three main types of HMA grants: (1) Hazard Mitigation Grant Program, (2) Building Resilient Infrastructure and Communities (BRIC), replacing the former Pre-Disaster Mitigation (PDM) Program, and (3) Flood Mitigation Assistance Program. Eligible applicants for the HMA include state and local governments, certain private non-profits, and federally recognized Indian tribal governments. While private citizens cannot apply directly for the grant programs, they can benefit from the programs if they are included in an application sponsored by an eligible applicant

FEMA Public Assistance Section 406 Mitigation

The Robert T. Stafford Disaster Relief and Emergency Assistance Act provides FEMA the authority to fund the restoration of eligible facilities that have sustained damage due to a presidentially declared disaster. The regulations contain a provision for the consideration of funding additional measures that will enhance a facility's ability to resist similar damage in future events.

Community Development Block Grants

The California Department of Housing and Community Development administers the State's Community Development Block Grant (CDBG) program with funding provided by the U.S. Department of Housing and Urban Development. The program is available to all non-entitlement communities that meet applicable threshold requirements. All projects must meet one of the national objectives of the program – projects must benefit 51 percent low- and moderate-income people, aid in the prevention or clearance of slum and blight, or meet an urgent need. Grant funds can generally be used in federally declared disaster areas for CDBG eligible activities including the replacement or repair of infrastructure and housing damaged during, or as a result of, the declared disaster.

Small Business Loans

SBA offers low-interest, fixed-rate loans to disaster victims, enabling them to repair or replace property damaged or destroyed in declared disasters. It also offers such loans to affected small businesses to help them recover from economic injury caused by such disasters. Loans may also be increased up to 20 percent of the total amount of disaster damage to real estate and/or leasehold improvements to make improvements that lessen the risk of property damage by possible future disasters of the same kind.

Increased Cost of Compliance

Increased Cost of Compliance (ICC) coverage is one of several resources for flood insurance policyholders who need additional help rebuilding after a flood. It provides up to $30,000 to help cover the cost of mitigation measures that will reduce flood risk. ICC coverage is a part of most standard flood insurance policies available under NFIP.

5.2 Goals and Objectives

Requirement §201.6(c)(3)(i) and §201.7(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Up to this point in the planning process, the HMPC has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals, objectives, and mitigation actions were developed based on these tasks. The HMPC held a series of meetings and exercises designed to achieve a collaborative mitigation strategy as described further throughout this section. Appendix C documents the information covered in these mitigation strategy meetings, including information on the goals development and the identification and prioritization of mitigation alternatives by the HMPC.

During the initial goal-setting meeting, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to formulate planning goals and to develop the mitigation strategy for the Sacramento County Planning Area.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- A time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for actions that will be used as means to achieve the goals.

HMPC members were provided with the list of goals from the 2016 LHMP as well as a list of other sample goals to consider. The team was told that they could use, combine, or revise the statements provided or develop new ones, keeping the risk assessment in mind. Each member was asked to provide two goal statements. Goal statements were collected and grouped into similar themes and provided to the HMPC. Some of the statements were determined to be better suited as actual mitigation actions and were set aside for later use. Edits and refinements to these new goals were provided by the HMPC until the team came to consensus on the final goals and objectives for this 2021 LHMP Update.

Based on the risk assessment review and goal setting process, the HMPC identified the following goals which provide the direction for reducing future hazard-related losses within the Sacramento County Planning Area.

GOAL 1: Minimize risk and vulnerability of the Sacramento County community to the impacts of natural hazards, including consideration of the exacerbation of natural hazards and unique hazards due to climate change; and protect lives and reduce damages and losses to property, public health, economy, and the environment.

GOAL 2: Provide protection for critical facilities, infrastructure, utilities, and services from hazard impacts, to include hardening and other efforts to establish redundancy and reliability, to prevent or minimize loss, and to facilitate recovery.

GOAL 3: Enhance public outreach, education, awareness, and preparedness for all hazards to minimize hazard related losses and to include effective strategies for reaching underserved communities and vulnerable populations.

GOAL 4: Increase community capabilities and leverage interagency and public-private coordination and resources to mitigate losses and to be prepared for, respond to, and recover from a disaster event.

GOAL 5: Assure conformance to federal and state hazard mitigation initiatives and maximize potential for mitigation implementation.

5.3 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii) and §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified in Section 4.1 was evaluated at the completion of the risk assessment as part of the second prioritization process to determine which hazards were priorities for mitigation strategy planning. Only those hazards that were determined to be a priority hazard for each participating jurisdiction were considered further in the development of hazard-specific mitigation actions. Those hazards not considered a priority for mitigation strategy development were eliminated from further consideration because the risk of a hazard event in the County is unlikely, the vulnerability of the county is low, or capabilities are already in place to mitigate negative impacts. Further, the resulting mitigation strategy presented in this Chapter focuses on those mitigation actions that each jurisdiction has the authority, resources, and capacity to consider for implementation over the next 5-years covered by this LHMP Update.

Table 5-2 and Table 5-3 provide a listing of priority hazards by jurisdiction to be addressed in the mitigation strategy portion of this Plan.

Table 5-2 Sacramento County Planning Area: Mitigation Action Priority Hazards by Jurisdiction – Unincorporated County and Incorporated Jurisdictions

Priority Hazards for Mitigation Action Development	Sacramento County	Citrus Heights	Elk Grove	Folsom	Galt	Isleton	Rancho Cordova
Climate Change	X		X	X	X	X	X
Dam Failure	X	X	X	X		X	X
Drought & Water Shortage	X		X	X	X	X	X
Earthquake	X			X			
Earthquake Liquefaction	X			X			
Floods: 1%/0.2% annual chance	X	X	X	X	X	X	X
Floods: Localized Stormwater	X	X	X		X	X	X
Landslides, Mudslides, and Debris Flow							
Levee Failure	X		X			X	
Pandemic	X		X	X	X		
Severe Weather: Extreme Cold and Freeze	X			X	X		
Severe Weather: Extreme Heat	X		X	X	X	X	X

Priority Hazards for Mitigation Action Development	Sacramento County	Citrus Heights	Elk Grove	Folsom	Galt	Isleton	Rancho Cordova
Severe Weather: Heavy Rains and Storms	X		X	X	X	X	X
Severe Weather: Wind and Tornado	X			X			X
Subsidence	X						
Volcano							
Wildfire	X		X	X	X		X

Table 5-3 Sacramento County Planning Area: Mitigation Action Priority Hazards by Jurisdiction – Special Districts

Priority Hazards for Mitigation Action Development	American River Flood	Citrus Heights Water	Cosumnes CSD	Los Rios Community College	RD 800	RD 1000	Sac. County Water
Climate Change	X				X	X	X
Dam Failure	X						X
Drought & Water Shortage							X
Earthquake							X
Earthquake Liquefaction							
Floods: 1%/0.2% annual chance	X				X	X	X
Floods: Localized Stormwater				X			
Landslides, Mudslides, and Debris Flow							
Levee Failure	X				X	X	X
Pandemic			X	X			
Severe Weather: Extreme Cold and Freeze			X				
Severe Weather: Extreme Heat			X				
Severe Weather: Heavy Rains and Storms	X			X	X		
Severe Weather: Wind and Tornado					X	X	
Subsidence							
Volcano							
Wildfire			X				

Table 5-4 Sacramento County Planning Area: Mitigation Action Priority Hazards by Jurisdiction – Special Districts (continued)

Priority Hazards for Mitigation Action Development	Sac Metro Fire	Sacramento Regional San	Sac Sewer	Southgate Rec and Park	Twin Rivers School	BALMD
Climate Change	X			X		
Dam Failure	X	X	X			X
Drought & Water Shortage	X			X		
Earthquake					X	
Earthquake Liquefaction	X					
Floods: 1%/0.2% annual chance		X	X	X	X	X
Floods: Localized Stormwater				X	X	X
Landslides, Mudslides, and Debris Flow						
Levee Failure	X	X	X	X		X
Pandemic	X	X	X	X		
Severe Weather: Extreme Cold and Freeze	X			X	X	
Severe Weather: Extreme Heat	X			X	X	
Severe Weather: Heavy Rains and Storms	X			X	X	X
Severe Weather: Wind and Tornado	X				X	
Subsidence						X
Volcano						
Wildfire	X	X		X	X	

Table 5-5 Sacramento County Planning Area: Mitigation Action Priority Hazards by Jurisdiction – Special Districts (continued)

Priority Hazards for Mitigation Action Development	RD 3	RD 341	RD 349	RD 369	RD 551	RD554
Climate Change		X				
Dam Failure						
Drought & Water Shortage						
Earthquake		X				
Earthquake Liquefaction				X		
Floods: 1%/0.2% annual chance	X	X	X		X	X
Floods: Localized Stormwater	X		X	X	X	X
Landslides, Mudslides, and Debris Flow						

Priority Hazards for Mitigation Action Development	RD 3	RD 341	RD 349	RD 369	RD 551	RD554
Levee Failure	X	X	X	X	X	X
Pandemic						
Severe Weather: Extreme Cold and Freeze						
Severe Weather: Extreme Heat						
Severe Weather: Heavy Rains and Storms	X	X	X	X	X	X
Severe Weather: Wind and Tornado		X		X		
Subsidence						
Volcano						
Wildfire						

Table 5-6 Sacramento County Planning Area: Mitigation Action Priority Hazards by Jurisdiction – Special Districts (continued)

Priority Hazards for Mitigation Action Development	RD 556	RD 563	RD 1002	RD 1601	RD 2111
Climate Change					
Dam Failure	X				
Drought & Water Shortage					
Earthquake		X		X	
Earthquake Liquefaction		X		X	
Floods: 1%/0.2% annual chance	X	X	X	X	X
Floods: Localized Stormwater		X	X	X	
Landslides, Mudslides, and Debris Flow					
Levee Failure	X	X	X	X	X
Pandemic					
Severe Weather: Extreme Cold and Freeze					
Severe Weather: Extreme Heat					
Severe Weather: Heavy Rains and Storms	X	X	X	X	
Severe Weather: Wind and Tornado		X		X	
Subsidence	X	X			
Volcano					
Wildfire					

It is important to note, however, that all the Hazards addressed in this Plan are included in the countywide multi-hazard public awareness mitigation action as well as in other multi-hazard, emergency management actions, and other hazard-specific actions, providing benefits to all participating jurisdictions to this Plan.

Once it was determined which hazards warranted the development of specific mitigation actions, the HMPC analyzed viable mitigation options that supported the identified goals and objectives. The HMPC was provided with the following list of categories of mitigation actions, which originate from the Community Rating System:

- Prevention
- Property protection
- Structural projects
- Natural resource protection
- Emergency services
- Public information

The HMPC was provided with examples of potential mitigation actions for each of the above categories. The HMPC was also instructed to consider both future and existing buildings in determining possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Appendix C provides a detailed review and discussion of the six mitigation categories to assist in the review and identification of possible mitigation activities or projects. Also utilized in the review of possible mitigation measures is FEMA's publication on Mitigation Ideas, by hazard type. Prevention type mitigation alternatives were discussed for each of the priority hazards. This was followed by a brainstorming session that generated a list of preferred mitigation actions by hazard.

5.3.1. Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria, STAPLEE sustainable disaster recovery criteria; Smart Growth principles; and others, to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE stands for the following:

- Social: Does the measure treat people fairly? (e.g., different groups, different generations)
- Technical: Is the action technically feasible? Does it solve the problem?
- Administrative: Are there adequate staffing, funding, and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action includes:

- Contribution of the action to save life or property
- Availability of funding and perceived cost-effectiveness
- Available resources for implementation
- Ability of the action to address the problem

The initial list of mitigation actions from the 2016 LHMP and new actions identified during this planning process were reviewed and prioritized via an LHMP mitigation action voting website for inclusion in this 2021 LHMP Update. The Sacramento County mitigation action voting website established at https://fostermorrison.aweeba.com/ included the list of actions brainstormed during the mitigation strategy meetings and provided a mechanism for everyone to vote on their priority actions for further development as detailed below. This comprehensive review of mitigation measures was performed using the criteria (alternatives and selection criteria) in Appendix C.

With these criteria in mind, HMPC members were each provided with nine weighted votes, indicating High (worth 5 points), Medium (worth 3 points), and Low (worth 1 point) priorities. The team was asked to use the votes to prioritize actions with the above criteria in mind. The point score for each action was totaled. Appendix C contains the total score given to each identified mitigation action.

The process of identification and analysis of mitigation alternatives allowed the HMPC to come to consensus and to prioritize recommended mitigation actions. During the voting process, emphasis was placed on the importance of a benefit-cost review in determining project priority; however, this was not a quantitative analysis. The team agreed that prioritizing the actions collectively enabled the actions to be ranked in order of relative importance and helped steer the development of additional actions that meet the more important objectives while eliminating some of the actions which did not garner much support.

Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed below in Section 5.4. The cost-effectiveness of any mitigation alternative will be considered in greater detail through performing benefit-cost project analyses when seeking FEMA mitigation grant funding for eligible actions associated with this LHMP Update.

Recognizing the limitations in prioritizing actions from multiple jurisdictions and departments and the regulatory requirement to prioritize by benefit-cost to ensure cost-effectiveness, the HMPC decided to pursue actions that contributed to saving lives and property as first and foremost, with additional consideration given to the benefit-cost aspect of a project. This process drove the development of a determination of a high, medium, or low priority for each mitigation action, and a comprehensive prioritized mitigation action plan for the Sacramento County Planning Area.

5.4 Mitigation Action Plan

Requirement §201.6(c)(3)(iii) and §201.7(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This mitigation action plan was developed to present the recommendations developed by the HMPC for how the Sacramento County Planning Area can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. Emphasis was placed on both future and existing development. This mitigation action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Each action summary also includes a discussion of the benefit-cost review conducted to meet the regulatory requirements of the Disaster Mitigation Act.

Table 5-7 identifies all mitigation actions for all participating jurisdictions to this LHMP Update. For each mitigation action item included in Table 5-7, a detailed mitigation implementation strategy has been developed. Only those actions where the County is the lead jurisdiction are detailed further in this section. Actions specific to other participating jurisdictions, or where other jurisdictions are taking the lead, are detailed in each respective jurisdictional annex to this Plan.

The mitigation action plan detailed below contains both new action items developed for this LHMP Update as well as old actions that were yet to be completed from the 2016 Plan. Table 5-7 indicates whether the action is new or from the 2016 LHMP and Chapter 2 contains the details for each 2016 mitigation action item indicating whether a given action item has been completed, deleted, or deferred.

As described throughout this LHMP Update, Sacramento County has many risks and vulnerabilities to identified hazards. Although many possible mitigation actions, as detailed in Appendix C, were brainstormed and prioritized during the mitigation strategy meetings, the resulting mitigation strategy presented in this Chapter 5 of this LHMP focuses only on those mitigation actions that are both reasonable and realistic for the community to consider for implementation over the next 5-years covered by this 2021 Update. Thus, only a portion of the actions identified in Appendix C have been carried forward into the mitigation strategy presented in Table 5-7. Although many good ideas were developed during the mitigation action brainstorming process, the reality of determining which priority actions to develop and include in this LHMP Update came down to the actual priorities of communities, individuals and departments based in part on department direction, staffing, and available funding. The overall value of the mitigation action table in Appendix C is that it represents a wide-range of mitigation actions that can be consulted and developed for this LHMP Update during annual plan reviews and the formal 5-year update process.

It is also important to note that Sacramento County and the participating jurisdictions have numerous existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as stormwater and drainage plans, flood and water management plans, and capital improvement budgets and reports. These actions are considered to be part of this Plan, and the details, to avoid

duplication, should be referenced in their original source document. The HMPC also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this Plan.

Further, it should be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The participating communities are not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the community to mitigate the risks and vulnerabilities from identified hazards. The actual selection, prioritization, and implementation of these actions will also be further evaluated in accordance with the mitigation categories and criteria contained in Appendix C.

It should be noted that many of the projects submitted by each jurisdiction in Table 5-7 benefit multiple or all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this Plan.

Table 5-7 Sacramento County Planning Area Mitigation Actions

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Sacramento County						
Multi-Hazard Actions						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	Unincorporated Sacramento County	2016 Action	X	X		Prevention
Action 2. Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	Unincorporated Sacramento County	2016 Action	X	X		Public Information
Action 3. County-wide Mass Care and Shelter Plan Update	Unincorporated Sacramento County	New Action	X	X		Emergency Services
Action 4. County-wide Evacuation Annex Update	Unincorporated Sacramento County	New Action	X	X		Emergency Services
Action 5. Evacuation Planning Countywide	Unincorporated Sacramento County	New Action	X	X		Prevention Emergency Services
Action 6. Expand Broadband/Wifi Access	Unincorporated Sacramento County	New Action	X	X		Emergency Services
Climate Change and Pandemic Actions						
Action 7. Implement and improve telecommuting and remote work access for County operations	Unincorporated Sacramento County	New Action	X	X		Prevention
Action 8. Implement the actions contained within the Sacramento County Climate Action/Adaptation Plan	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection Public Information Emergency Services
Action 9. Develop and incentivize carbon sequestration plans and programs	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 10. Update the Sacramento County Climate Action for carbon neutrality by 2030	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Natural Resource Protection
Dam Failure, Earthquake (and liquefaction), Flood: 1%, 0.5%, 0.2% annual chance, Flood: Localized Flood, Levee Failure, Subsidence, and Severe Weather: Heavy Rains and Storms Actions						
Action 11. Bicycle/pedestrian bridge across Discovery Park connecting Garden Highway to the Jibboom Street bridge	Unincorporated Sacramento County	New Action	X	X	X	Prevention Structural Projects Natural Resource Protection Emergency Services
Action 12. Acquire Floodprone Properties	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects
Action 13. Maintain and improve railroad embankment levee from south of Freeport to south of Hood, a reach owned by CA Parks Department (Railroad Museum)	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 14. McCormack Williamson flood control weir	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 15. Flood risk mitigation for mobile home and recreational vehicle parks	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects
Action 16. Plan for Public Information (PPI)	Unincorporated Sacramento County	2016 Action	X	X	X	Public Information
Action 17. Mitigation of repetitive loss flood areas and properties	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects
Action 18. Flood risk mapping	Unincorporated Sacramento County	New Action	X	X	X	Prevention
Action 19. Storm Ready	Unincorporated Sacramento County	2016 Action	X	X	X	Prevention Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 20. Alder Creek flood hazard mitigation	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 21. Operational protocol for American River pump stations that are affected by the reoperation of Folsom Dam	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Emergency Services
Action 22. Arcade Creek flood control	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 23. Beach Stone Lakes area flood risk reduction program	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 24. Protect critical facilities from flooding	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Emergency Services
Action 25. Dam Safety (Activity 630)	Unincorporated Sacramento County	New Action	X	X	X	Public Information Emergency Services
Action 26. Flood fighting for Delta legacy communities: Hood, Courtland, Locke, Walnut Grove	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection Emergency Services
Action 27. Implement Delta Small Communities	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information
Action 28. Elevate houses to reduce flood risk	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 29. Flood emergency management exercises	Unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
Action 30. Flood evacuation mapping	Unincorporated Sacramento County	2016 Action	X	X	X	Prevention Emergency Services
Action 31. Floodproofing non-residential structures	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects
Action 32. Flood insurance studies (modeling and mapping the special flood hazard area)	Unincorporated Sacramento County	New Action	X	X	X	Prevention
Action 33. Update Hydrology Standards	Unincorporated Sacramento County	2016 Action	X	X	X	Prevention
Action 34. Laguna Creek flood control, modeling, and mapping	Unincorporated Sacramento County	New Action	X	X	X	Prevention
Action 35. Update County GIS aerial photography and LiDAR topography	Unincorporated Sacramento County	New Action	X	X	X	Prevention
Action 36. Maintain and improve Sacramento River levee from south of Freeport to south of Hood, a reach owned and operated by CA DWR Maintenance Area 9	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 37. Use existing Aggregate Mining Pits for Flood Control	Unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 38. Implement Storm Drain Capital Improvement Plan	Unincorporated Sacramento County	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information
Action 39. Woodside Condominiums Flood Risk Reduction	Unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 40. Implement Actions In The Courtland Flood Risk Reduction Plan 2021	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information
Action 41. Implement Actions In The Walnut Grove West Flood Risk Reduction Plan 2021	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information
Action 42. Implement Actions In The Locke Flood Risk Reduction Plan 2021	Unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information
Drought & Water Shortage, Severe Weather: Extreme Heat, and Wildfire Actions						
Action 43. Reduce the urban heat island effect through the implementation of "cool communities" strategies, including but not limited to, increasing tree plantings, using cool/green roofs and cool/pervious pavements	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 44. Defensible Space and Vegetation Management; Development of Areas of Refuge	Unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 45. Wildfire Suppression - Regional Parks and Open Space (urban interface)	Unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 46. Wildfire Fighting - Support	Unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Natural Resource Protection
Action 47. Wildfire Suppression	Unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Natural Resource Protection
Severe Weather: Extreme Cold and Freeze and High Wind and Tornado Actions						
Action 48. Establish Warming Centers with Backup Power	Unincorporated Sacramento County	New Action	X	X		Emergency Services Public Information
City of Citrus Heights						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Citrus Heights	2016 Action	X	X		Prevention
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Citrus Heights	New Action	X	X	X	Public Information
Action 3. Cable Trellis w/ Vines Shading Project	City of Citrus Heights	New Action	X	X	X	Property Protection
Action 4. Trash Racks and Debris Cages Project	City of Citrus Heights	New Action	X	X	X	Property Protection
Action 5. Protection of Transportation Infrastructure Project	City of Citrus Heights	New Action	X	X	X	Property Protection Structural Projects
Action 6. Neighborhood Storm Drain Project	City of Citrus Heights	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 7. Neighborhood Storm Drain Master Plan	City of Citrus Heights	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Public Information

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 8. Storm Drain Inlet Retrofit Project	City of Citrus Heights	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 9. Reduce Citrus Heights extreme heat events and associated hazards by Increase tree planting/canopy preservation/enhancement (this is in general plan) Project	City of Citrus Heights	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 10. Increase pedestrian and bicycle evacuation routes by constructing regional bike/pedestrian trail infrastructure, and expanding connection to neighborhoods (particularly in vulnerable areas) Project	City of Citrus Heights	New Action	X	X		Emergency Services Public Information
Action 11. Interconnected Transportation System Project	City of Citrus Heights	New Action	X	X	X	Emergency Services
Action 12. Critical Facility Generator Project	City of Citrus Heights	New Action	X	X	X	Emergency Services
Action 13. Critical Street Floodproofing Project	City of Citrus Heights	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 14. Creek Maintenance and Restoration Project	City of Citrus Heights	New Action	X	X	X	Property Protection Natural Resource Protection
Action 15. CMP Storm Drain Replacement Project	City of Citrus Heights	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
City of Elk Grove						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Elk Grove	2016 Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Elk Grove	New Action	X	X		Public Information
Action 3. Elk Grove Green Street Project: Repurposing Urban Runoff with Green Instructure Technologies	City of Elk Grove	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Mutual Aid Agreements	City of Elk Grove	2016 Action	X	X	X	Emergency Service
Action 5. City of Elk Grove's Storm Drainage Master Plan (SDMP)	City of Elk Grove	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 6. Create a Climate-Smart Stormwater Management System	City of Elk Grove	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 7. Implement a Comprehensive and Climate-Smart Green Infrastructure Strategy	City of Elk Grove	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 8. Upgrade the City's Laguna West Levee System to Mitigate Climate-Related Flood Impacts	City of Elk Grove	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 9. Establish a Resilient Pedestrian and Bicycle Infrastructure Network	City of Elk Grove	New Action	X	X		Emergency Services
City of Folsom						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Folsom	2016 Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Folsom	2016 Action	X	X		Public Information
Action 3. Redevelopment Area Drainage Improvements	City of Folsom	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Stormwater Basin Maintenance and Operation Project	City of Folsom	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 5. Stormwater Utility Fee	City of Folsom	2016 Action	X	X	X	Prevention Property Protection
Action 6. Fuel Reduction and Modification	City of Folsom	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 7. Comprehensive Cooling City Strategy	City of Folsom	2016 Action	X	X		Prevention Property Protection
Action 8. Identification and Upgrades to Heating and Cooling Centers	City of Folsom	2016 Action	X	X		Prevention Emergency Services
Action 9. Landscape and Irrigation Modifications	City of Folsom	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 10. Landscape Ordinance and Model Water Efficient Landscape Ordinance Implementation	City of Folsom	New Action	X	X		Prevention
Action 11. Post Disaster Staff Training	City of Folsom	New Action	X	X		Emergency Services
Action 12. Weed Abatement Program	City of Folsom	2016	X	X		Prevention Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
City of Galt						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Galt	2016 Action	X	X		Prevention
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Galt	New Action	X	X		Public Information
Action 3. Future Development Projects shall complete a Climate Action Plan Consistency Review Checklist.	City of Galt	New Action	X	X		Prevention
Action 4. Develop a Robust Geographic Based System (GIS) to Geographically Locate Issues/Actions/Mitigation in the City.	City of Galt	New Action	X	X		Prevention
Action 5. Perform Vegetative Control of City Drainages and Channels by Natural Methods	City of Galt	New Action	X	X		Property Protection Natural Resource Protection
Action 6. Continue Work with the Other Groundwater Sustainability Agencies (GSAs) in the Cosumnes Subbasin of the San Joaquin Valley Basin (DWR Basin No. 5-022.16) who are Working Together to Develop a Single Groundwater Sustainability Plan (GSP).	City of Galt	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 7. Increase Resiliency of City Critical Infrastructure and Emergency Operations and against Hazards.	City of Galt	New Action	X	X		Emergency Service
Action 8. Maintain City Drainages, Channels and Open Spaces	City of Galt	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
City of Isleton						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Isleton	2016 Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Isleton	New Action	X	X		Public Information
Action 3. Support climate change mitigation laws	City of Isleton	New Action	X	X		Prevention
Action 4. Support drought mitigation laws. Establish RWIP (Redundant Water for Isleton Plan)	City of Isleton	New Action	X	X		Prevention Property Protection Natural Resource Protection
Action 5. Levee Reinforcement Projects	City of Isleton	New Action	X	X	X	Property Protection Natural Resource Protection Structural Projects
Action 6. Implement IFIP (Isleton Flood Improvement Plan) and create and activate IFMA (Isleton Flood Management Agency)	City of Isleton	New Action	X	X	X	Prevention Property Protection Natural Resource Protection Structural Projects
Action 8. Activate Emergency Operation Plan (Cooling Center)	City of Isleton	New Action	X	X	X	Emergency Services
Action 9. Storm Water Runoff Rehabilitation Project	City of Isleton	2016 Action	X	X	X	Property Protection Natural Resource Protection Structural Projects
Action 10. Wastewater Treatment Plant Pond Levee Elevation Raise to 200-year Flood Standard	City of Isleton	2016 Action	X	X	X	Property Protection Natural Resource Protection Structural Projects
City of Sacramento						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Sacramento	2016 Action	X	X		Prevention
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Sacramento	New Action	X	X	X	Public Information

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 3. Coordination with Relevant Organizations and Agencies to Consider the Impacts of Urbanization and Climate Change on Long-Term Natural Hazard Safety	City of Sacramento	2016 Action	X	X		Prevention
Action 4. Maintain and Identify Changes in Critical Facilities GIS Layer to Support Emergency Management Efforts	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services
Action 5. Community Outreach on Multi-Hazard Preparation & Pre-mitigation	City of Sacramento	2016 Action	X	X	X	Public Information
Action 6. Evaluation and Mitigation of Critical Facilities in Identified Hazard Areas	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services
Action 7. Retrofit of Repetitive Loss Properties	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects
Action 8. Safeguard Essential Communication Services	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services
Action 9. Multi-lingual Disaster Education	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services Public Information
Action 10. Cal OES Safety Assessment Program Evaluators	City of Sacramento	2016 Action	X	X	X	Prevention Emergency Services
Action 11. National Flood Insurance Program & Community Rating System Continuation	City of Sacramento	2016 Action	X	X	X	Prevention
Action 12. Develop a Master Generation Plan for Pump Stations	City of Sacramento	2016 Action	X	X	X	Prevention Property Protection
Action 13. Develop a Disaster Housing Plan	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 14. Disaster Resistant Business Program	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 15. Develop Enhanced Emergency Planning for Special Needs Populations in the City of Sacramento Emergency Operations Plan and Other Planning Documents	City of Sacramento	2016 Action	X	X		Prevention Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 16. Establish a Post-Disaster Action Plan	City of Sacramento	2016 Action	X	X		Emergency Services
Action 17. Flood Recovery Plan	City of Sacramento	2016 Action	X	X	X	Emergency Services
Action 18. Public Information Flood Response Plan (Action #18 from 2016)	City of Sacramento	2016 Action	X	X	X	Public Information
Action 19. Construction of a New Emergency Operation Center (EOC) (Action 19 from 2016 plan)	City of Sacramento	2016 Action	X	X		Emergency Services
Action 20. Emergency Operation Center (EOC) Expansion and Information Technology Upgrade (Action 20 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 21. Protection of Transportation Infrastructure (Action 21 from 2016 plan)	City of Sacramento	2016 Action	X	X		Emergency Services Property Protection Structural Projects
Action 22. Public Education Campaign for Everbridge System (Action 22 from 2016 plan)	City of Sacramento	2016 Action	X	X		Public Information Emergency Services
Action 23. Regional Emergency and Disaster Preparedness Exercises to Test Operational & Emergency Plans (Action 23 from the 2016 plan)	City of Sacramento	2016 Action	X	X		Emergency Services
Action 24. Special Needs and Critical Facilities Database and Advanced Warning System (Action 24 from 2016 plan)	City of Sacramento	2016 Action	X	X	X	Emergency Services Public Information
Action 25. Asset Inventory	City of Sacramento	2016 Action	X	X		Prevention
Action 26. Protection of City Information Technology Infrastructure (Action 27 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 27. Travel Time Model for Lower American and Sacramento Rivers and their Major Tributaries (Action 29 from 2016 plan)	City of Sacramento	2016 Action	X	X	X	Prevention
Action 28. Watershed Spill Contamination to Drinking Water Quality: Preparedness for Events and Recovery	City of Sacramento	2016 Action	X	X		Prevention Property Protection
Action 29. Purchase Drones for Use in Disaster Preparedness, Mitigation, and Response	City of Sacramento	2016 Action	X	X	X	Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 30. Map and Assess Vulnerability to Sea Level Rise (Action 32 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention
Action 31. Emission Study of City Sump and Pump Stations (Action 33 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention
Action 32. Climate Change Mitigation Actions/Climate Change Adaptation Plan for Drinking Water Quality (Action 34 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention Property Protection
Action 33. Harmful Algal Bloom (HAB) Surveillance and Response Planning (Action 35 from 2016 plan	City of Sacramento	2016 Action	X	X		Prevention Property Protection
Action 34. Perform a Groundwater Recharge Feasibility Study (Action 37 from 2016 plan)	City of Sacramento	2016 Action	X	X		Prevention Property Protection Natural Resource Protection
Action 35. Retrofit Historical Buildings	City of Sacramento	2016 Action	X	X		Prevention Property Protection Structural Projects
Action 36. Heating Centers in High Priority Locations	City of Sacramento	2016 Action	X	X		Prevention Emergency Services Public Information
Action 37. Cooling Centers in High Priority Locations	City of Sacramento	2016 Action	X	X		Prevention Emergency Services Public Information
Action 38. Extreme Weather Outreach Strategy	City of Sacramento	2016 Action	X	X		Prevention Emergency Services Public Information
Action 39. Severe Weather Action Plan	City of Sacramento	2016 Action	X	X		Prevention Emergency Services
Action 40. Coordinate with Stakeholder on Proposed Flood Control Project on Magpie Creek	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 41. Adopt Additional Floodplain Development Standards	City of Sacramento	2016 Action	X	X	X	Prevention
Action 42. Drainage Projects for Repetitive Loss Properties	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 43. Emergency Notification and Evacuation Planning	City of Sacramento	2016 Action	X	X	X	Emergency Services Public Information
Action 44. Historic Magpie Creek	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 45. Natomas Internal Drainage Canals/Levees	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 46. Drainage Projects from the City's Priority Drainage Project List	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 47. Projects Identified in the Combined Sewer System Improvement Plan Update	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Project Natural Resource Protection
Action 48. Easements for Open Land Along Levees	City of Sacramento	2016 Action	X	X	X	Prevention
Action 49. Emergency Management Planning and Levee Security	City of Sacramento	2016 Action	X	X	X	Emergency Services
Action 50. Flood Fighting Equipment	City of Sacramento	2016 Action	X	X	X	Emergency Services
Action 51. Flood Management Land Use Planning and Development	City of Sacramento	2016 Action	X	X	X	Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 52. Florin Creek Pump at Pomegranate Avenue	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 53. Internal Drainage System Improvements	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 54. Levee and Structural Flood Management Improvements	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 55. Master planning to identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding	City of Sacramento	2016 Action	X	X	X	Prevention
Action 56. Retrofit Pumping Plans with Discharge Monitoring Devices	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 57. Risk Communication and NFIP/CRS Projects	City of Sacramento	2016 Action	X	X	X	Prevention Public Information
Action 58. Trash Racks and Debris Cages	City of Sacramento	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 59. Multi-Jurisdictional Modeling for Drainage Watersheds Greater than 10 Square Miles	City of Sacramento	2016 Action	X	X	X	Prevention
Action 60. Post-Flood Water Treatment Facility Recovery	City of Sacramento	2016 Action	X	X	X	Emergency Services Property Protection
Action 61. Tree Trimming & Debris Removal	City of Sacramento	2016 Action	X	X		Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 62. Install redundancies and Loop Feeds for Power Lines & Infrastructure	City of Sacramento	2016 Action	X	X		Property Protection
Action 63. Stabilization of Erosion Hazard Areas	City of Sacramento	2016 Action	X	X		Property Protection Structural Projects
Action 64. Implement a Fire Education and Information Program	City of Sacramento	2016 Action	X	X		Prevention Public Information
Action 65. Fuels Reduction on the American River Parkway	City of Sacramento	2016 Action	X	X		Property Protection Structural Projects Natural Resource Protection
Action 66. Outreach on the Effects of Smoke on Air Quality	City of Sacramento	2016 Action	X	X		Public Information
Action 67. Implement 2040 Climate Action and Adaptation Plan	City of Sacramento	New Action	X	X		Property Protection Natural Resource Protection
City of Rancho Cordova						
Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	City of Rancho Cordova	2016 Action	X	X		Prevention
Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness	City of Rancho Cordova	New Action	X	X		Public Information
Action 3. Sunrise Blvd Widening Kiefer to Jackson	City of Rancho Cordova	2016 Action	X	X	X	Property Protection Structural Projects
Action 4. City of Rancho Cordova Disaster Debris Management Plan	City of Rancho Cordova	New Action	X	X		Emergency Services
Action 5. Transportation Interconnectivity	City of Rancho Cordova	2016 Action	X	X		Emergency Services
Action 6. Intergovernmental Agreement between the County of Sacramento and the City of Rancho Cordova	City of Rancho Cordova	2016 Action	X	X		Prevention Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 7. Land Use (Long Range)	City of Rancho Cordova	2016 Action	X	X		Prevention Natural Resource Protection
Action 8. Post disaster training for staff	City of Rancho Cordova	2016 Action	X	X		Emergency Services
Action 9. Update/Maintain Emergency Operation Plans (EOPs)	City of Rancho Cordova	2016 Action	X	X		Emergency Services
Action 10. Increase Everbridge Enrollment	City of Rancho Cordova	2016 Action	X	X		Emergency Services
Action 11. Developing and maintaining a database to track community vulnerability	City of Rancho Cordova	2016 Action	X	X		Prevention Emergency Services
Action 12. Landscape and Irrigation Requirements/Retro	City of Rancho Cordova	2016 Action	X	X		Prevention Public Information
Action 13. Landscape Ordinance and Model Water Efficient Landscape Ordinance Implementation	City of Rancho Cordova	2016 Action	X	X	X	Prevention Natural Resource Protection
Action 14. Restrict Impervious Surfaces in Front Yards	City of Rancho Cordova	2016 Action	X	X	X	Prevention Natural Resource Protection Public Information
Action 15. Porous pavement and vegetative buffers	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Natural Resource Protection
Action 16. Storm Water Pump Station Generator Purchase and Infrastructure Upgrades	City of Rancho Cordova	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 17. SB-5 Urban Level of Flood Protection	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 18. Channel Vegetation Management and Erosion Control Projects	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 19. Adoption of Hydromodification and Low Impact Development (LID) Standards	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Natural Resource Protection
Action 20. Implement Projects in the Stormwater Capital Improvement Program Master Plan	City of Rancho Cordova	2016 Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 21. Sunrise Blvd. & Monier Circle Drainage Improvements	City of Rancho Cordova	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 22. Roundabouts	City of Rancho Cordova	2016 Action	X	X		Prevention Property Protection Structural Projects
Action 23. Dam Failure Mitigation and Preparedness for Evacuations	City of Rancho Cordova	New Action	X	X		Property Protection Natural Resource Protection
Action 24. Wildfire Weed Reduction and Resiliency	City of Rancho Cordova	New Action	X	X		Property Protection Natural Resource Protection
American River Flood Control District						
Action 1. Arcade Creek Erosion Repair Project	ARFCD and unincorporated Sacramento County	New Action	X	X	X	Property Protection Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. American River Emergency Rock Revetment Preparedness Stockpile	ARFCD and unincorporated Sacramento County	New Action	X	X	X	Property Protection Natural Resource Protection
Action 3. Highway 160 Bridge Gap Levee Access	ARFCD and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Citrus Heights Water District						
Action 1. Implement ASR Technology	CHWD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 2. Construction of a New Storage Tank	CHWD and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects
Action 3. Construction of a New Operations Building	CHWD and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects
Cosumnes Community Services District						
Action 1. Drought Mitigation Planning	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 2. Enhance the District's Public Education, Awareness, and Outreach Program to Include all Hazards of Concern	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 3. Integrate the LHMP into Cosumnes CSD Strategic Plans	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 4. Wildfire Staffing	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 5. Mutual Aid Agreements	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 6. Continue Vegetation Management Program	Cosumnes CSD and unincorporated Sacramento County	New Action	X	X		Prevention
Los Rios Community College						
Action 1. Pandemic Response Plan	Los Rios Community College	New Action	X	X		Prevention Emergency Services
Action 2. Emergency Operations Plan Update	Los Rios Community College	New Action	X	X		Prevention Emergency Services
Action 3. COVID-19 Education/Information Program	Los Rios Community College	New Action	X	X		Prevention Public Information
Action 4. Installing a Microgrid Project, at the Folsom Lake College, El Dorado Center (EDC) in Placerville, CA	Los Rios Community College	New Action	X	X		Prevention Emergency Service
Action 5. Backup Power for Police Dispatch	Los Rios Community College	New Action	X	X		Emergency Services
Action 6. Tree Mitigation – Districtwide	Los Rios Community College	New Action	X	X		Property Protection Natural Resource Protection
RD 800						
Action 1. Reclamation District 800 Emergency Levee Repair Project	RD 800 and unincorporated Sacramento County	2016 Action	X	X		Property Protection Structural Projects Natural Resource Protection
RD 1000						
Action 1. Asset Management Plan Update	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Corporation Yard Improvements	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Waterside Levee Inspection Capability	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Property Protection
Action 4. Pleasant Grove Area Levee Improvements	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 5.Plant 1 Emergency Generator Natural Gas Conversion and Mobile Generators for Plants 2, ,3 and 5	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection Emergency Services
Action 6. Plant 8 Improvements	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 7. Expanded SCADA System	RD 1000 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Natural Resource Protection
Action 8. Update Emergency Operations Plan and Staffing	RD 1000 and unincorporated Sacramento County	New Action	X	X	X	Emergency Services
Sacramento County Water Agency						
Action 1. Flood Hazard Mitigation	SCWA and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Improve Water Supply Portfolio	SCWA and unincorporated Sacramento County	New Action	X	X		Prevention
Action 3. Seismic Upgrades	SCWA and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects Natural Resource Protection
Sac Metro Fire						
Action 1. Finalization and Implementation of Metro Fire's Community Risk Assessment and Associated Community Risk Reduction Plan	SMFD	New Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection Public Information Emergency Services
Action 2. Evaluation and Implementation of Measures Necessary to Mitigate Fire Stations that Would be Directly Affected by Dam Failure	SMFD	New Action	X	X		Property Protection Structural Projects Emergency Services
Action 3. Modernization/Upgrade all District Facilities to Comply with Essential Services Code Requirements	SMFD	New Action	X	X		Property Protection Structural Projects Emergency Services
Action 4. Community Wildfire Protection Plan (CWPP) – Revision and Implementation of Resulting Changes	SMFD	New Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information
Action 5. Relocate the Essential Facilities in the 200 year Floodplain	SMFD	New Action	X	X	X	Property Protection Structural Projects Emergency Services

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Sacramento Regional Sanitation District						
Action 1. Develop Climate Change Resiliency Plan	Regional San and unincorporated Sacramento County	New Action	X	X		Prevention
Action 2. Replace current equipment with touchless technologies	Regional San and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects
Action 3. Complete I&I Study and Develop I&I Policy	Regional San and unincorporated Sacramento County	New Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection
Action 4. Regional San Biogeneration Facility	Regional San and unincorporated Sacramento County	New Action	X	X		Property Protection Structural Projects Natural Resource Protection
Action 5. Reduction of Fire Hazard of Regional San Bufferlands	Regional San and unincorporated Sacramento County	2016 Action	X	X		Property Protection Natural Resource Protection
Action 6. Update GHG Emissions Inventory	Regional San and unincorporated Sacramento County	New Action	X	X		Prevention Property Protection
Action 7. Study Telecommute Options and Enhanced Information Technology Needs to Support Workforce	Regional San and unincorporated Sacramento County	New Action	X	X		Prevention
Sacramento Area Sewer District						
Action 1. Flood Control	SASD and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Pandemic Planning	SASD and unincorporated Sacramento County	New Action	X	X		Prevention

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Southgate Recreation and Park District						
Action 1. Drought Mitigation Actions/Drought Contingency Plan	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Natural Resource Protection
Action 2. Flood Mitigation Actions/Land Acquisition	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Structural Projects
Action 3. Conservation Easements	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention
Action 4. Multi-jurisdictional Cooperation within Watersheds	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention
Action 5. Storm Water Management Practices – Implement Storm Water Management Practices as identified in Stormwater Quality Design Manual	SRPD and unincorporated Sacramento County	2016 Action	X	X		Prevention Property Protection Structural Projects Natural Resource Protection
Action 6. Severe Weather: Heavy Rains and Storms Mitigation Actions/Tree Management	SRPD and unincorporated Sacramento County	2016 Action	X	X		Property Protection Natural Resource Protection
Action 7. Integrate Local Hazard Mitigation Plan into District Master Plan	SRPD and unincorporated Sacramento County	New Action	X	X		Prevention
Action 8. Covid-19 Response Plan	SRPD and unincorporated Sacramento County	New Action	X	X		Emergency Services
Twin Rivers School District						
Action 1. Reduce Risks to Property and Life due to Earthquake	TRSD	New Action	X	X		Property Protection Structural Projects
Action 2. Reduce Risk to Flooding of Northern Area Schools	TRSD	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 3. Stormdrain Upgrades/Revise and Update Districtwide Stormwater Prevention Plan	TRSD	New Action	X	X	X	Prevention Property Protection Structural Projects Natural Resource Protection
Action 4. Prevent Loss of Life or Injury due to Extreme Heat	TRSD	New Action	X	X		Prevention Emergency Services
Action 5. Evacuation for Heavy Rains, Storms, Winds, and ALL Hazards	TRSD	New Action	X	X		Emergency Services
Action 6. Trees Trimmed/ Vegetation Removed to Minimize Impact During Fire Season	TRSD	New Action	X	X		Property Protection Natural Resource Protection
BALMD						
Action 1. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.	BALMD, RD 317, RD 407, RD 2067	New Action	X`	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information
Action 2. Regional Flood Management Plan Projects	BALMD, RD 317, RD 407, RD 2067	New Action	X`	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information
Action 3. Small Communities Plans – Flood Protection – Structural and Nonstructural Mitigation	BALMD, RD 317, RD 407, RD 2067	New Action	X`	X	X	Prevention Property Protection Structural Projects Natural Resource Protection Emergency Services Public Information

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 4. 2021 Emergency Operations Plan (EOP) – Currently in development	BALMD, RD 317, RD 407, RD 2067	New Action	X`	X	X	Prevention Emergency Services
RD 3						
Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. FSRP Critical Erosion Repair	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Steamboat Slough Seepage Repairs	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Interior Drainage Improvements	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 5. Relief Cut Plan	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 6. Implement recommendations in West Walnut Grove Flood Risk Reduction Plan	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 7. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report	RD 3 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
RD 341						
Action 1. San Joaquin River Multi-Benefit Project	RD 341 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 349						
Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs	RD 349 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Interior Drainage Improvements	RD 349 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report	RD 349 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Relief Cut Plan	RD 349 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 369						
Action 1. Backup Power Project	RD 369 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services Property Protection
Action 2. Flood Safety Plan Updates, Training, and Exercises	RD 369 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services Public Outreach
Action 3. Small Communities Plans - flood protection - structural and nonstructural mitigation	RD 369 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
RD 551						
Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. FSRP Critical Seepage Repair	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Interior Drainage Improvements	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 5. Implement recommendations in Courtland Flood Risk Reduction Plan	RD 551 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 554						
Action 1. Small Communities Plans – Flood Protection – Structural and Nonstructural Mitigation	RD 554	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Disadvantaged Community Projects and subsequent updating in 2021.	RD 554	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 3. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.	RD 554	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. 2021 Emergency Operations Plan (EOP) – Currently in development	RD 554	New Action	X	X	X	Prevention Emergency Services
Action 5. Regional Flood Management Plan Projects	RD 554	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 556						
Action 1. 2021 Emergency Operations Plan (EOP) – Currently in development	RD 556	New Action	X	X	X	Prevention Emergency Services
Action 2. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.	RD 556	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Regional Flood Management Plan Projects	RD 556	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
RD 563						
Action 1. Rock Slope Protection Project	RD 563 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Levee Geometry Levee Improvement Project	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 3. Levee Failure Repair Project	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Levee Seepage Repair Project	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 5. Backup Power Generator Project	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
Action 6. Flood Exercise and Emergency Operations Plan Update	RD 563 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
RD 1002						
Action 1.Regional Flood Management Plan Projects	RD 1002 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2.2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.	RD 1002 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3.2021 Emergency Operations Plan (EOP) – Currently in development	RD 1002 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
RD 1601						
Action 1. Levee Improvement Project	RD 1601 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 2. Rock Slope Protection Project	RD 1601 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. San Joaquin River Setback Levee	RD 1601 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Backup Power Project	RD 1601 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
Action 5. Flood Safety Plan Updates, Training, and Exercises	RD 1601 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
RD 2111						
Action 1. Rock Slope Protection Project	RD 2111 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 2. Levee Improvement Projects	RD 2111 and unincorporated Sacramento County	2016 Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 3. Overflow Weir Project	RD 2111 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection
Action 4. Syphon Project	RD 2111 and unincorporated Sacramento County	New Action	X	X	X	Property Protection Structural Projects Natural Resource Protection

Action Title	Jurisdictions Benefitting from Action (s)	New Action/ 2016 Action	Address Current Development	Address Future Development	Continued NFIP Compliance	Mitigation Type
Action 5. Backup Power Project	RD 2111 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services
Action 6. Flood Safety Plan Updates, Training, and Exercises	RD 2111 and unincorporated Sacramento County	New Action	X	X	X	Prevention Emergency Services

Multi-Hazard Actions

Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Hazards Addressed: Multi-hazard (Aquatic Invasive Species, Climate Change, Dam Failure, Drought & Water shortage, Earthquake, Floods: 1%/0.5%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (Assembly Bill (AB) 2140).

Project Description: Specifically, this section requires that each applicable jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Safety Element of General Plan

Responsible Office/Partners: Sacramento County Planning Department and planning departments for each incorporated jurisdiction.

Cost Estimate: Jurisdictional board/staff time

Participating Jurisdictions: County and incorporated cities.

Benefits (avoided Losses): Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

Potential Funding: Local budgets

Timeline: 2021-2026

Project Priority: High

Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness

Hazards Addressed: Multi-hazard (Agricultural Hazards: Severe Weather/Insect/Pests, Aquatic Invasive Species, Avalanche, Climate Change, Dam Failure, Drought & Water shortage, Earthquake, Floods: 100/500 year, Floods: Localized Stormwater, Landslide, Mudslide, and Debris Flow, Levee Failure,

Pandemic Severe Weather: Extreme Heat, Severe Weather: Heavy Rain and Storms, Severe Weather: Wind and Tornado, Severe Weather: Winter Storm and Freeze, and Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Sacramento County plays a key role in public outreach/education efforts to communicate the potential risk and vulnerability of their community to the effects of natural hazards. A comprehensive multi-hazard public education program will better inform the community of natural hazards of concern and actions the public can take to be better prepared for the next natural disaster event.

Project Description: A comprehensive multi-hazard outreach program will ascertain both broad and targeted educational needs throughout the community. The County will work with other agencies as appropriate to develop timely and consistent annual outreach messages in order to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will leverage and build upon existing mechanisms, will include elements to meet the objectives of Goal 3 of this LHMP Update, and will consider:

- Using a variety of information outlets, including websites, local radio stations, news media, schools, and local, public sponsored events;
- Creating and distributing (where applicable) brochures, leaflets, water bill inserts, websites, and public service announcements;
- Displaying public outreach information in County office buildings, libraries, and other public places and events;
- Developing public-private partnerships and incentives to support public education activities.

Other Alternatives: Continue public information activities currently in place.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing County outreach programs will be reviewed for effectiveness and leveraged and expanded upon to reach the broader region.

Responsible Office/Partners: Sacramento County, incorporated communities, and other jurisdictions

Priority (H, M, L): High

Cost Estimate: Annual costs to be determined, and will depend on the scope and frequency of activities and events as well as volunteer participation

Benefits (Losses Avoided): Increase residents' knowledge of potential hazards and activities required to mitigate hazards and be better prepared. Protect lives and reduce damages, relatively low cost to implement.

Potential Funding: Local budgets, grant funds

Timeline: Ongoing/Annual public awareness campaign

Action 3. County-wide Mass Care and Shelter Plan Update

Hazards Addressed: Multi-hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The current Mass Care & Shelter Plan was published in 2012 and is sorely out of date and does not include lessons learned from the COVID-19 pandemic (PPE, non-congregate sheltering, feeding, etc.). Regulations, guidance and training requirements from the National to local level have changed significantly in the last nine years and needs to be captured and incorporated into County emergency mass care and sheltering operations. Lastly, several organizations listed in the current Plan no longer exist as they are portrayed in the Plan.

Project Description: Update the Mass Care and Shelter Plan memorializing Mass Care and Shelter activities that took place in response to the 2020 California wildfires and Novel Coronavirus 2019 (COVID-19). The project description includes:

- Updates to the 2012 Mass Care and Shelter Plan according to the latest available Federal, State and Local guidance and lessons learned from COVID-19 and wildfires
- Memorialize procedures and requirements for non-congregate sheltering and any other issues in managing sheltering in a social distancing environment
- Identify all of the non-congregate shelter facilities within Sacramento County; prioritize based on various factors including cost, access, flood plain, regional capacity, etc.
- Create a contact list of all non-congregate shelter options for future contract needs

Other Alternatives: Continue using current Mass Care & Shelter Plan and coordinate with agencies (as time permits) in order to update plans and procedures. Most mass care & shelter operations would be handled by OES, ARC and DHA adjusting procedures on the fly; with ad-hoc coordination with partnering agencies. This alternative is far less efficient and could cost lives.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Contract with competitively selected vendor to coordinate with all affected organizations throughout the County of Sacramento to create a straightforward Mass Care & Shelter annex with up-to-date information in order to make critical, real-time decisions.

Responsible Agency/ Department/Partners: Sac Co OES, PER, DHA, DHS, Jurisdictions' OES, Utilities, SacRT, Paratransit, ARC, VOAD

Cost Estimate: $30,000

Benefits (Losses Avoided): The benefits of updating our Mass Care & Shelter Plan are four-fold. It will:

- Capture the latest available Federal, State and Local guidance and lessons learned from COVID-19 and wildfires
- Memorialize procedures and requirements for non-congregate sheltering and any other issues in managing sheltering in a social distancing environment
- Identify all of the non-congregate shelter facilities within Sacramento County

- Provide a prioritize shelter list based on various factors including cost, access, flood plain, regional capacity, etc.

Having this information in the Plan in a consolidated and easy to reference manner will help all organizations understand their roles/responsibilities and which other support agencies and contacts are available. This update will also allow us to have at the ready, a complete and prioritized listing of all temporary evacuation points and shelter facilities within each zone in the County (to include 24/7 contact information). Having this information at our fingertips will save precious time and allow us to focus on caring for and sheltering our population; thus saving lives.

Potential Funding: FEMA and other available grants. Local, state funding.

Timeline: 3 years (recurring)

Project Priority (H, M, L): M

Action 4. County-wide Evacuation Annex Update

Hazards Addressed: Multi-hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The current Evacuation Annex is three years old and minimally mentions the access and functional needs community, and includes little operational information with regards to services, locations and resources available or that would be requested in an evacuation. Also, there is no public campaign associated with our current Annex to help education the population in order for them to help themselves and relieve some of the burden on first responders. Finally, the current plan does not include demographic information (English as second language, vehicle ownership, medically fragile, etc.) in order to be able to pre-plan resources based on the zone evacuated.

Project Description: Update the Sacramento County Evacuation Plan and associated appendices. Memorialize lessons learned during evacuations and patient movement activities that took place in response to the Novel Coronavirus 2019 (COVID-19) and 2020 California wildfires. Project Description includes:

- Update the 2018 Evacuation Plan and associated appendices
- Identify all potential Temporary Evacuation Points (aka Evacuation Transfer Points) within Sacramento County; prioritize based on various factors including cost, access, flood plain, regional capacity, etc.
- Identify non-congregate sheltering within each zone, and determine travel distance, road capacity, and time from one zone to another
- Create numeric evacuation zones, as sub-sets of the Sheriff Patrol Districts; to include, mapping available cell towers (for pre-identified WEA polygons) and provide calculations on the number of people and the logistical support needed per zone per day
- Identify and create shapefiles for each of the zones to be loaded onto the emergency web pages and other operational software/systems
- Develop a “Know your Zone” campaign
- Translation of evacuation messages into the top 4 identified languages within the County
- Estimate the number of people in each “evacuation zone” and calculate the needs for food (to include cultural/dietary suggestions), water, etc.

Other Alternatives: Continue using current Evacuation Annex and coordinate with agencies (as time permits) in order to update plans and procedures. Much of the evacuation operations would be handled by the Sheriff's Office, possibly "writing procedures" in real-time; with ad-hoc coordination with partnering agencies. This alternative is far less efficient and could cost lives.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Contract with competitively selected vendor to coordinate with all affected organizations throughout the County of Sacramento to create a straightforward evacuation annex with pertinent information in order to make critical, real-time decisions.

Responsible Agency/ Department/Partners: Sac Co OES, PER, SacDOT, Jurisdictions' OES, CHP, Utilities, SacRT, Paratransit, VOAD, ARC

Cost Estimate: $95,000

Benefits (Losses Avoided): An Evacuation Annex that is coordinated with all responding agencies, partner organizations and local jurisdictions that defines evacuation zones, routes, evacuation points, zone demographics, and zone population will ensure highly efficient and effective evacuation operations when the time comes. This Annex will synchronize with local evacuation plans/routes to ensure a smooth transition to/through zones and jurisdictions. This annex will also include a "Know Your Zone" campaign to educate the population about their particular zone (routes, meeting points, etc.).

Potential Funding: FEMA and other available grants. Local, state funding.

Timeline: 3 years (recurring)

Project Priority (H, M, L): M

Action 5. Evacuation Planning Countywide

Hazards Addressed: Multi-hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Sacramento's unique geography and riverine systems make evacuation difficult and constrained by bridges and other elements. Refining the evacuation zones are necessary to study and identify corridors for improvement and/or provide identification of areas where rapid or early evacuation may be necessary.

Project Description: The evacuation zone mapping and hazard threat assessment will help in the county's compliance with SD 99 and AB 747 regarding evacuation corridor capacity and multiple community egress. Once the elements are studied, they may be applied to zone mapping criteria. Following mapping, an awareness campaign to inform residents of their relative risk and familiarize them with their zones and primary routes of travel will be necessary. The software that would be used is Zonehaven or similar GIS based product that can integrate with the county's alerting system.

Other Alternatives: Increase capacity of corridors used for evacuation.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Emergency Operations Plan, Evacuation Annex, SACOG corridor capacity studies, MARAC Region IV Evacuation Guidelines

Responsible Agency/ Department/Partners: Sacramento County OES

Cost Estimate: $2 million

Benefits (Losses Avoided): Improvements to corridors and/or capacities to evacuate greater numbers of people. Improvement to the resiliency of corridors to allow more of the community to shelter-in-place for certain disaster types

Potential Funding: Roadway improvement, capital project funding

Timeline: Within 5 years

Project Priority (H, M, L): H

Action 6. Expand Broadband/Wifi Access

Hazards Addressed: Multi-hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The COVID-19 Pandemic has brought to light disparities in access to broadband and Wi-Fi within communities.

Project Description: Wifi and broadband access would be distributed at county park facilities. The installation of additional towers in the Sacramento-San Joaquin Delta would address existing coverage gaps that disadvantage that community from receiving timely safety information.

Other Alternatives: Partner with companies installing 5G and explore additional wireless alternatives.

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Agency/ Department/Partners: Sacramento County OES

Cost Estimate: $4 million

Benefits (Losses Avoided): Improvements to areas of the county without adequate coverage. This will foster more rapid technology that uses automated alert and warning such as Shake Alert, Alert Notifications, Levee Failure and Flash Flood Warnings or other sensor technologies used to study conditions for potential future mitigation or provide warning.

Potential Funding: FEMA, Cal OES, and other grant sources.

Timeline: Within 5 years

Project Priority (H, M, L): H

Climate Change and Pandemic Actions

Action 7. Implement and improve telecommuting and remote work access for County operations

Hazards Addressed: Climate Change, Pandemic

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The COVID-19 pandemic created a nationwide work-from-home program virtually overnight. The County, like many organizations, was technologically unprepared for this shift, lacking high-speed broadband access, computer hardware, backbone infrastructure, and software solutions to allow employees to work-from-home. The shift to remote work resulted in significant, measurable decreases in traffic, air pollution, and greenhouse gas (GHG) emissions. The ability to work remotely, whether from home or alternative work locations, has proven feasible, and will remain as a component of business and government operations. This shift to remote work provides one method to prevent the reemergence of COVID-19 or other communicable diseases in the workplace. It also assists in achieving the reductions in Vehicle Miles Traveled (VMT) necessary to reduce the effects of climate change. Climate change has been identified as a public health threat and national security risk. Therefore, it is becoming increasingly apparent that the ability to remotely work and decentralize government operations will provide lasting public health, climate, and national security benefits.

Project Description: This project could include high-speed broadband access, computer hardware, backbone infrastructure, and software solutions.

Other Alternatives: Return to the pre-COVID model of centralized government operations.

Existing Planning Mechanism(s) through which Action Will Be Implemented: This action could be implemented through changes to internal County policies such as information technology, purchasing, and capital improvements. The action would also be coordinated with labor organizations and their agreements. This action is consistent with and supportive of measures and policies in the County Climate Action/Adaptation Plan.

The action would dovetail with existing programs such as the State Homeland Security Program (SHSP) and the Urban Area Security Initiative (UASI).

Responsible Agency/ Department/Partners: OCE, DTECH, DPS, SacOES, PER, DGS

Cost Estimate: $10,000 to $1,000,000

Benefits (Losses Avoided): This action would result in reduced public health risk from communicable disease and would reduce the effects of climate change through the reduction of GHG emissions associated with employee commute trips. This action has the added co-benefit of supporting dispersed personnel and decentralized infrastructure and services; thus making the community more resilient to natural or man-made disasters by minimizing the target footprint and assuring a pathway for continuity of operations.

Potential Funding: FEMA hazard mitigation program. Local, state and private funding. Other grants, incentives, and donations, including in-kind services.

Timeline: 1-3 years

Project Priority (H, M, L): M

Action 8. Implement the actions contained within the Sacramento County Climate Action/Adaptation Plan

Hazards Addressed: Climate Change, Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: In recent decades, human activities (e.g., burning of fossil fuels for transportation and energy, increasing rates of deforestation and development) have contributed to elevated atmospheric greenhouse gas (GHG) concentrations. Human-caused emissions of GHGs above natural ambient concentrations are responsible for intensifying the greenhouse effect, leading to a trend of unnatural warming of the Earth's climate, known as global climate change, or global warming. Global climate change has a number of adverse effects on natural resources and the human population. These include:

- rising sea levels due to thermal expansion of ocean water and melting of polar ice caps and sea ice, which can inundate low-lying areas exposed to tidal action and increase the severity of flooding risk;
- changes in the timing, severity, and amounts of rainfall and snowfall, leading to changes and greater variability in wet and dry periods that will affect water supply and flood risk;
- increased stress to vegetation and terrestrial and aquatic habitats, leading to adverse effects on biological resources and sensitive species;
- changes in the frequency and duration of heat waves and droughts, which can affect human populations and community infrastructure; and
- increases in wildfire hazards.

Over the long term, these changes create the potential for a wide variety of secondary consequences, including human health and safety risks, economic disruptions, diminished water supply, shifts in ecosystem function and habitat qualities, and difficulties with provision of basic services.

Addressing climate change requires an integrated approach, or plan, that targets both the sources and the potential effects of climate change.

Project Description: This project would include the implementation of the GHG reduction measures and adaptation strategies contained within Sacramento County's Climate Action Plan(s) and Vulnerability Assessment(s). Projects could include the following: revisions to adopted plans and codes, creation of new programs, incentives, education and outreach, demonstration projects, capital improvements, land acquisition, and carbon sequestration projects.

Other Alternatives: Address climate impacts on a singular basis through each individual hazard such as increased flooding, drought, wildfires, extreme weather, increased heat events, and critical infrastructure vulnerabilities.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Updates to the General Plan, Zoning Code, Design Guidelines, Building Code, Stormwater Design, and County Code. Changes to internal County policies such as purchasing, capital improvements, and fleets. Negotiation of labor agreements.

Responsible Agency/ Department/Partners: PER, DWR, SacDOT, SacOES, BP&I, DGS, SMUD, Regional Parks, SMAQMD, non-governmental and community-based organizations.

Cost Estimate: Varies depending on project size and scope. Order of magnitude of tens to hundreds of thousands of dollars most common.

Benefits (Losses Avoided): Because climate change exacerbates most other hazards, the benefits of this mitigation action include those associated with most other mitigation actions in this annex. Additionally, the centralized and coordinated all-hazards approach of addressing climate change through this mitigation action will provide economies of scale, multiple co-benefits, and the policy and legal framework to assure that climate adaptation, resiliency, and meaningful greenhouse gas (GHG) reductions occur.

Potential Funding: FEMA hazard mitigation program. Local, state and private funding. Other grants, incentives, and donations, including in-kind services.

Timeline: 1-5 years

Project Priority (H, M, L): H

Action 9. Develop and incentivize carbon sequestration plans and programs

Hazards Addressed: Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: In recent decades, human activities (e.g., burning of fossil fuels for transportation and energy, increasing rates of deforestation and development) have contributed to elevated atmospheric greenhouse gas (GHG) concentrations. Human-caused emissions of GHGs above natural ambient concentrations are responsible for intensifying the greenhouse effect, leading to a trend of unnatural warming of the Earth's climate, known as global climate change, or global warming. Global climate change has a number of adverse effects on natural resources and the human population. These include:

- rising sea levels due to thermal expansion of ocean water and melting of polar ice caps and sea ice, which can inundate low-lying areas exposed to tidal action and increase the severity of flooding risk;
- changes in the timing, severity, and amounts of rainfall and snowfall, leading to changes and greater variability in wet and dry periods that will affect water supply and flood risk;
- increased stress to vegetation and terrestrial and aquatic habitats, leading to adverse effects on biological resources and sensitive species;
- changes in the frequency and duration of heat waves and droughts, which can affect human populations and community infrastructure; and
- increases in wildfire hazards.

Over the long term, these changes create the potential for a wide variety of secondary consequences, including human health and safety risks, economic disruptions, diminished water supply, shifts in ecosystem function and habitat qualities, and difficulties with provision of basic services.

The sequestration of carbon dioxide from the atmosphere combined with robust reductions in the emissions of GHGs is an accepted method to address climate change. Carbon sequestration can best be achieved by focusing on habitat preservation, increasing the urban forest and connected open space, and carbon farming.

Project Description: This project would include the implementation of various sequestration projects including open space land acquisition and management, carbon farming education and pilot programs, incentives, and investment in new sequestration technology. This program may be coordinated with industry groups and non-profits.

Other Alternatives: Address climate impacts on a singular basis through each individual hazard such as increased flooding, drought, wildfires, extreme weather, increased heat events, and critical infrastructure vulnerabilities.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Climate Action Plan and updates to the General Plan and Zoning Code. University of California (UC) Agricultural Extension Cooperative Agreements.

Responsible Agency/ Department/Partners: PER, Regional Parks, SMAQMD, non-governmental and community-based organizations, SMUD, Agricultural Commissioner, Farm Bureau, Cattlemen's Association, Nature Conservancy, Sacramento Valley Conservancy.

Cost Estimate: Varies depending on project size and scope. Order of magnitude of tens to hundreds of thousands of dollars most common.

Benefits (Losses Avoided): Because climate change exacerbates most other hazards, the benefits of this mitigation action include those associated with most other mitigation actions in this annex. Additionally, the centralized and coordinated all-hazards approach of addressing climate change through this mitigation action will provide economies of scale, multiple co-benefits, and the policy and legal framework to assure that climate adaptation, resiliency, and meaningful greenhouse gas (GHG) reductions occur.

Potential Funding: FEMA hazard mitigation program. Local, state and private funding. Other grants, incentives, and donations, including in-kind services.

Timeline: 1-5 years

Project Priority (H, M, L): H

Action 10. Update the Sacramento County Climate Action for carbon neutrality by 2030

Hazards Addressed: Climate Change, Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: In recent decades, human activities (e.g., burning of fossil fuels for transportation and energy, increasing rates of deforestation and development) have contributed to elevated atmospheric greenhouse gas (GHG) concentrations. Human-caused emissions of GHGs above natural ambient concentrations are responsible for intensifying the greenhouse effect, leading to a trend of unnatural warming of the Earth's climate, known as global climate change, or global warming. Global climate change has a number of adverse effects on natural resources and the human population. These include:

- rising sea levels due to thermal expansion of ocean water and melting of polar ice caps and sea ice, which can inundate low-lying areas exposed to tidal action and increase the severity of flooding risk;
- changes in the timing, severity, and amounts of rainfall and snowfall, leading to changes and greater variability in wet and dry periods that will affect water supply and flood risk;
- increased stress to vegetation and terrestrial and aquatic habitats, leading to adverse effects on biological resources and sensitive species;
- changes in the frequency and duration of heat waves and droughts, which can affect human populations and community infrastructure; and
- increases in wildfire hazards.

Over the long term, these changes create the potential for a wide variety of secondary consequences, including human health and safety risks, economic disruptions, diminished water supply, shifts in ecosystem function and habitat qualities, and difficulties with provision of basic services.

Addressing climate change requires an integrated approach, or plan, that targets both the sources and the potential effects of climate change.

On December 16, 2020, the Sacramento County Board of Supervisors adopted a resolution declaring a climate change emergency. The resolution requires urgent and immediate mobilization of public and private resources to develop and implement a climate action plan that identifies and integrates current and future actions necessary to achieve an equitable, sustainable, and resilient economy and transition to a countywide carbon neutrality footprint by 2030.

Project Description: Pursuant to the County's adopted climate emergency resolution, this project would include an update to the Climate Action Plan and associated elements of the County General Plan to update GHG forecasts, GHG reduction measures, and policies to achieve carbon neutrality by 2030.

Other Alternatives: Do not update the climate action plan and/or achieve and document carbon neutrality through other means.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The project would most likely be implemented through a concurrent update to the General Plan. It could also include: revisions to the Zoning Code, Design Guidelines, Building Code, Stormwater Design, and County Code; changes to internal County policies, such as purchasing, capital improvements, and fleets; and negotiation of labor agreements. Another planning mechanism could be through adoption of an annex to the County Emergency Operations Plan.

Responsible Agency/ Department/Partners: PER in collaboration with DWR, SacDOT, SacOES, BP&I, DGS, SMUD, Regional Parks, SMAQMD, non-governmental and community-based organizations.

Cost Estimate: $500,000

Benefits (Losses Avoided): The release of atmospheric carbon dioxide is a major contributing factor to climate change. Because climate change exacerbates hazards, the benefits of this mitigation action include those associated with most other mitigation actions in this annex. Establishing carbon neutrality, would assure that no more carbon is released than is sequestered, and that the impacts associated with climate change will be reduced.

Potential Funding: FEMA hazard mitigation program. Local, state and private funding. Other grants, incentives, and donations, including in-kind services.

Timeline: 3-5 years

Project Priority (H, M, L): H

Dam Failure, Flood: 1%, 0.5%, 0.2% annual chance, Flood: Localized Flood, Levee Failure, Subsidence, and Severe Weather: Heavy Rains and Storms Actions

Action 11. Bicycle/pedestrian bridge across Discovery Park connecting Garden Highway to the Jibboom Street bridge

Hazards Addressed: Flood, Earthquake, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The Natomas Basin has a high risk of flooding and is bordered by Interstate 5, Highway 80, canals, and the Sacramento and American Rivers. These features provide barriers to the safe and efficient evacuation of pedestrians and bicycles from the Basin during a flood. Originally, the Jibboom Street Bridge crossed the American River from the south and connected to the Garden Highway. The Jibboom Street bridge now drops into Discovery Park, which is designed to flood every winter during high water events thus preventing people in Natomas from accessing the bridge. During these high water events, bicyclists are allowed to use the shoulder of the Interstate 5 bridge to cross the American River. This situation is potentially unsafe and leads to a high level of traffic stress for users. The level of stress would be exacerbated during a mass evacuation event and the risk of an accident would increase, which would then limit the bridge's effectiveness in moving people out of harm's way.

Project Description: This project would utilize the existing right-of-way (ROW) to connect the bike trail that runs along the portion of the Garden Highway in Natomas, west of Interstate 5, through Discovery Park to the Jibboom Street Bridge and increase connectivity for all modes of transportation into and out of the Natomas Basin.

Other Alternatives:

- Expand/modify the existing Interstate 5 bridge over the American River to include bicycle/pedestrian areas to allow for safe and convenient crossings.
- Build the Green Line light rail extension bridge over the American River including bicycle/pedestrian areas to allow for safe and convenient crossings.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Updates to the American River Parkway Plan, Bicycle Master Plan (or Active Transportation Plan), and Capital Improvement Plan (CIP) budgeting process.

Responsible Agency/ Department/Partners: SacDOT, Regional Parks, PER, City of Sacramento, SacOES

Cost Estimate: $1-10 million

Benefits (Losses Avoided): This project would help avoid the loss of human life during a flood in the Natomas Basin by providing a safe and secure evacuation route for bicycles and pedestrians. It would also provide an accessory point of ingress/egress to the Natomas Basin in the event the Interstate 5 bridge over the American River was compromised. A co-benefit by providing year-round bicycle and pedestrian

connections across the American River, is that Vehicle Miles Traveled (VMT) would be reduced, which would reduce greenhouse gas (GHG) emissions. Reducing GHG emissions will reduce the impacts of climate change and thereby reduce the other hazards exacerbated by climate change.

Potential Funding: FEMA hazard mitigation program. local, state and private funding. SACOG and other grants, Natomas Basin development fees, incentives, and donations, including in-kind services.

Timeline: 5 years

Project Priority (H, M, L): M

Action 12. Acquire Floodprone Properties

Hazard(s) Addressed: Flood, Levee Failure

Issue/Background: Acquisition in lieu of elevation or other mitigation measure could be applicable when there is a structure at risk of flooding in an area that would be suitable for long term ownership by a public agency.

Project Description: Appraisal, agreement, acquisition, demolition, deed restriction

Other Alternatives: Flood control, flood-proofing, structure elevation

Existing Planning Mechanism(s) through which Actions will be Implemented: various park and parkway plans and open space plans

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $400,000 to $2,000,000(+) per property, depending on appraised value and project benefit

Benefits (Losses Avoided): life safety, elimination of flood damage because the structure is gone

Potential Funding: various FEMA grants, park grants, clean water grants

Timeline: 5 years

Project priorities (High, Medium, Low): Medium

Action 13. Maintain and improve railroad embankment levee from south of Freeport to south of Hood, a reach owned by CA Parks Department (Railroad Museum)

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The abandoned railroad line from Freeport to south of Hood is an embankment separating Beach Stone Lakes floodplain from the area to the west toward the Sacramento River. The railroad right of way is owned by the CA Parks Department associated with the Railroad Museum. It also is the secondary protection should the Sacramento River levee fail, which is owned and maintained by the CA DWR Maintenance Area 9.

Project Description: The long term plan by the state of California is not understood by the local community. This railroad embankment acts like a levee but needs repair and improvement.

Other Alternatives: An analysis of project alternatives should be developed.

Existing Planning Mechanism(s) through which Actions will be implemented: County flood planning.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $20,000,000

Benefits (losses avoided): When the Beach Stone Lakes floodplain is high, failure of this railroad could allow floodwater from east to west damaging areas including the historic town of Hood.

Potential Funding: FEMA grants, various federal grants, state grants, local match funding

Timeline: 2 to 5 years

Project Priority (H, M, L): Medium

Action 14. McCormack Williamson flood control weir

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Local flooding occurs in the Beach Stone Lakes and Franklin Pond area, building up against the levees that surround the McCormack Williamson Tract (Reclamation District 2110) until the levee breaks as recently occurred in 2017. The solution is to construct a permanent weir at the northeast end of the tract.

Project Description: California Department of Water Resources intends to construct a weir that will reduce the risk of sudden levee failure, thereby reducing flood damage upstream and downstream of the McCormack Williamson Tract.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Actions will be implemented: The environmental impact report was circulated years ago, there will be a supplemental report in 2021.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section.

Cost Estimate: $30,000,000

Benefits (losses avoided): $millions if a levee were to break due to the sudden surge of water associated with a breach at McCormack Williamson Tract.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): High

Action 15. Flood risk mitigation for Mobile Home and Recreational Vehicle Parks

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Mobile home Parks and RV Parks are licensed by the State of California, the parks are grandfathered into the Code of Federal Regulations requiring the floors to be 3 feet high regardless of actual flood risk.

Project Description: Flood risk reduction, flood warning systems, evacuation procedures

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Actions will be implemented: County flood planning.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $200,000 to develop risk map products for the properties

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: FEMA grants, various federal grants, state grants, local match funding

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 16. Plan for Public Information (PPI)

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The FEMA Community Rating System describes best practices and rewards NFIP communities who have a PPI

Project Description: Keeping the Program for Public Information (PPI) current and annually implementing the program is important to the community's awareness and preparedness in case of flood but it also provides other important information such as mitigation measures, building restrictions and storm water regulations

Other Alternatives: Delay or omit informational outreach, but that would not be appropriate

Existing Planning Mechanism(s) through which Actions will be implemented: The FEMA Community Rating System is a very good guide to PPI.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section.

Cost Estimate: $80,000 per year

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Annual

Project Priority (H, M, L): Medium

Action 17. Mitigation of repetitive loss flood areas and properties

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: When a structure floods twice in ten years it is deemed a repetitive loss property and there should be additional effort applied to mitigating the flood hazard at that property, of course, subject to a willing property owner. Where one structure is listed as repetitive loss by FEMA, there are often more who happened to not have insurance or for other reasons were not listed, thus the community maps repetitive loss areas.

Project Description: Map repetitive flood loss areas, discover the cause of the flooding, field surveying may be required, contact the property owners, develop mitigation strategies and implement mitigation projects.

Other Alternatives: There are area specific alternatives described in the repetitive loss plan, these will be detailed when property owners invite the County to help them.

Existing Planning Mechanism(s) through which Actions will be implemented: This is an important part of the Sacramento County Program for Public Information.

Responsible Agency / Department / Partners: County DWR in coordination with other state, county, and local agencies.

Cost Estimate: $5 million

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 18. Flood risk mapping

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: FEMA flood insurance rate maps simply tell people if they are in or out if they must buy flood insurance or not, however, the maps do not tell people the frequency, depth, and velocity of the water.

Project Description: Flood risk mapping would be done in a location, such as a repetitive loss area, to determine the frequency, depth and velocity of the water. Then flood warning systems can be established and ultimately flood hazard mitigation projects can be constructed.

Other Alternatives: Treating all flood insurance rate map floodplains the same is not a viable alternative.

Existing Planning Mechanism(s) through which Actions will be implemented: The tools are available; it really depends on an area of residents desiring this information.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $100,000 per area analyzed

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 19. Storm Ready

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: It is believed that every resident, homeowner, business owner should understand the flood hazard that could affect their interests and mitigate that risk. Mitigation measures include being ready to flood fight and to evacuate, being storm ready.

Project Description: Weather radio, understanding the hazard and risk, high water notices describing the flood depth, brochures, outreach,

Other Alternatives: No action

Existing Planning Mechanism(s) through which Actions will be implemented: County flood planning.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $100,000

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 20. Alder Creek flood hazard mitigation

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Alder Creek drains from the City of Folsom through Aerojet and into Lake Natomas. It is a drainage area that was heavily gold mined in the late 1800s into mid-1900s. Now, there are land development interests. On the creek is a circa 1890 miner's debris dam that is in poor shape.

Project Description: Repair the dam so that it may stand the test of time.

Other Alternatives: Remove the dam and the sediment behind it

Existing Planning Mechanism(s) through which Actions will be implemented: Glenborough Master Plan.

Responsible Agency / Department / Partners: City of Folsom with oversight by County of Sacramento Floodplain Management Section

Cost Estimate: $1M to $10M

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 21. Operational protocol for American River pump stations that are affected by the reoperation of Folsom Dam

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Folsom Dam has a new lower and larger spillway that allows the operator to do forecast based water management; however, the river will be high more often. Consequently the operation of the pump stations might need to be revised. This could include upgrades to the pump stations.

Project Description: Analysis, modeling and mapping, discussion with operations team and consider what changes might be necessary

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Actions will be implemented: Sacramento County floodplain management staff have prepared models for existing condition at each pump station.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $1M

Benefits (losses avoided): Reduced risk to people and property.

Potential Funding: FEMA, CA DWR, USACE, other

Timeline: Within 5 years.

Project priorities (High, Medium, Low): medium

Action 22. Arcade Creek flood control

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Flooding is a common occurrence on Arcade Creek,

Project Description: Construct Gum Ranch basin, improve existing floodwalls and levees, clean sediment, repair erosion, improve pump station(s), complete FEMA modeling and mapping updates, outreach public information

Other Alternatives: Other mitigation measures

Existing Planning Mechanism(s) through which Actions will be implemented: South Branch Arcade Creek CLOMR/LOMR, Arcade Creek analysis and map revision, Evergreen Estates, Cameron Ranch, and operation and maintenance reports.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $5 million (+/-)

Benefits (losses avoided): Flood control, flood risk knowledge and outreach, flood hazard mitigation.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 23. Beach Stone Lakes area flood risk reduction program

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Flooding is frequent after heavy rains in the Beach Stone Lakes area

Project Description: McCormack Williamson weir, Stanton Island flood control, Snodgrass Slough conveyance improvement, raise structures, raze structures, raise wells, abandon basements, add foundation vents, construct floodwalls and flood berms, livestock mounds. Encourage CA DWR to repair and improve the Sacramento River levee from Freeport to downstream of Hood, manage peak flow and volume upstream, ensure flood risk, enhance warning and evacuation.

Other Alternatives: The alternatives are listed in the project description

Existing Planning Mechanism(s) through which Actions will be implemented: Beach Stone Lakes Area flood hazard mitigation program, various reports

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $50,000 to $5M depending on scope of project(s)

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure are risk of flooding.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 24. Protect critical facilities from flooding

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Every property is important but there are certain facilities that are critical to be up and running post-flood-disaster, these critical facilities should take priority in flood hazard mitigation

Project Description: Raise, protect, or relocate structures and critical features so that they are reasonably safe from statistically improbable flood hazards

Other Alternatives: The alternatives are expressed in the project description

Existing Planning Mechanism(s) through which Actions will be implemented: General Plan Safety Element, Floodplain Management Ordinance, ASCE-24.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: Up to $5M depending on size and scope of each project

Benefits (losses avoided): Structure protection from flooding but the importance of a critical facility post flood disaster would be much greater than merely the structure being protected

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 25. Dam Safety (Activity 630)

Hazard(s) Addressed: Dam Failure, Levee Failure, Heavy Rains and Storms, Flood, Localized Flood,

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: There are several dams that can affect Sacramento County, the most potentially catastrophic is Folsom. Recently and new spillway was constructed, so the chance of dam breach is reduced but there could be a 'controlled' release from the spillway that overwhelms the levees

Project Description: Develop an emergency management and public outreach effort using the Community Rating System Activity 630 as our guide.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Actions will be implemented: The Community Rating System Activity 630 is our guide for this Action.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $200,000 for the initial planning and outreach

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 26. Flood fighting for Delta legacy communities: Hood, Courtland, Locke, Walnut Grove

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The levees protecting the Delta legacy communities are not accredited to FEMA standards and there should be attention directed to flood risk reduction for these communities.

Project Description: In the Flood Risk Reduction Plans for each of the Delta legacy communities there are proposed management actions. These actions should be considered and acted upon by the communities

Other Alternatives: Flood insurance is a form of mitigation

Existing Planning Mechanism(s) through which Actions will be implemented: Flood Risk Reduction Plans for each of the Delta legacy communities.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $millions as described in the plan for each community

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 27. Implement Delta Small Communities Projects

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake, Earthquake Liquefaction

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: In 2018-2021, Sacramento County Water Resources developed, with CA DWR grant funds and significant input from the communities, programmatic flood risk reduction plans for the towns of Hood, Courtland, Walnut Grove east, Locke, and Walnut Grove west.

Project Description: Each plan has management actions and recommendations

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Actions will be implemented: These are programmatic plans to which detailed plans and requisite documentation and environmental review will be required.

Responsible Agency / Department / Partners: Sacramento County in partnership with Delta communities and reclamation districts.

Cost Estimate: the cost estimates for each measure are described in the plans

Benefits (losses avoided): Reduced flood risk in the Delta communities. Water supply to the state of California and local flood control

Potential Funding: FEMA, CA DWR, US Army Corps of Engineers, others

Timeline: 2 to 10 years

Project Priority (H, M, L): Medium

Action 28. Elevate houses to reduce flood risk

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Raising structures on a firm flood resistant foundation so that the floor is safely above the flood hazard elevation is agreed to be a very effective flood hazard mitigation measure.

Project Description: Raise houses and other structures so the floor is safely above the flood hazard elevation, the lower level would be subject to flooding and can only be used for vehicles and incidental storage, things that can be quickly relocated to high ground.

Other Alternatives: Flood insurance is not the best form of flood mitigation.

Existing Planning Mechanism(s) through which Actions will be implemented: Sacramento County Floodplain Management Section has managed numerous grants for the raising of houses.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: Typically $150,000 to $200,000 to raise a house

Benefits (losses avoided): Protection of property and life safety

Potential Funding: FEMA grants, various federal grants, state grants, local match funding

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 29. Flood emergency management exercises

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: It is important to train for emergencies so that key people know what to do when/if the real event occurs. FEMA encourages flood emergency exercises by their Community Rating System in which the County is well ranked.

Project Description: Annual flood emergency exercises

Other Alternatives: There are various forms of exercises from tabletop, webinar, panel discussion, and full scale real time.

Existing Planning Mechanism(s) through which Actions will be implemented: The Sacramento County Floodplain Management Section and the Office of Emergency Services would plan the exercises and many others will play in the exercises.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $10,000 to $150,000 per exercise depending on scope

Benefits (losses avoided): Understanding flood hazards and risks and how to manage a flood event is important in protecting life safety.

Potential Funding: FEMA, CA DWR, US Army Corps of Engineers, others

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 30. Flood evacuation mapping

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: To understand flood hazards one must understand the routing of flood water and time to reach certain depths at which the evacuation would become rescue.

Project Description: Analyze various flood events and map the resulting flood, time to reach 12" deep in the streets and ultimate depth. Map evacuation routes for various scenarios.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Actions will be implemented: Much of this work has been done and should be reviewed, exercised and updated from time to time. There are areas where flood hazards have not yet been analyzed and evacuation mapping has not yet been completed.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $250,000 (+/-)

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: FEMA, CA DWR, US Army Corps of Engineers, others

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 31. Floodproofing non-residential structures

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: FEMA recommends flood-proofing of non-residential structures such as commercial, industrial, or churches when other mitigation measures are impractical.

Project Description: Dry flood-proofing is most effective for shallow flooding, using berms, floodwalls, flood fight materials, flood gates at doors, flood proofing membrane on walls, reshaping landscaping. Wet flood-proofing can be effective when dry flood-proofing is not; in this, the flood water would be allowed to enter the building causing only limited damage.

Other Alternatives: There are flood control and other flood mitigation measures that should be considered before deciding on flood-proofing.

Existing Planning Mechanism(s) through which Actions will be implemented: Sacramento County Floodplain Management Ordinance.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $50,000 to $200,000 depending on the project and subject to the benefits

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: FEMA, CA DWR, US Army Corps of Engineers, others

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 32. Flood insurance studies (modeling and mapping the special flood hazard area)

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Sacramento County DWR is aware of areas that need updated modeling and mapping. While for the purposes of local floodplain management, local information such as historic high water and internal studies is often used, it is also appropriate to memorialize the updated modeling in the form of an approved flood insurance study.

Project Description: Model the hydrologic and hydraulic characteristics of the watershed in question, map the results of the modeling, peer review, and submit to FEMA for a Flood Insurance Rate Map revision.

Other Alternatives: Continue using best available information for floodplain management purposes and explain the differences to the interested parties upon request.

Existing Planning Mechanism(s) through which Actions will be implemented: Sacramento County Floodplain Management Ordinance

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $300,000, typical, per modeling/mapping effort

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: FEMA, CA DWR, US Army Corps of Engineers, others

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 33. Update Hydrology Standards

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The 1996 County Hydrology Standards are to be updated, starting with depth duration and frequency (DDF), consideration of climate change predictions as they impact DDF.

Project Description: Analyze historic rainfall records and update the statistical analysis and the DDF for current date then consider climate change. Outreach the updated data to hydrology experts for peer review. Then, update the County Hydrology Standards.

Other Alternatives: Continue using older standards, but that's not a good alternative

Existing Planning Mechanism(s) through which Actions will be implemented: Hydrology Standards dated 1996, Updated depth duration frequency analysis 2021.

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $200,000

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: FEMA, CA DWR, US Army Corps of Engineers, others

Timeline: Within 5 years

Action 34. Laguna Creek flood control, modeling, and mapping

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Laguna Creek extends from Rancho Cordova, through the unincorporated Vineyard area, into Elk Grove, then to the City of Sacramento (see the Laguna Creek Watershed Council www.lagunacreek.org).

Project Description: There are three flood control facilities planned for Laguna Creek:

- Triangle Aggregate Pit (2022-2025)
- Southgate Soccer Field Basin (2021-2022)
- Kalwani Basin Site (2025-?)

Other Alternatives: Others were considered in the 1990s, this is the preferred alternative

Existing Planning Mechanism(s) through which Actions will be implemented: The plan is described in the Vineyard Springs drainage study as updated (2002-2005).

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $20M

Benefits (losses avoided): Controlling peak flow while allowing the beneficial function and habitat value of the natural creek is the primary benefit protecting property, roads, and casualties.

Potential Funding: FEMA, CA DWR, US Army Corps of Engineers, others

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 35. Update County GIS aerial photography and LiDAR topography

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: For floodplain mapping and modeling, it is important to have updated aerial survey data

Project Description: Fly the County with LiDAR and photography, georeferenced the area.

Other Alternatives: Continue using old topographic

Existing Planning Mechanism(s) through which Actions will be implemented: County GIS and Survey will take the lead

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $200,000

Benefits (losses avoided): Reduced risk to people, property, critical facilities, and infrastructure at risk of flooding.

Potential Funding: FEMA, CA DWR, US Army Corps of Engineers, others

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Action 36. Maintain and improve Sacramento River levee from south of Freeport to south of Hood, a reach owned and operated by CA DWR Maintenance Area 9

Hazard(s) Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The Sacramento River east bank levee from Freeport to down-river of Hood is a primary flood control and water supply feature and is owned and operated by the State of California Department of Water Resources, Maintenance Area 9. This is also deemed to be one of the weakest levees in the system in need of repair and improvement.

Project Description: Repair, improve, and certify this reach of levee to urban standards to ensure flood control and water supply for the 20 million water users to the south.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Actions will be implemented: This is fully in the hands of the State of California

Responsible Agency / Department / Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $120 million

Benefits (losses avoided): Save lives, protect property, provide reliable water supply to agriculture and 20 million people in the central and southern part of the state.

Potential Funding: FEMA grants, various federal grants, state grants, local match funding

Timeline: Within 5 years

Project Priority (H, M, L): High

Action 37. Use Existing Aggregate Mining Pits for Flood Control

Hazards Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: On Laguna Creek and Morrison Creek there are large aggregate mines that can be used long-term as flood control as well as other mixed uses. There are planned aggregate mines on Elder Creek, similarly a possibility for flood control.

Project Description: Where the open pit mine is near a creek it is straight forward for a weir to allow peak flow in the creek to spill into the pit, then when the creek water surface profile subsides, the water could be pumped back into the creek. This would reduce peak flow downstream.

Other Alternatives: Construct flood control in other locations, mitigate flood risk by other methods.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Master planning for the Vineyard area, Jackson corridor, Laguna Creek, Morrison Creek, Elder Creek

Responsible Agency/ Department/Partners: Sacramento County Department of Water Resources

Cost Estimate: $2,000,000

Benefits (Losses Avoided): Flood control, property and casualty protection

Potential Funding: Various FEMA grants, other grants, local cost share

Timeline: 1 to 5 years

Project Priority (H, M, L): H

Action 38. Implement Storm Drain Capital Improvement Plan

Hazards Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Design and construction of drainage capital improvement projects to repair facilities and to make improvements that will reduce flooding.

Project Description: The County of Sacramento has a 5 year capital improvement plan

Other Alternatives: Defer the projects, but that would not be favorable

Existing Planning Mechanism(s) through which Action Will Be Implemented: 5 year capital improvement plan to which projects may be added and priorities may be adjusted

Responsible Agency/ Department/Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $100,000 to $10 million

Benefits (Losses Avoided): Reduce flooding, protect property and casualty losses

Potential Funding: FEMA grants, various federal grants, state grants, local match funding

Timeline: 1 to 5 years

Project Priority (H, M, L): M

Action 39. Woodside Condominiums Flood Risk Reduction

Hazards Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Woodside Condominiums is comprised of about 725 individually owned units in which all own a share of the common area which includes the structures and each own the interior of their unit. There are about 90 units in buildings that have flooded multiple times and there are about that many additional units that flooded one time.

Project Description: Raise the buildings that are most prone to flooding. Construct flood-proofing walls, berms, planter around those building that flooded only one time.

Other Alternatives: Many other alternatives have been considered but the project described here is the best

Existing Planning Mechanism(s) through which Action Will Be Implemented: There is a thick file on this subject at Sacramento County DWR.

Responsible Agency/ Department/Partners: County of Sacramento Floodplain Management Section

Cost Estimate: $15 million (+/-)

Benefits (Losses Avoided): Reduce property and casualty losses

Potential Funding: FEMA grants, various federal grants, state grants, local match funding

Timeline: 1 to 5 years

Project Priority (H, M, L): M

Action 40. Implement Actions In The Courtland Flood Risk Reduction Plan 2021

Hazards Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: If a levee were to fail on RD 551 or RD 755 the floodwater would be in the town of Courtland in about 2 days. Measures in the Courtland Flood Risk Reduction Plan 2021 would serve to reduce the risk of damage due to flooding.

Project Description: See Courtland Flood Risk Reduction Plan 2021, e.g., construct a flood fight road around the back of town to an appropriate profile elevation so that the available Muscle Wall could be deployed to fight the rising water should a levee break anywhere on the reclamation district.

Other Alternatives: Several alternatives are discussed in the Courtland Flood Risk Reduction Plan 2021

Existing Planning Mechanism(s) through which Action Will Be Implemented: Courtland Flood Risk Reduction Plan 2021

Responsible Agency/ Department/Partners: County of Sacramento Floodplain Management Section / RD 551

Cost Estimate: There are several Management Actions described, e.g. flood fight berm $5M

Benefits (Losses Avoided): Expected annual damage, based on levee fragility analysis described in the Courtland Flood Risk Reduction Plan 2021, $4M per year.

Potential Funding: FEMA grants, various federal grants, state grants, local match funding

Timeline: 1 to 5 years

Project Priority (H, M, L): M

Action 41. Implement Actions In The Walnut Grove West Flood Risk Reduction Plan 2021

Hazards Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: If a levee were to fail on RD 003 the floodwater would be in the town of Walnut Grove (west) in about 32 hours. Measures in the Walnut Grove West Flood Risk Reduction Plan 2021 would serve to reduce the risk of damage due to flooding.

Project Description: See Walnut Grove West Flood Risk Reduction Plan 2021, generally the flood fight road would be around the back of town constructed to an appropriate profile elevation so that the available

Muscle Wall could be deployed to fight the rising water should a levee break anywhere on the reclamation district.

Other Alternatives: Several alternatives are discussed in the Walnut Grove West Flood Risk Reduction Plan 2021

Existing Planning Mechanism(s) through which Action Will Be Implemented: Walnut Grove West Flood Risk Reduction Plan 2021

Responsible Agency/ Department/Partners: County of Sacramento Floodplain Management Section / RD 003

Cost Estimate: There are several Management Actions described, e.g. flood fight berm costing about $5M

Benefits (Losses Avoided): Expected annual damage, based on levee fragility analysis described in the Flood Risk Reduction Plan 2021, averages about $4M per year.

Potential Funding: FEMA grants, various federal grants, state grants, local match funding

Timeline: 1 to 5 years

Project Priority (H, M, L): M

Action 42. Implement Actions In The Locke Flood Risk Reduction Plan 2021

Hazards Addressed: Flood, Localized Flood, Dam Failure, Levee Failure, Heavy Rains and Storms, Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: If a levee were to fail on RD 369 the floodwater would be in the town of Locke in a few hours. Measures in the Locke Flood Risk Reduction Plan 2021would serve to reduce the risk of damage due to flooding.

Project Description: The Locke Flood Risk Reduction Plan 2021 offers several alternative flood mitigation measures such as a cross levee

Other Alternatives: Several alternatives are described in the Locke Flood Risk Reduction Plan 2021

Existing Planning Mechanism(s) through which Action Will Be Implemented: Locke Flood Risk Reduction Plan 2021

Responsible Agency/ Department/Partners: County of Sacramento Floodplain Management Section / RD 369

Cost Estimate: There are several Management Actions described, e.g., a cross-levee costing about $4M

Benefits (Losses Avoided): Expected annual damages, based on levee fragility analysis described in the Flood Risk Reduction Plan 2021, are about $360K per year.

Potential Funding: FEMA grants, various federal grants, state grants, local match funding

Timeline: 1 to 5 years

Project Priority (H, M, L): M

Drought & Water Shortage, Severe Weather: Extreme Heat, and Wildfire Actions

Action 43. Reduce the urban heat island effect through the implementation of "cool communities" strategies, including but not limited to, increasing tree plantings, using cool/green roofs and cool/pervious pavements

Hazards Addressed: Severe Weather: Heat

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Locations where development dominates the landscape experience higher temperatures due to the Urban Heat Island Effect (UHIE), compared to landscapes that are mostly landscaped or natural vegetation. Human-made materials, such as asphalt and concrete, absorb heat and alter microclimate conditions by several degrees °F, exacerbate emissions of air pollutants, and increase the rate of photochemical production of ozone. The impacts of UHIE are more pronounced in the summer months when daily temperatures are highest during the year, leading to degraded air quality or increased heat exposure. Global climate change is exacerbating the UHIE and is increasing the impacts of severe heat events. Excessive heat:

- Negatively impacts health and well-being by exacerbating chronic and acute conditions (which increase emergency room visits and death rates, particularly for the most vulnerable populations);
- Increases electricity use — which can increase the costs for cooling, stress power generation and transmission systems, and increase greenhouse gas emissions;
- Negatively impacts our economy by reducing agricultural and labor productivity, among other factors;
- Impairs water quality and increases the volume of water required to keep trees and landscape alive and healthy.
- Damages critical infrastructure that has not been hardened.

The County supports “Cool Communities” programs designed to reduce the impacts of urban heat islands by increasing the reflectivity and emissivity of surfaces within the community, as well as using vegetative cover to shade surfaces from the sun. Cool Communities strategies are most successful when roofing, paving, and shade tree and shrub planting are used together on a wide scale to reduce the amount of heat energy absorbed by the built environment. This systematic approach reduces local ambient temperatures, energy used for air conditioning, and the potential for ozone formation in the lower atmosphere - a harmful pollutant.

Trees in urban areas help reduce the UHIE and provide aesthetic and environmental benefits to residential and commercial areas. Trees enhance a community's livability by softening street noise and enhancing pedestrian use. Urban trees provide stormwater quality benefits by intercepting small, more frequent rain and compensating, to some extent, the impact of paved areas. Trees also provide a cool green canopy of shade to reduce the heating effects of summer sun and consequently reduced energy consumption to cool buildings. The urban forest in Sacramento has provided distinct identities for local neighborhoods and has reduced summertime temperatures by minimizing reflective heat. As the County's urbanized area expands, the need for trees and associated canopy cover will increase. Since an urban forest is not static, the planting and maintenance of trees will be required to encourage healthy growth and to mitigate the impacts of extreme heat events and the UHIE.

Cool roofs are designed to maintain a lower roof temperature than traditional roofs that are heated through sun exposure and contribute to the UHIE. Cool roofs are composed of surfaces that reflect sunlight and

absorb less heat, which reduces heat flow into buildings and lowers energy usage and associated costs. Green roofs are rooftops that are partially or completely covered by vegetation. These forms of roofing lower the amount of heat absorbed by a building and reduces energy demand associated with air conditioning

Cool pavement reduces the effects of UHIE by reflecting sunlight and absorbing less heat as compared to traditional pavement. Pavement reflectance can be enhanced through the use of reflective aggregate, reflective or clear cinder, or a reflective surface coating. Pervious pavements help reduce the UHIE by cooling their surface and surrounding air as water passes through the pavement and evaporates.

Project Description: The project will increase tree plantings around buildings, in parking lots, and along public rights-of-way especially in the County's Environmental Justice Communities through the following activities:

- Planning for and mapping of the Urban Forest, including areas available to receive tree plantings
- Planting (materials and labor or financial support to partnering non-governmental organizations such as the Sacramento Tree Foundation)
- Maintenance activities for the existing Urban Forest including pruning, pest control and fertilization to extend tree life and longevity.
- Enforcement of existing tree protection ordinances and penalty provisions for replacement tree planting.
- Education and outreach to increase awareness of the importance of tree planting and maintenance on private property.

The project will also increase the use of cool/green roofs and cool/pervious pavements through activities such as code amendments, grants, and educational programs to promote, require and/or incentivize their use in both the replacement and construction of new, buildings, roads, sidewalks, parking areas, and bikeways.

Other Alternatives: Solar canopies over large parking lots and rooftops.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Climate Action Plan and updates to the General Plan, Zoning Code, Design Guidelines, Building Code, Stormwater Design, County Code, and/or County Improvement Standards.

Responsible Agency/ Department/Partners: PER, SMUD, Sac Tree Foundation, Regional Parks, SacDOT, BP&I

Cost Estimate: $10,000 to $250,000

Benefits (Losses Avoided): The "cool communities" strategy would reduce the UHIE and result in lower energy consumption thus reducing GHG emissions and improving air quality. This would result in lower cooling costs, reduced healthcare costs associated with heat-related illness and air quality, and a reduction in infrastructure repair costs. A co-benefit is that reducing greenhouse gas (GHG) emissions will reduce the impacts of climate change and thereby reduce the other hazards exacerbated by climate change.

Potential Funding: FEMA hazard mitigation grants, County Tree Mitigation Fund, CEQA mitigation applied to projects, State conservation and/or Climate grants, potential Climate Action Plan mitigation fee, SMUD Cool Roof Incentive program.

Timeline: Ongoing, 1-5 years

Project Priority (H, M, L): M

Action 44. Defensible Space and Vegetation Management; Development of Areas of Refuge

Hazards Addressed: Grassland Fire/Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Numerous areas of the community are affected by wildfires including the American River Parkway, Rancho Murrieta, Sloughouse and Jackson Highway. Wildfires can cut off the limited egress routes and residents and businesses need to identify areas of refuge that can protect people from approaching fire.

Project Description: Projects to create defensible space and vegetation management in communities most affected by wildfire dangers. To study the feasibility of designated areas of refuge, fund the purchase and design of those areas and implement a public education strategy on how to safely use those refuge areas.

Other Alternatives: Partner with local Fire Safe Councils, fire departments, General Plan changes requiring the identification of refuge sites. Alternatives could include expanding arterial and corridor capacity to effect large, rapid evacuation orders.

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Agency/ Department/Partners: Sacramento County OES

Cost Estimate: $1.5 million

Benefits (Losses Avoided): Reduced wildfire risk.

Potential Funding: CAL FIRE grants, other grant funding sources.

Timeline: Within 5 years

Project Priority (H, M, L): H

Action 45. Wildfire Suppression – Regional Parks and Open Space (urban interface)

Hazards Addressed: Hazard - Loss of residential and business structures and loss of habitat from wildfire. Post hazard results in sedimentation of creeks and rivers.

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Large areas of Sacramento County's rural areas and open space are susceptible to wildfire. The multi-year drought conditions have stressed trees and other vegetation, increased flammability and lengthening the fire season. The County has experienced more and larger wildfires than in years past. Wildfire suppression is needed to reduce fire loads and reduce response time to minimize wildfire size and intensity.

Project Description: Mitigation includes: Fire fuel reduction and firebreaks maintenance. The method used depends on the terrain and type of fire fuel to remove (dry vegetation, limb ladders, etc.), such as hand crews with manual tools, livestock grazing, prescribed burns, mechanical fuels removal, planting of fire resilient vegetation and/or invasive species removal.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Parks has a fire fuel reduction plan in place with prioritized areas based on the threat level and proximity to people and structures balanced against the available funding. Parks coordinates with other agencies for efficiencies in use of funds and manpower.

Responsible Agency/ Department/Partners: Sacramento County Department of Regional Parks / Sacramento Metropolitan Fire District, City of Sacramento Fire Department

Cost Estimate: $200,000

Benefits (Losses Avoided): Primary benefit is protecting residential and commercial structures in areas adjacent to park lands.

Potential Funding: FEMA Hazard Mitigation grants, Agency funding

Timeline: Annual

Project Priority (H, M, L): H

Action 46. Wildfire Fighting - Support

Hazards Addressed: Wildfire risk within Sacramento County Regional Parks and in Open Space, especially at the urban interface.

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Large areas of Sacramento County's rural areas and open space are susceptible to wildfire. The multi-year drought conditions have stressed trees and other vegetation, increased flammability and lengthening the fire season. The County has experienced more and larger wildfires than in years past. Wildfire fighting support is needed to reduce response time to minimize wildfire size and intensity.

Project Description: Mitigation includes: Firebreak maintenance, clearance for access roadways, adding fire access signage, maintaining technology to share information on access routes, hydrants, sensitive habitat, and cultural resource areas. Coordination with local fire agencies on risks and response activities.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Parks has identified locations for road clearance. Planning with other agencies is ongoing to prioritize hazardous conditions and make efficient use of funds.

Responsible Agency/ Department/Partners: Sacramento County Department of Regional Parks / Sacramento Metropolitan Fire District, City of Sacramento Fire Department

Cost Estimate: $40,000

Benefits (Losses Avoided): Protecting park lands, adjacent neighborhoods, high priority forests, wildlife habitats, and cultural resources.

Potential Funding: Agency funding, fire grants

Timeline: Annual, and periodic as required by specific projects

Project Priority (H, M, L): H

Action 47. Wildfire Suppression

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Large areas of Sacramento County's rural areas and open space are susceptible to wildfire. Areas of concern include Regional Parks and Open Space areas, especially at the urban interface. The multi-year drought conditions have stressed trees and other vegetation, increased flammability and lengthening the fire season. The County has recently experienced more and larger wildfires than in years past. Wildfire suppression is needed to reduce fire loads and to reduce response time to minimize wildfire size and intensity.

Project Description: Mitigation includes: Clearance for access roadways and firebreaks, maintaining and adding fire access signage, sharing information on access routes, hydrants, sensitive habitat, and cultural resource areas. Providing areas for wildfire training (burns) for fire departments, when feasible. Active patrols to monitor for wildfire ignitions, and possibly adding remote monitoring equipment.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: American River CWPP and other area fire plans and programs

Responsible Agency/ Department/Partners: Sacramento County Department of Regional Parks, Sacramento Metropolitan Fire District, City of Sacramento Fire Department

Cost Estimate: Flexible, depending on size and scope of project. FY21-22 County allocation in excess of $1M

Benefits (Losses Avoided): Protecting park lands and facilities, adjacent neighborhoods, high priority forests, wildlife habitats, and cultural resources.

Potential Funding: FEMA grants, Fire grants, Agency funding

Timeline: Periodic scheduled work, at minimum implemented on an annual timetable.

Project Priority (H, M, L): H

Severe Weather: Extreme Cold and Freeze, High Winds and Tornadoes Actions

Action 48. Establish Warming Centers with Backup Power

Hazards Addressed: Severe Weather, Extreme Cold and Freeze, Climate Adaptation

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: As Sacramento begins to experience temperature extremes and more frequent storm systems, the likelihood of those weather events being combined with a widespread loss of power is increased. Extreme cold, combined with high winds, can cause frostbite to occur. Climate adaptation strategies have called for building all-electric homes, which would leave homeowners without power during an extreme weather event and without options to adequately heat their home to remain safely in their home for the duration of the event.

Project Description: This project would identify likely sites to host residents as a warming center. In order to ensure that the warming center could maintain operations, an electrician should install building connections and transfer switches to allow the operation of generators to serve the building. Additionally, battery systems intended to provide electrical load for a short duration until generators could re-charge or connect to the building would prevent interruption of services.

Other Alternatives: Building code requirements to ensure new construction homes are self-sufficient and provide stable indoor temperatures during long-term power outages combined with severe weather.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Severe Weather Cold and Freeze Emergency Plan, General plan, building codes

Responsible Agency/ Department/Partners: Sacramento County OES

Cost Estimate: $3 million

Benefits (Losses Avoided): Facility wall batteries could be configured to charge during lower peak hours, or from direct solar charges thereby reducing demand on the grid infrastructure and

Potential Funding: Capital Improvement Funds; BRIC funding

Timeline: Within 5 years

Project Priority (H, M, L): Medium

Chapter 6 Plan Adoption

Requirement §201.6(c)(5) and §201.7(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

The purpose of formally adopting this LHMP Update is to secure buy-in from Sacramento County and participating jurisdictions, raise awareness of the plan, and formalize the plan's implementation. The adoption of this 2021 LHMP Update completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of the Disaster Mitigation Act (DMA) of 2000. For Sacramento County and the incorporated communities this adoption also establishes initial compliance with AB 2140 requiring adoption by reference or incorporation into the Safety Element of the General Plan. Two resolutions were created – one for Sacramento County and the incorporated communities and one for participating Special Districts.

The governing board for each participating jurisdiction has adopted this 2021 Local Hazard Mitigation Plan by passing a resolution. A copy of the generic resolutions and the executed copies are included in Appendix D: Adoption Resolutions.

Chapter 7 Plan Implementation and Maintenance

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and maintenance of this LHMP Update is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This chapter provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the Plan. The chapter also discusses incorporating the Plan into existing planning mechanisms and how to address continued public involvement.

Chapter 3 Planning Process includes information on the implementation and maintenance process since the 2016 LHMP Update was adopted. This section includes information on the implementation and maintenance process for this 2021 LHMP Update.

7.1 Implementation

Once adopted, this Plan faces the truest test of its worth: implementation. While this Plan contains many worthwhile actions, the County will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned the actions in the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful Plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other plans and mechanisms, such as general plans, stormwater plans, Community Wildfire Protection Plans (CWPPs), Emergency Operations Plans (EOPS), evacuation plans, and other hazard and emergency management planning efforts for Sacramento County and participating jurisdictions. The County and participating jurisdictions already implement policies and programs to reduce losses to life and property from hazards. This Plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. Implementation can be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the Sacramento County community and its stakeholders. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities.

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This could include

creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the County and participating jurisdictions will be in a better position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal programs and earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

Responsibility for Implementation of Goals and Activities

The elected officials and staff appointed to head each department within the County are charged with implementation of various activities in the Plan. During the quarterly reviews as described later in this section, an assessment of progress on each of the goals and activities in the Plan Update should be determined and noted. At that time, recommendations were made to modify timeframes for completion of activities, funding resources, and responsible entities. On a quarterly basis, the priority standing of various activities may also be changed. Some activities that are found not to be doable may be deleted from the Plan Update entirely and activities addressing problems unforeseen during plan development may be added.

7.1.1. Role of Hazard Mitigation Planning Committee (HMPC) in Implementation and Maintenance

With adoption of this Plan, the participating jurisdictions and HMPC will be responsible for the Plan implementation and maintenance. The HMPC (and/or HMPC Steering Committee) identified in Appendix A (or a similar committee) will reconvene quarterly each year to ensure mitigation strategies are being implemented and the County continues to maintain compliance with the NFIP. As such, Sacramento County and the City of Sacramento as the two CRS communities and participating jurisdictions will continue their relationship with the HMPC, and:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure hazard mitigation remains a consideration for community decision makers;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the Plan's recommended actions for which no current funding exists;
- Monitor and assist in the implementation and update of this Plan;
- Report on Plan progress and recommended changes to the County Board of Supervisors/other governing boards; and
- Inform and solicit input from the public.

The primary duty of the County and participating jurisdictions is to see the Plan Update successfully carried out and to report to their governing board and the public on the status of Plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the County and other websites.

7.2 Maintenance

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update this plan as progress, roadblocks, or changing circumstances are recognized.

7.2.1. Maintenance Schedule

The Sacramento County Department of Water Resources (County DWR) is responsible for initiating Plan reviews. In order to monitor progress and update the mitigation strategies identified in the mitigation action plan, Sacramento County DWR and the HMPC will revisit this Plan quarterly each year and following a hazard event. The HMPC will meet quarterly to review progress on Plan implementation, and the County and City of Sacramento, as participating CRS communities, will provide annual evaluation reports for Activity 510. The HMPC will also submit a five-year written update to the State and FEMA Region IX, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With this LHMP Update anticipated to be fully approved and adopted in late 2021, the next Plan Update for the Sacramento County Planning Area will occur by 2026.

7.2.2. Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the Plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or annexation).
- Increased vulnerability resulting from unforeseen or new circumstances.

Updates to this Plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

Changes will be made to this Plan to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. All mitigation actions will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of this Plan will be by written changes and submissions, as the HMPC deems appropriate and necessary, and as approved by the County Board of Supervisors and other governing boards. In keeping with the five-year update process, the HMPC will convene public meetings to solicit public input on this Plan and its routine maintenance and the final product

will be again adopted by the County Board of Supervisors and the governing boards and councils of other participating jurisdictions.

Quarterly Plan Review Process

For the hazard mitigation plan update review process, Sacramento County DWR, as lead along with the County CRS Coordinator for the City of Sacramento, and project leads from other participating jurisdictions will be responsible for facilitating, coordinating, and scheduling reviews and maintenance of the Plan. The LHMP is intended to be a living document. The review of the 2021 LHMP Update will normally occur on a quarterly basis each year and will be conducted by the HMPC as follows:

- The Sacramento County DWR will place an advertisement in the local newspaper advising the public of the date, time, and place for each quarterly review of the Plan Update and will be responsible for leading the meeting to review the Plan.
- Notices will be mailed to the members of the HMPC, federal, state, and local agencies, non-profit groups, local planning agencies, representatives of business interests, neighboring communities, and others advising them of the date, time, and place for the review.
- County/City/District officials will be noticed by email and telephone or personal visit and urged to participate.
- Members of the County's Planning Commission and other appointed commissions and groups will also be noticed by email and either by telephone or personal visit.
- Prior to the review, department heads and others tasked with implementation of the various activities will be queried concerning progress on each activity in their area of responsibility and asked to present a report at the review meeting.
- The local news media will be contacted, and a copy of the current plan will be available for public comment at Sacramento County.
- After the review meeting, minutes of the meeting and a quarterly report will be prepared by the HMPC and forwarded to the news media (public) and the ISO/CRS specialist for the CRS program. The report will also be presented to the County/City/participating jurisdictions' governing boards for review, and a request will be made that the boards take action to recognize and adopt any changes resulting from the review.
- A copy of the 2021 LHMP Update will be continually posted on the Internet as will the annual CRS Activity 510 report.

Criteria for Quarterly Reviews

The criteria recommended in 44 CFR 201 and 206 will be utilized in reviewing and updating the Plan. More specifically, the reviews should include the following information:

- Community growth or change in the past quarter.
- The number of substantially damaged or substantially improved structures by flood zone.
- The renovations to public infrastructure including water, sewer, drainage, roads, bridges, gas lines, and buildings.
- Natural hazard occurrences that required activation of the Emergency Operations Center (EOC) and whether or not the event resulted in a presidential disaster declaration.
- Natural hazard occurrences that were not of a magnitude to warrant activation of the EOC or a federal disaster declaration but were severe enough to cause damage in the community or closure of businesses, schools, or public services.
- The dates of hazard events descriptions.

- Documented damages due to the event.
- Closures of places of employment or schools and the number of days closed.
- Road or bridge closures due to the hazard and the length of time closed.
- Assessment of the number of private and public buildings damaged and whether the damage was minor, substantial, major, or if buildings were destroyed. The assessment will include residences, mobile homes, commercial structures, industrial structures, and public buildings, such as schools and public safety buildings.
- Review of any changes in federal, state, and local policies to determine the impact of these policies on the community and how and if the policy changes can or should be incorporated into the Hazard Mitigation Plan. Review of the status of implementation of projects (mitigation strategies) including projects completed will be noted. Projects behind schedule will include a reason for delay of implementation.

7.2.3. Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the 2021 LHMP Update recommendations and their underlying principles into other County plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated in Section 7.1 of this plan, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. The point is re-emphasized here. As described in this Plan's capability assessments, the County already implements policies and programs to reduce losses to life and property from hazards. This Plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- County general and master plans
- County Emergency Operations Plans and other emergency management efforts
- County ordinances
- Flood/stormwater management/master plans
- Community Wildfire Protection plans
- Capital improvement plans and budgets
- Other plans and policies outlined in the capability assessment
- Other plans, regulations, and practices with a mitigation focus

HMPC members involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this Plan with these other plans, programs, etc., as appropriate. As described in Section 7.1 Implementation, incorporation into existing planning mechanisms will be done through the routine actions of:

- monitoring other planning/program agendas;
- attending other planning/program meetings;
- participating in other planning processes; and
- monitoring community budget meetings for other community program opportunities.

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Examples of incorporation of the LHMP into existing planning mechanisms include:

1. As recommended by Assembly Bill 2140, the County should adopt (by reference or incorporation) this LHMP into the Safety Element of their General Plan(s). Evidence of such adoption (by formal, certified resolution) shall be provided to CAL OES and FEMA.
2. Integration of wildfire actions identified in this mitigation strategy and those established in existing CWPPs, such as the American River CWPP. Key people responsible for development of the American River CWPP participated on the HMPC. Key projects were identified and integrated into this LHMP. Actual implementation of these projects will likely occur through the CWPP process.
3. Integration of flood actions identified in this mitigation strategy with implementation priorities in existing Watershed and Stormwater Drainage Plans and other Flood Plan. Key people responsible for development and implementation of the County's Watershed Master Plans and various jurisdictional watershed plans, stormwater drainage, and flood plans participated on the HMPC. Key projects were identified and integrated specifically into this LHMP, while others currently of lessor priority should be referenced in their source document. Actual implementation of these projects will likely occur through these other plans' processes through the efforts of each responsible jurisdiction and departments.
4. Use of risk assessment information to inform future updates of the hazard analysis in the Sacramento County and jurisdictional Emergency Operations Plans.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

7.2.4. Continued Public Involvement

Continued public involvement is imperative to the overall success of the Plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stores from the Plan implementation and seek additional public comment. The Plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings.

Public Involvement Process for Quarterly Reviews

The public will be noticed by placing an advertisement in the newspaper specifying the date and time for the review and inviting public participation. The HMPC, Steering Committee, local, state, and regional agencies will be notified and invited to attend and participate.

Public Involvement for Five-year Update

When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the Plan. In reconvening, the HMPC plan to identify a public outreach subcommittee, which will be responsible for coordinating the activities necessary to involve the greater public. The subcommittee will develop a plan for public involvement and will be responsible for disseminating information through

a variety of media channels detailing the Plan update process. As part of this effort, public meetings will be held and public comments will be solicited on the Plan update draft. The subcommittee will also coordinate this public outreach process with any public information programs established pursuant to the 2017 guidelines from the Community Rating System (CRS).

Annex A City of Citrus Heights

A.1 Introduction

This Annex details the hazard mitigation planning elements specific to the City of Citrus Heights, a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to Citrus Heights, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

A.2 Planning Process

As described above, Citrus Heights followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table A-1. Additional details on Plan participation and City representatives are included in Appendix A.

Table A-1 City of Citrus Heights – Planning Team

Name	Position/Title	How Participated
Alison Bermudez	Associate Planner	Historic Data Research
Leslie Blomquist	City Engineer	General Service Department overview/development
Regina Cave	Operations Manager	General Service Department overview/development and Historic Data Research
Ardelyn Flores	Associate Civil Engineer	General Services Department overview/development
Casey Kempenaar	Planning Manager	Community Development Department overview/development
Dirk Medema	Associate Civil Engineer	General Services Department overview and drainage CIP development

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the City integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the City incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table A-2.

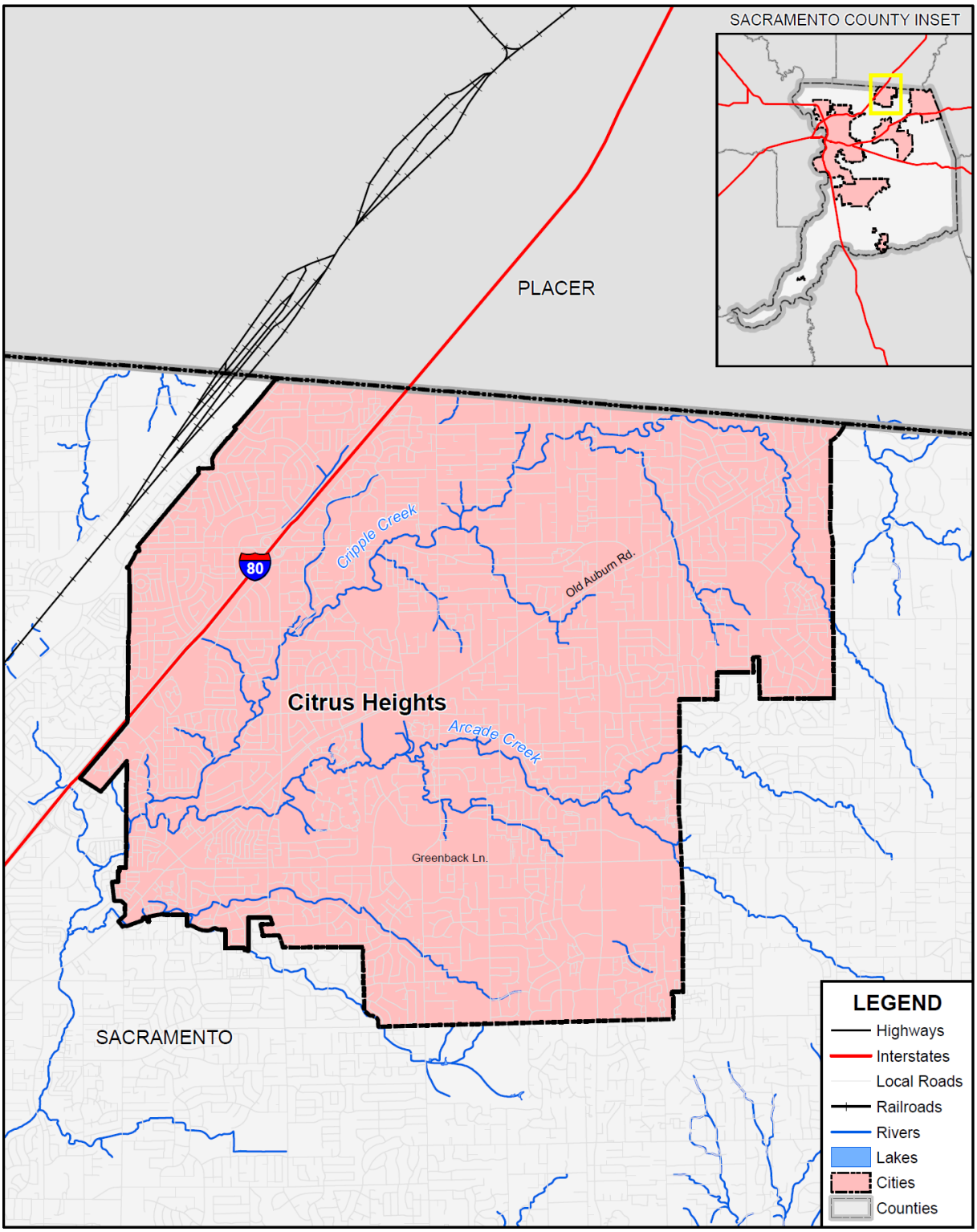
Table A-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
City Zoning Code - Partially incorporated	Several LHMP-related measures have been incorporated in sections of Zoning Code regarding stormwater management and restrictions on creekside development

A.3 Community Profile

The community profile for the City of Citrus Heights is detailed in the following sections. Figure A-1 displays a City map and the location of Citrus Heights within Sacramento County.

Figure A-1 City of Citrus Heights



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

A.3.1. Geography and Climate

Citrus Heights is located in a relatively flat area bordered by the north Coast Ranges to the west and the northern Sierra Nevada to the east. Air flows into the area through the Carquinez Strait, the only breach in the western mountain barrier, and moves across the Sacramento–San Joaquin Delta (Delta) from the San Francisco Bay area.

Citrus Heights is centrally located between the region's major freeways and highways. Interstate 80, Interstate 5, U.S. Highway 50, and U.S. Highway 99 are all located from three to 11 miles from the City. The Sacramento International Airport is located approximately 20 miles from the city, while rail transportation (Amtrak) is accessible in Roseville (about 10 miles from the City).

The topography of the Citrus Heights area is characterized by flat terrain with small hills in some locations. Cripple Creek and Arcade Creek flow through the project area. The majority of the City has been developed with residential and commercial uses. Slopes within the planning area range from zero percent to 15 percent with the majority of the steeper slopes located in the southeastern portion of Citrus Heights. Elevations range from 120 feet above mean sea level near the southwestern edge of Citrus Heights to 200 feet above mean sea level near the southeastern portion of the City.

The Mediterranean climate type of the City is characterized by hot, dry summers and cool, rainy winters. During the summer, daily temperatures range from 50°F to more than 100°F. The inland location and surrounding mountains shelter the area from much of the ocean breezes that keep the coastal regions moderate in temperature.

Most precipitation in the area results from air masses that move in from the Pacific Ocean, usually from the west or northwest, during the winter months. More than half the total annual precipitation falls during the winter rainy season (November through February). Average winter temperatures are 49°F. Also characteristic of winters are periods of dense and persistent low-level fog, which are most prevalent between storms. The prevailing winds are moderate in speed and vary from moisture-laden breezes from the south to dry land flows from the north.

A.3.2. History

Throughout most of the Spanish-Mexican period of the growth of California (1542-1848), settlement was limited to a narrow coastal strip along El Camino Real with only a few isolated frontier outposts of civilization. One of these outposts was the vast estate of John Augustus Sutter, a German-Swiss immigrant, who was granted 11-square leagues of land in the Sacramento Valley under the condition that he settle 12 other families on the land. One of these Mexican land sub-grants was the Ranch Del San Juan, an approximately 20,000-acre tract of rich farmland originally granted in 1844. This sub-grant included present-day Citrus Heights.

A schoolhouse was built in 1862, spurred on by W.A. Thomas' conviction that Citrus Heights housed enough children to justify a school district. Mr. Thomas donated five acres of land on the northwest corner of Sylvan corners, and deemed it Sylvan School. Once completed, it became the educational, civic, social,

and religious center of the community. Community parties and church services were held in the small, one-room building, as well as daily classes.

Adolph Van Maren, successor to his father Peter Van Maren, played a leading role in community development for many years. He served on the San Juan School Board, and contributed to the development of the San Juan High School in 1915. The present site of the Citrus Heights Community Club House on Sylvan Road is on land donated by Van Maren, while the actual building is the old Sylvan School House moved after a new school facility was built in 1927.

In 1970, ground was broken for the giant Sunrise Mall, spurring a great deal of new growth in the Sunrise Boulevard-Greenback Lane area. By 1975, 101 shops, anchored by four department stores, employed 2,500 people within Sunrise Mall. Then in 1976, across Sunrise Boulevard from the Mall, rose Birdcage Walk, a collection of shops and businesses laid out along a park-like walkway. The two shopping centers spurred the construction of hundreds of businesses in the surrounding area.

In 1994, after agreement with the County was reached, the effort gained momentum and took on the challenge to raise funds to pay for the mandated Environmental Impact Report (EIR). Once accomplished, the County Board of Supervisors approved the measure for the November 1996 ballot and a full campaign was initiated. Finally, after a 12-year battle with the County of Sacramento, the Citrus Heights residents voted on the issue. The voters approved the measure to incorporate the City on November 5, 1996, effective January 1, 1997. The measure won handily, with 62.5% of the votes.

A.3.3. Economy and Tax Base

Citrus Heights has established itself as an important suburb in the Sacramento region with its solid base of small businesses, retail chains, and food service establishments. With an ongoing commitment to providing high-quality, economical, responsive services to the local community, the City is well-positioned for future commercial redevelopment, neighborhood enhancements, and positive changes.

US Census estimates show economic characteristics for the City of Citrus Heights. These are shown in Table A-3 and Table A-4. Mean household income in the City was $76,121. Median household income in the City was $61,898.

Table A-3 City of Citrus Heights – Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	448	1.0%
Construction	4,473	10.2%
Manufacturing	1,935	4.4%
Wholesale trade	1,882	4.3%
Retail trade	6,687	15.3%
Transportation and warehousing, and utilities	2,079	4.8%
Information	564	1.3%

Industry	Estimated Employment	Percent
Finance and insurance, and real estate and rental and leasing	3,496	8.0%
Professional, scientific, and management, and administrative and waste management services	4,269	9.8%
Educational services, and health care and social assistance	8,754	20.0%
Arts, entertainment, and recreation, and accommodation and food services	4,854	11.1%
Other services, except public administration	1,619	3.7%
Public administration	2,680	6.1%

Source: US Census Bureau American Community Survey 2019 Estimates

Table A-4 City of Citrus Heights – Income and Benefits

Income Bracket	Percent
<$10,000	5.8%
$10,000 – $14,999	2.4%
$15,000 - $24,9999	7.0%
$25,000 – $34,999	7.7%
$35,000 – $49,999	16.1%
$50,000 – $74,999	23.7%
$75,000 – $99,999	14.1%
$100,000 – $149,999	14.4%
$150,000 – $199,999	4.9%
$200,000 or more	3.8%

Source: US Census Bureau American Community Survey 2019 Estimates

Top 10 Citrus Heights Employers (Alphabetical order)

- City of Citrus Heights
- Costco
- Sunrise Parks & Recreation District
- Lowe's
- Macy's
- Sam's Club
- Stone's Casino
- Maita Honda
- Target
- Wal-Mart

A.3.4. Population

The California Department of Finance estimated the January 1, 2020, total population for the City of Citrus Heights was 87,811.

A.4 Hazard Identification

Citrus Heights identified the hazards that affect the City and summarized their location, extent, likelihood of future occurrence, potential magnitude, and significance specific to Citrus Heights (see Table A-5).

Table A-5 City of Citrus Heights—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Low	–
Dam Failure	Limited	Unlikely	Limited	Medium	Medium
Drought & Water Shortage	Extensive	Occasional	Critical	Low	High
Earthquake	Extensive	Unlikely	Critical	Low	Low
Earthquake Liquefaction	Limited	Unlikely	Negligible	Low	Low
Floods: 1%/0.2% annual chance	Significant	Occasional/ Unlikely	Negligible	Medium	Medium
Floods: Localized Stormwater	Significant	Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Low
Levee Failure	Limited	Unlikely	Negligible	Low	Medium
Pandemic	Extensive	Likely	Critical	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Critical	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Critical	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Likely	Critical	Low	Medium
Severe Weather: Wind and Tornado	Limited	Unlikely	Negligible	Low	Low
Subsidence	Limited	Unlikely	Negligible	Low	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Unlikely	Negligible	Low	Medium

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

A.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile Citrus Heights's hazards and assess the City's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City is included in this Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards ranked of medium or high significance specific to the City (as identified in the Significance column of Table A-5) and also includes a vulnerability assessment to the three primary hazards to the State of California: earthquake, flood, and wildfire. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

A.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section A.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

A.5.2. Vulnerability Assessment and Assets at Risk

This section identifies Citrus Heights's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

Values at Risk

The following data from the Sacramento County Assessor's Office is based on the 2020 Assessor's data. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitations are created by Proposition 13 and the Williamson Act as detailed in the Base Plan. With respect to Proposition 13, instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is most likely low and does not reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table A-6 shows the 2020 Assessor's values and content replacement values (e.g., the values at risk) broken down by property use for the City.

Table A-6 City of Citrus Heights – Total Values at Risk by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	0	0	$0	$0	$0	$0
Care/Health	37	29	$16,430,609	$73,652,597	$73,652,597	$163,735,803
Church/Welfare	45	39	$9,351,283	$46,214,191	$46,214,191	$101,779,665
Industrial	22	19	$11,535,364	$17,589,132	$26,383,698	$55,508,194
Miscellaneous	353	0	$627,387	$0	$0	$627,387
Office	151	142	$55,647,981	$121,241,584	$121,241,584	$298,131,149
Public/Utilities	24	1	$27,054	$3,837	$3,837	$34,728
Recreational	6	4	$2,578,894	$12,938,386	$12,938,386	$28,455,666
Residential	25,437	25,218	$1,809,237,816	$4,654,812,476	$2,327,406,306	$8,791,456,521
Retail/ Commercial	366	350	$325,606,703	$537,181,077	$537,181,077	$1,399,968,857
Unknown	4	3	$34,193	$271,996	$0	$306,189
Vacant	332	16	$46,160,118	$4,649,535	$0	$50,809,653
Citrus Heights Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$3,145,021,676**	**$10,890,813,812**

Source: Sacramento County 2020 Parcel/Assessor's Data

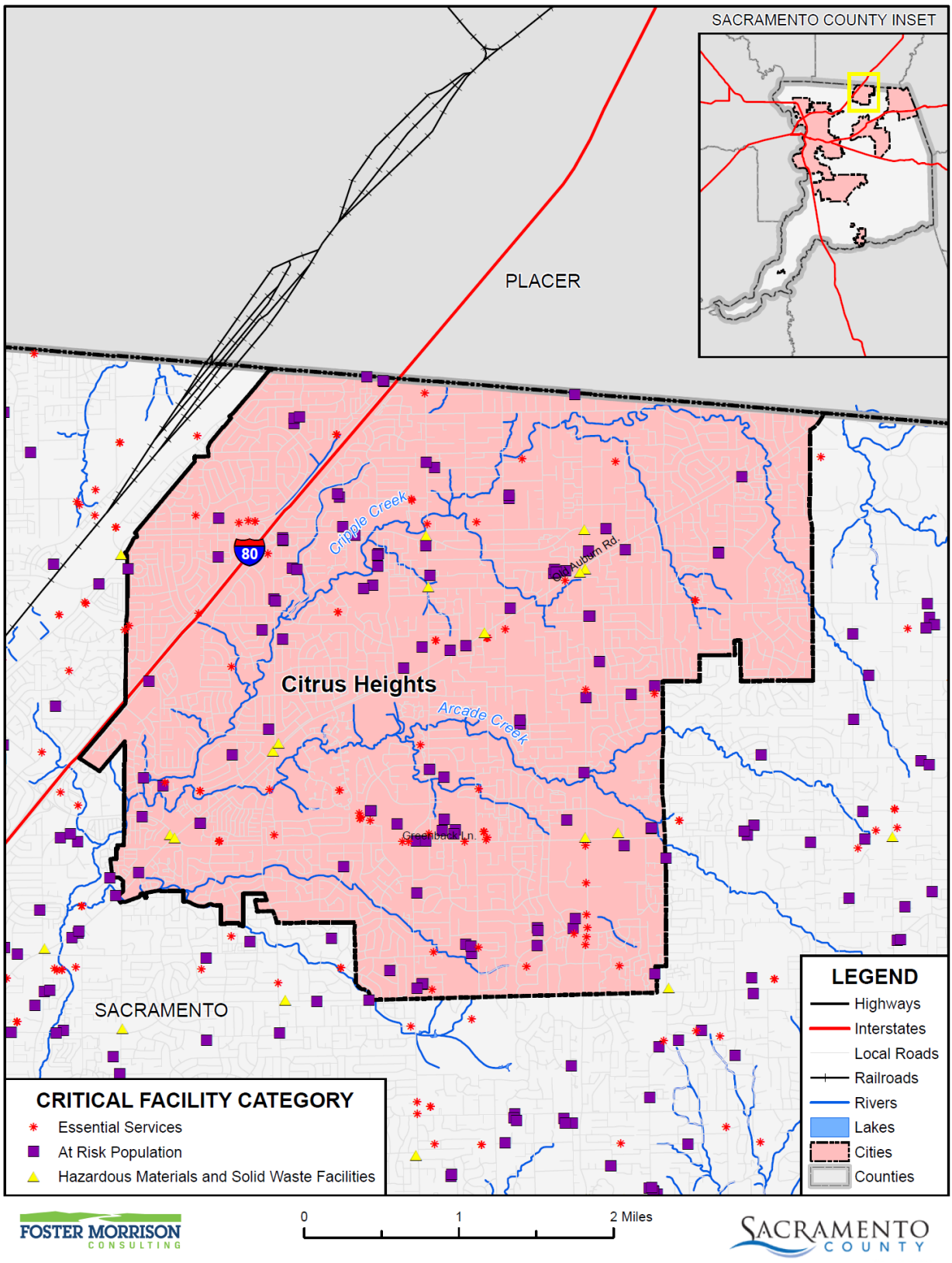
Critical Facilities and Infrastructure

Critical facilities and infrastructure are those buildings and infrastructure that are crucial to a community. Should these be damaged, it makes it more difficult for the community to respond to and recover from a disaster. For purposes of this plan, a critical facility is defined as:

> *Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities. Critical facilities in the City are shown on Figure A-2 and detailed in Table A-7.

Figure A-2 City of Citrus Heights – Critical Facilities



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table A-7 City of Citrus Heights – Critical Facilities by Category and Type

Critical Facility Category	Critical Facility Type	Facility Count
Essential Services Facilities	Emergency Evacuation Center	8
	EMS Stations	4
	FDIC Insured Banks	13
	Fire Station	5
	Law Enforcement	2
	Microwave Service Towers	17
	Water Well	27
	Total	**76**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Day Care Center	27
	Mobile Home Parks	10
	Places of Worship	37
	School	31
	Total	**108**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	12
	Total	**12**
Citrus Heights Total		**196**

Source: City of Citrus Heights

Natural Resources

Natural resources are unique to each area and are difficult to replace. Should a natural disaster occur, these species and locations are at risk. The City of Citrus Heights has a variety of natural resources of value to the community. Table A-8 and Table A-9 depict special status plant and animal species in the City. Figure A-3 shows the location of each of the species.

Table A-8 Special-Status Plant Species Known to Occur or Potentially Occurring in Citrus Heights

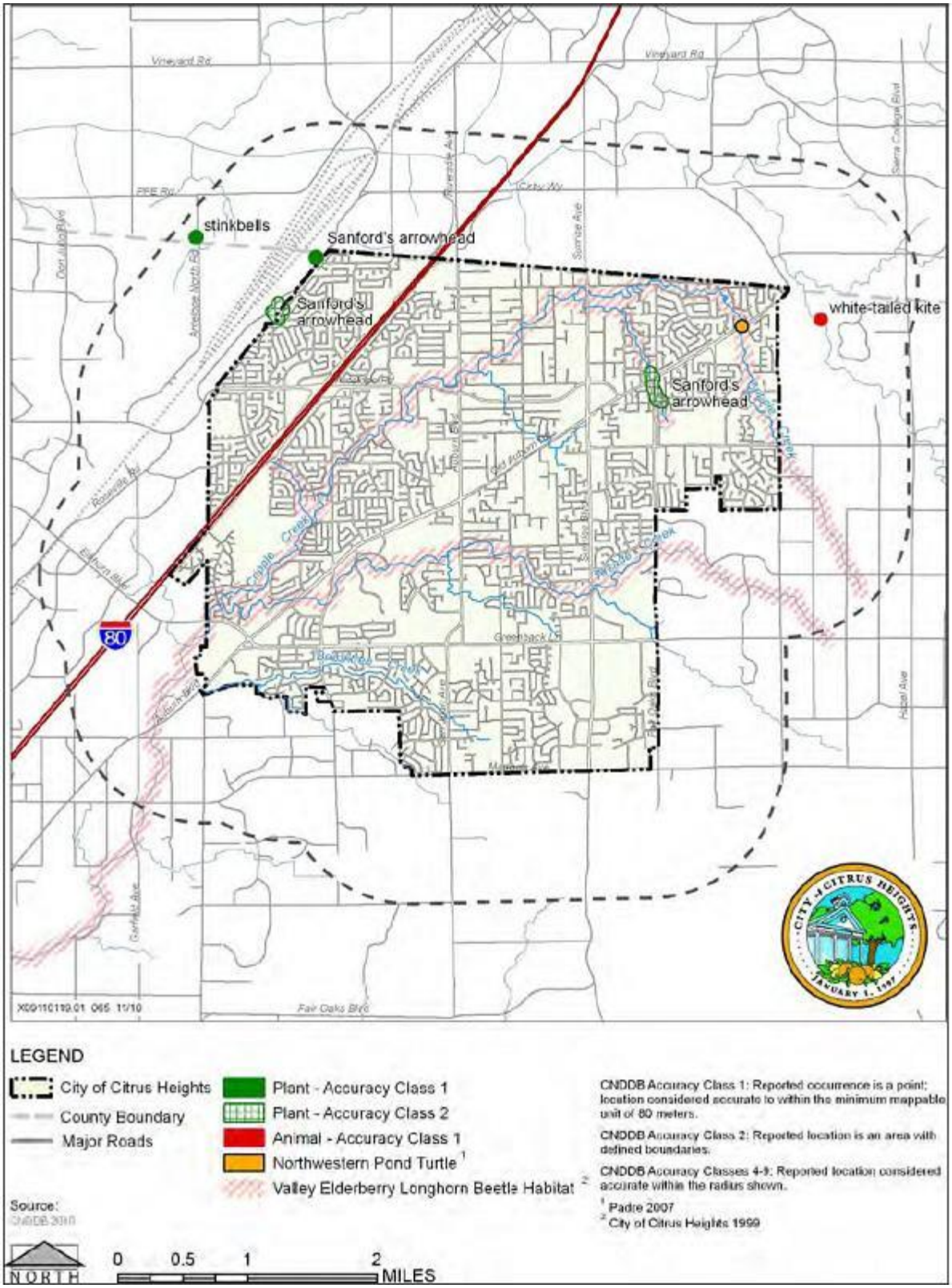
Species	Status[1]			Habitat
	USFWS	DFG	CNPS[1, 2]	
Bigscale balsam root *Balsamorhiza macrolepis var. macrolepis*	–	–	1B.2	Could occur; suitable habitat in open areas that support California annual grassland. The nearest known occurrence is approximately five miles away.
Stinkbells *Fritillaria agrestis*	–	–	4.2	Known to occur; suitable habitat in California annual grassland habitat

Species	Status[1]			Habitat
	USFWS	DFG	CNPS[1, 2]	
Sanford's arrowhead *Sagittaria sanfordii*	–	–	1B.2	Known to occur; suitable habitat in freshwater marsh along creeks and streams in valley foothill riparian habitat as well slow-moving drainages and ditches

Notes:
USFWS = US Fish and Wildlife Service, DFG = Department of Fish and Game, CNPS = California Native Plant Society
[1]CNPS Categories:
1B Plant species considered rare or endangered in California and elsewhere (protected under CEQA, but not legally protected under ESA or CESA)
4 Plants species of limited distribution or infrequent throughout a broader area in California (vulnerability or susceptibility to threat appears low). Uncommon enough that their status should be monitored regularly
[2]CNPS Extensions:
2 Fairly endangered in California (20% to 80% of occurrences are threatened).

Source: City of Citrus Heights General Plan Environmental Impact Report (2011)

Figure A-3 Special Status Species Location in Citrus Heights



Source: City of Citrus Heights General Plan Environmental Impact Report (2011)

Table A-9 Special-Status Wildlife Species Known or Potentially Occurring in Citrus Heights

Species	Status[1]		Habitat
	USFWS	DFG	
Invertebrates			
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T	–	Could occur; elderberry shrubs are present in valley foothill riparian habitat along Arcade and Cripple creeks
Reptiles			
Northwestern pond turtle *Actinemys marmorata*	–	CSC	Known to occur; suitable habitat is present in freshwater marshes, rivers, streams, and irrigation ditches within valley foothill riparian habitat.
Birds			
White-tailed kite *Elanus leucrus*	–	FPS	Known to occur; suitable habitat is present for nesting in trees within the valley foothill riparian and interior live oak habitats and foraging in annual grassland habitat
Mammals			
Palid bat *Antrozous pallidus*	–	CSC	Could occur; suitable habitat for roosting and foraging is present in valley foothill riparian, interior live oak habitats and annual grassland habitats.

Notes: DFG = California Department of Fish and Game; USFWS = U.S. Fish and Wildlife Service
[1]Legal Status Definitions

Federal Listing Categories (USFWS)	State Listing Categories (DFG)
E Endangered T Threatened (legally protected) C Candidate	E Endangered T Threatened (legally protected) CSC Species of Special Concern FPS Fully Protected Species

Source: City of Citrus Heights General Plan Environmental Impact Report (2011)

Historic and Cultural Resources

Historic and cultural resources are difficult to replace. Should a natural disaster occur, these properties and locations can be at risk.

Euro-American settlement of Citrus Heights began in the mid-19th century with a Mexican land grant of 11 square leagues of land in the Sacramento Valley to John Sutter, including the Rancho Del San Juan subgrant. This subgrant area occupied 20,000 acres, including the modern-day Citrus Heights area. The area developed as an agricultural community consisting of families settling small farms surrounding the Sylvan Corners area, located at the present-day intersection of Sylvan Road, Auburn Boulevard, and Old Auburn Road. The 20th Century saw a boom in urbanization of the area, particularly after World War II, when subdivisions began springing up to accommodate an influx of new residents to the area. The area continued to grow, in part as the rocket manufacturing plant at Aerojet in nearby Citrus Heights attracted employees and their families to the region. As this new development occurred, many older structures throughout the community were demolished and replaced by tract housing and new commercial development to serve the booming population. As this shift occurred, Citrus Heights saw its historical character change to a more urbanized, suburban community, losing its character as a rural agricultural community.

Despite the urbanization of the community, several historic buildings remain intact today. However, many have been altered in such ways as to possibly lose their historic integrity. Some of these structures may no longer qualify for protection under historic preservation regulations. To inventory these resources, the HMPC collected information from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. OHP administers the National Register of Historic Places, the California Register of Historical Resources, California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the Base Plan. Table A-10 lists the historical buildings in the City.

Table A-10 City of Citrus Heights – Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Rusch Home (P737)				X	2/11/1991	Citrus Heights

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

In addition to the registered sites, there are several assets within Citrus Heights that define the community and represent the City's history. Some of the historical sites of importance to Citrus Heights are listed below and shown in Figure A-4.

14 Mile/Van Maren House

In 1851, the original 14 Mile House was constructed as a roadhouse and way station for teamsters hauling supplies to country mining camps. It is located on Auburn Boulevard approximately halfway between Greenback Lane and Van Maren Lane. The property is surrounded by a modern apartment complex on three sides. The roadhouse was acquired by the Van Maren family and renovated in 1920 to serve as a family residence. An historic survey evaluation completed in 2002 suggests that this may be the oldest wood frame building in Sacramento County. The house is potentially eligible for listing in the California Register of Historical Resources and in the National Register of Historic Places for its potential to yield information as an historic archeological site. The house itself has an information potential regarding early construction in California. The area in the immediate vicinity of the house has potential for deposits associated with the 1850s roadhouse.

Rusch Home

The Rusch Home, built by Citrus Heights pioneers Fred and Julia Rusch, is located in the northwest section of Rusch Park, along Antelope Road. The existing structure was rebuilt in 1914 following a fire that

destroyed the original structure. The home and the surrounding land was donated to the community, which led to the establishment of Rusch Park, the City's largest and most prominent park, and the Sunrise Recreation and Park District offices. The home is listed with the State Office of Historic Preservation as a California Point of Historical Interest (SAC-012).

Dekay/Sunrise Ranch Home

The Dekay/Sunrise Ranch home was constructed in 1868 as part of the Sunrise Ranch property in the northern portion of the existing City, along current-day Sunrise Boulevard, named after the property. The home is currently used as a private residence and is one of the oldest residential structures in the area. However the building has been substantially altered and is not eligible for listing in the California Register of Historical Resources or the National Register of Historic Places due to a lack of historical integrity.

Sylvan School/Citrus Heights Community Club

The old Sylvan School, located south of Sylvan Corners, was initially constructed in 1862, and consisted of a single classroom and two small broom or hat halls. The school was also used as a civic, social, and religious center that supported church services, dancing parties, and local voting discussions. In 1927, the school was moved to another located on Sylvan Road, and the building remains in use as a community meeting hall. The building has been modified, which has resulted in a loss of historic integrity which makes listing in the California Register questionable. However the historic resources survey done by Rowland Nawi Associates in 2006 found that this property may be suitable for listed as a Point of Historic Interest.

Sylvan Cemetery

Sylvan Cemetery, located along Auburn Boulevard north of Sylvan Corners, was established on land donated in 1862, and first broke ground in 1864. The cemetery has been expanded over the years and currently occupies 18 acres. The site is not currently listed on the National or California Register of Historic Places, and further research would be necessary to determine its eligibility, particularly since cemeteries must meet special requirements for listing on the National Register.

San Juan High School

San Juan High School was the first secondary school established in Citrus Heights and the northeast part of Sacramento County. San Juan High School is eligible for listing in the National Register of Historic Places and the California Register of Historical Resources as a key institution representing the growth and development of the area of Citrus Heights and as the first high school in the northeast county. It is located at the intersection of Greenback Lane and Mariposa Avenue.

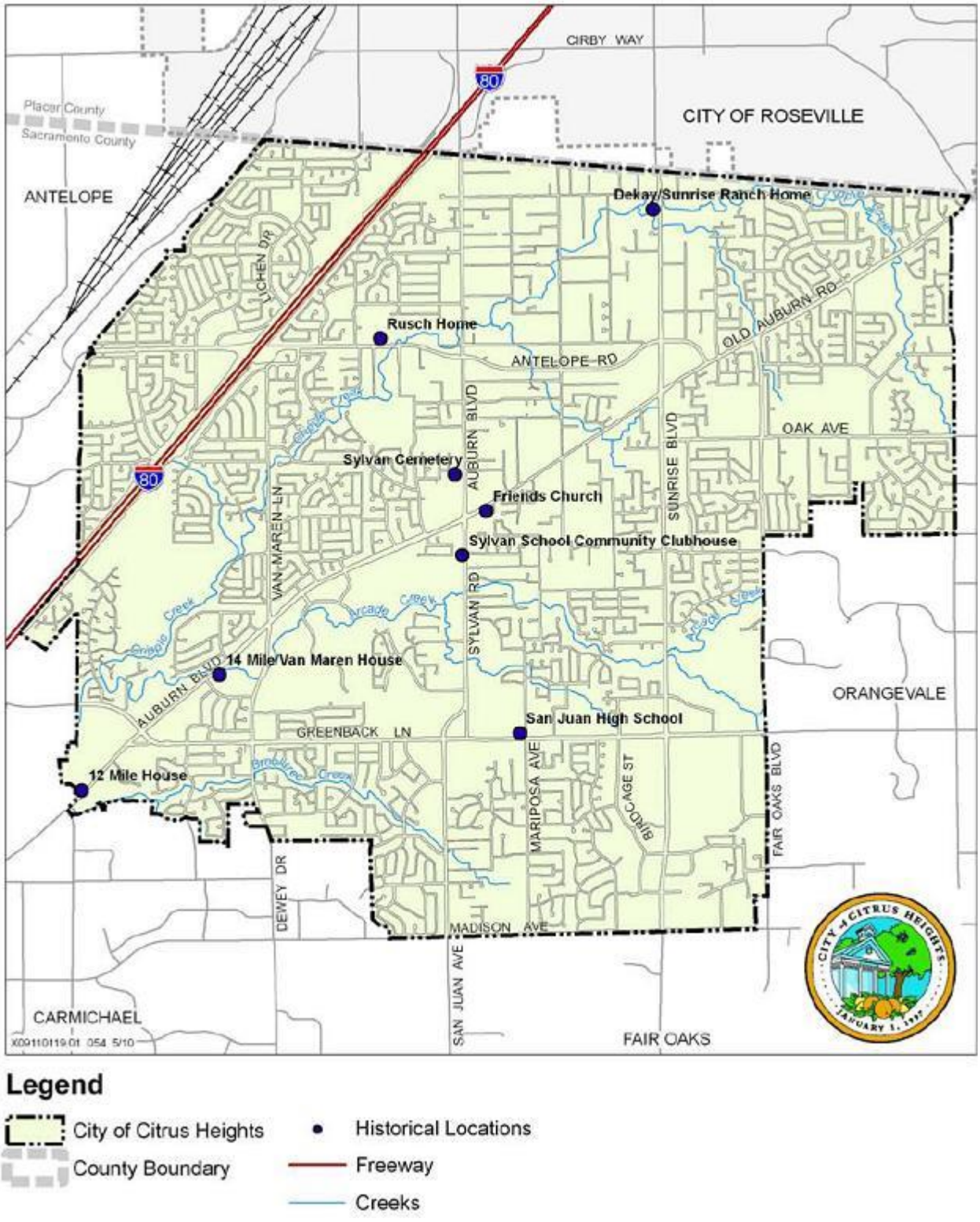
Friends Church

The Friends Church was constructed in 1921, just east of the intersection of Sylvan Road, Auburn Boulevard, and Old Auburn Road. It was the first church built within Citrus Heights. The church has been remodeled twice since its construction and looks different from its original appearance. However, both remodels took place more than 50 years ago, so it is eligible for listing in the California Register of Historical Resources.

12 Mile House

Like the 14 Mile House, the original 12 Mile House was also constructed in the 1800s as a teamster way station. It was located on the south bed of Cripple Creek near present-day DeVechi Road but was rebuilt in the 1920s to accommodate an expansion of Auburn Road. The new 12 Mile House, located at the extreme southwest corner of the planning area, was built and operated as a bar until 1998. The structure is one of the oldest commercial structures in Citrus Heights, and although it has been modified since its construction, this has not significantly compromised its architectural integrity. In addition, the building retains its historical associations to the late 1940s and so appears to be eligible for listing in the California Register of Historical Resources.

Figure A-4 Historic Resources in the City of Citrus Heights



Source: City of Citrus Heights General Plan Environmental Impact Report (2011)

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. Information from the City of Citrus Heights General Plan 2013-2021 Housing Element, the California Department of Finance, the US Census Bureau form the basis of this discussion.

Historic Population Trends and Current Population

Population growth can increase the number of people living in hazard prone areas. Citrus Heights has generally seen steady growth, with recent tapering of growth. Citrus Heights has seen growth rates as shown in Table A-11.

Table A-11 City of Citrus Heights – Population Changes Since 1970

Year	Population	Change	% Change
1970	31,015	–	–
1980	63,848	32,833	105.9%
1990	82,045	18,197	28.5%
2000	85,071	3,026	3.7%
2010[1]	88,115	3,044	3.6%
2020[2]	87,811	-304	-0.35%

Source: [1]US Census Bureau, [2]California Department of Finance

Special Populations and Disadvantaged Communities

The 2018 Census data reports the City Population of citizens aged 65 and over is 14,031 or 16% of the City's total. Approximately 29% of these seniors are "Frail Elderly". According to the 2018 American Community Survey, 8,330 persons or 11% of persons 5 years of age or older in the City of Citrus Heights has a disability. According to the 2018 American Community Survey, approximately 6,176 persons in the City of Citrus Heights above the age of 5 have a Mental Disability of some kind. According to the California Department of Developmental Services, a total of 919 Citrus Heights residents are considered developmentally disabled, with the majority being over 18 years of age. None of these special populations are located in hazard areas.

Land Use

State planning law requires that the land use element of a general plan include a statement of the standard population density, building intensity, and allowed uses for the various land use designations in the plan (Government Code Section 65302(a)). The Citrus Heights Municipal Code provides detailed land use and development standards for development. Currently, Citrus Heights is about 97 percent built out, meaning not much vacant land remains to be developed. As shown in Table A-12, about three-quarters of the City's remaining vacant land is residential in nature.

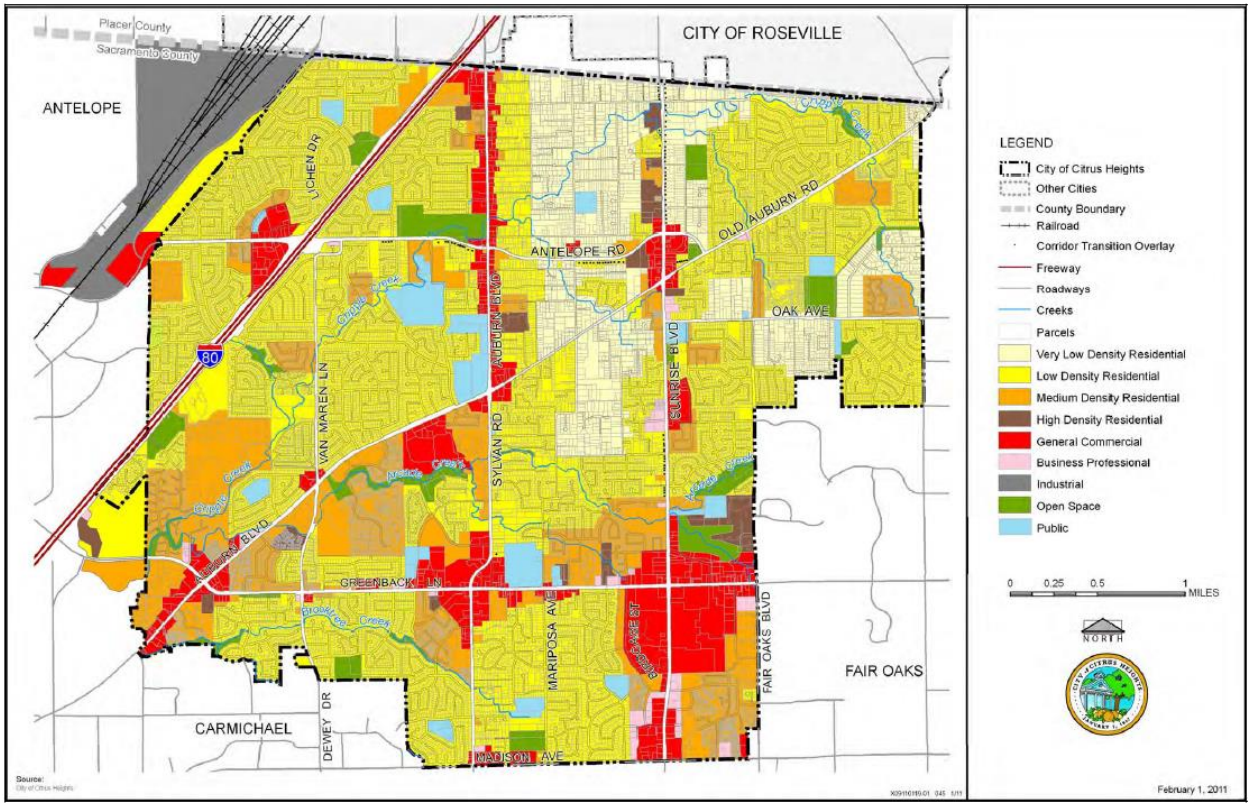
Table A-12 Vacant Land Inventory

Current Land Use/Zoning	Vacant Acres
Residential*	149
Commercial**	46
Total Land Area	195

Notes:
* Based on Vacant Land and Pending Development Inventory (2007), City of Citrus Heights
** Based on Sacramento County Assessor Data

Figure A-5 designates land uses for the Citrus Heights Area. The land use diagram employs a series of residential and nonresidential land use designations. The land use diagram identifies locations of the land use designations to indicate where certain types of land uses may occur.

Figure A-5 City of Citrus Heights Land Use



Source: City of Citrus Heights General Plan Environmental Impact Report (2011)

Development since 2016 Plan

As discussed in Section 4.3.1 of the Base Plan, future development has occurred in the County since the 2016 LHMP. Some of this has occurred in hazard prone areas. The City Building Department tracked total building permits issued since 2016 for the City. These are tracked by total development, property use type, and hazard risk area. These are shown in Table A-13 and Table A-14.

Table A-13 City of Citrus Heights – Total Development Since 2016

Property Use	2016	2017	2018	2019	2020
Agricultural	0	0	0	0	0
Commercial	3	2	0	1	3
Industrial	0	0	0	0	0
Residential	5	11	20	19	34
Unknown	0	0	0	0	0
Total	**8**	**13**	**20**	**20**	**37**

Source: City of Citrus Heights Building Department

Table A-14 City of Citrus Heights – Development in Hazard Areas since 2016

Property Use	1% Annual Chance Flood	Levee Protected Area	Wildfire Risk Area[1]	Other
Agricultural	0	0	0	0
Commercial	0	0	0	0
Industrial	0	0	0	0
Residential	0	0	0	0
Unknown	0	0	0	0
Total	**0**	**0**	**0**	**0**

Source: City of Citrus Heights Building Department

[1]Moderate or higher wildfire risk area

While the data shows no changes in development in the City since the 2016, including development in mapped hazard areas, all development is subject to current building standards to include any requirements for building in hazard areas which act to mitigate hazard exposure. Further development in hazard areas is only one factor of many that contribute to an overall change in hazard vulnerability. Based on these considerations, it cannot be definitively stated as to whether the development or even lack of development contributed to an increase or decrease in vulnerability for Citrus Heights.

Future Development

The Sacramento Council on Governments (SACOG) modeled population projections for the City of Citrus Heights and other areas of the region in 2012 for a Metropolitan Transportation Plan/Sustainable Communities Strategy report. This forecast uses a 2008 base year estimate with projections to 2020 and 2035 for population, housing units, households and employment. SACOG estimated the City population in 2020 and 2035 to be 86,057 and 94,242 respectively.

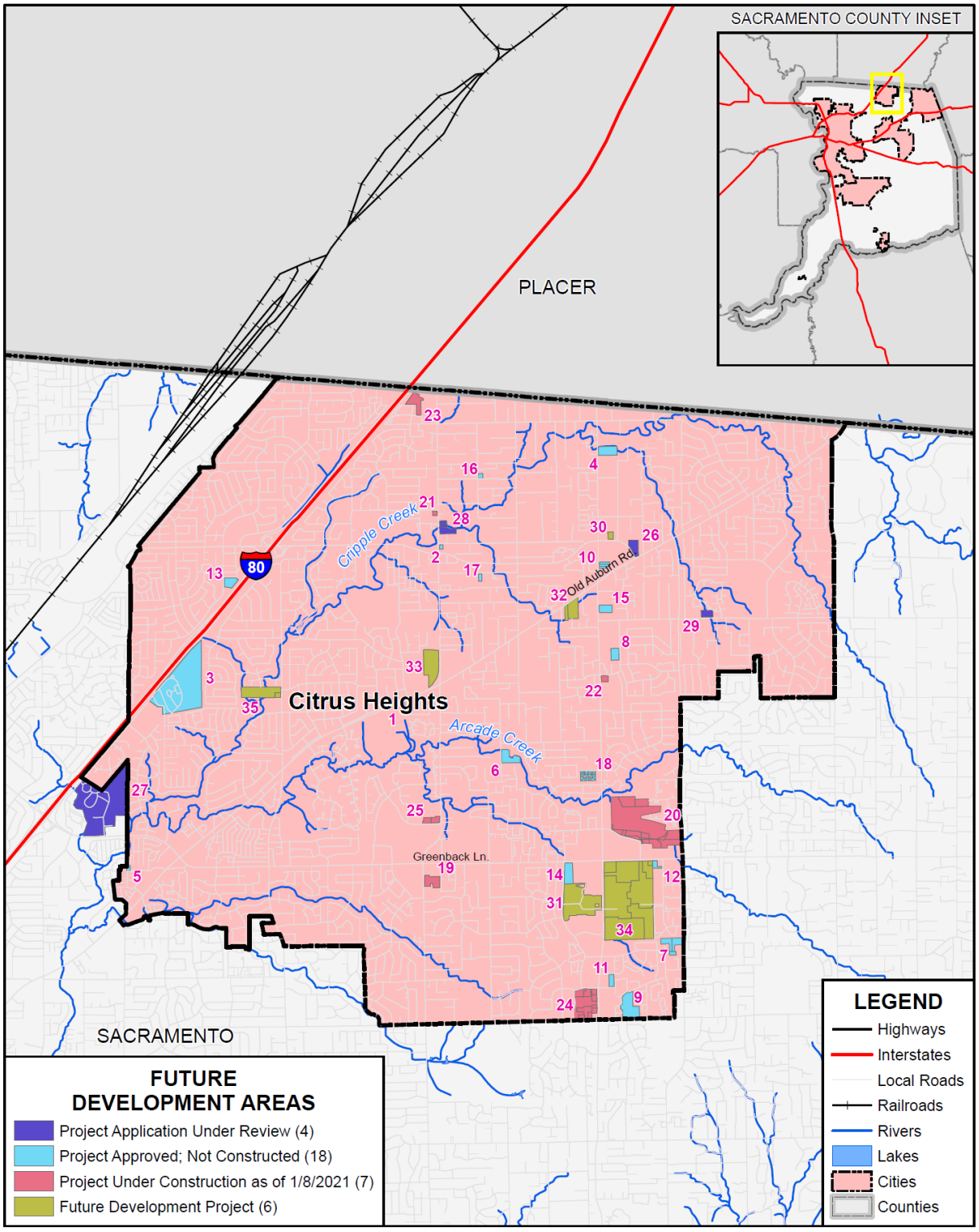
Future Annexation

The City and County cannot agree on mutual terms for annexation and no further attempts at annexation are currently planned.

GIS Analysis

The City of Citrus Heights provided a list of projects that the City is seeing be developed. Using GIS, the following methodology was used in determining parcel counts and acreages with future development projects in the City. Future development areas in the City were provided in mapped format by the City. Using the GIS parcel spatial file for each of these areas, the areas associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure A-6 shows the locations of future development areas the City is planning to develop, which are detailed on the legend in Figure A-7. Table A-15 shows the summary of parcels and acreages of each future development area in the City, while Table A-16 breaks down the areas and shows the parcels and acres for each.

Figure A-6 City of Citrus Heights – Future Development Areas



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Figure A-7 City of Citrus Heights Future Development Area Legend

Table A-15 City of Citrus Heights – Future Development Parcels and Acres by Development Stage Summary

Future Development Stage	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Project Application Under Review	4	6	1	66.5
Project Approved; Not Constructed	18	42	14	96.7
Project Under Construction as of 1/8/2021	7	34	13	83.5
Future Development Project	6	15	12	149.2
Grand Total	**35**	**97**	**40**	**395.9**

Source: City of Citrus Heights

Table A-16 City of Citrus Heights – Future Development Parcels and Acres by Development Stage Detail

Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Project Application Under Review				
American River Collegiate Academy	1	1	0	3.0
East Lawn Cemetery Expansion	1	1	1	58.1
Pioneer Baptist Church	1	3	0	3.6
Trubchik Parcel Map	1	1	0	1.9
Project Application Under Review Total	**4**	**6**	**1**	**66.5**
Project Approved; Not Constructed				
Auburn Heights	1	1	0	0.5
California Quick Slice	1	1	1	0.4
Calvary Cemetery Adm Center	1	1	1	53.5
Carefield Citrus Heights	1	1	0	4.2
Country Lane Townhome Apartments	1	1	0	0.5
Dundee Estates II	1	1		4.2
Fair Oaks Senior Apartments	1	3	2	5.0
Lords Grace Church	1	1	1	2.4
Orchard Apartments	1	1	1	8.3
Palms Auto	1	3	2	1.5
Pebble Beach Condo Conversion	1	1	1	1.5
Popeye's Louisiana Kitchen	1	1	1	1.0
Public Storage	1	1	1	2.7
Raising Cane's	1	1	1	4.4
Sunrise Pointe	1	1	0	2.4
Tentative Parcel Map: Holly Dr	1	1	1	0.5
Tentative Parcel Map: Sycamore Dr	1	1	1	0.7

Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Wyatt Ranch	1	21	0	3.0
Project Approved; Not Constructed Total	**18**	**42**	**14**	**96.7**
Project Under Construction as of 1/8/2021				
Green Acres Nursery & Supply	1	1	1	3.9
Mitchell Village	1	18	0	55.3
Rally's Hamburger	1	1	0	0.5
Starbucks Sunrise Retail Center	1	1	1	1.1
Studio Movie Grill	1	1	1	4.3
Sunrise Village	1	10	10	16.0
USPI ASC	1	2		2.4
Project Under Construction as of 1/8/2021 Total	**7**	**34**	**13**	**83.5**
Future Development Project				
Antelope Commons	1	1		1.0
Birdcage Apartments	1	1	1	24.2
Elbert Property	1	2	2	5.9
New Sylvan Project	1	1	0	11.2
Sunrise Mall Specific Plan Area	1	8	8	96.4
Van Maren Property	1	2	1	10.5
Future Development Project Total	**6**	**15**	**12**	**149.2**
Grand Total	**35**	**97**	**40**	**395.9**

Source: City of Citrus Heights

A.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table A-5 as high or medium significance hazards. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, populations at risk, critical facilities and infrastructure, and future development.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

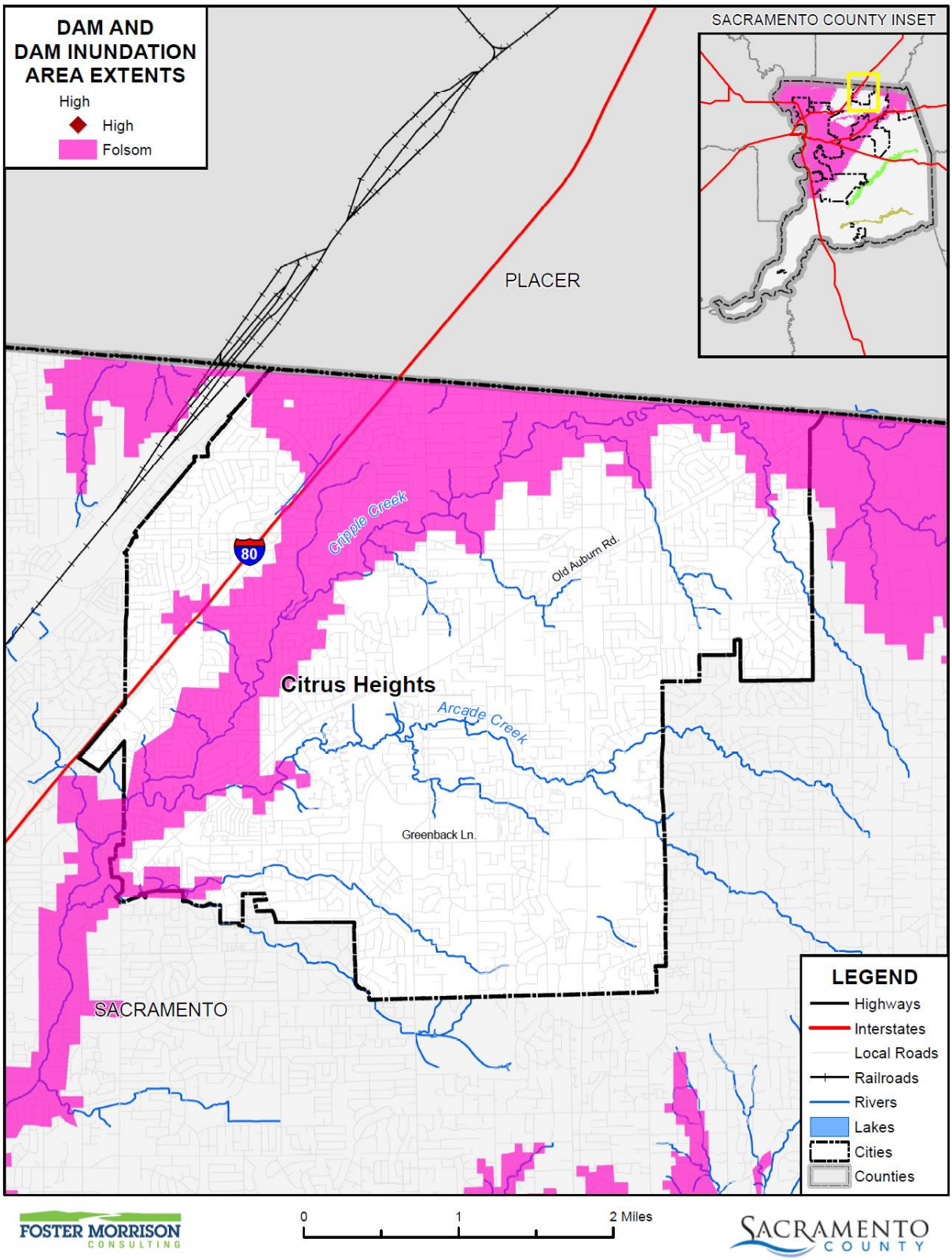
Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The City would be affected for as long as the flood waters from the dam failure took to drain downstream.

Based on available data, the City falls within the inundation areas of Folsom dam. The City falls outside the Folsom Dam 235,000 cfs scenario, as discussed in Section 4.3.7 of the Base Plan. Geographic flood extent from the DWR DSOD and Cal OES dam inundation areas is shown on Figure A-8 for dams outside the County and summarized for all these dams in Table A-17. No dams outside the County have inundation areas that intersect the City.

Note: the Cal OES and DSOD dam inundation data did not include inundation mapping of all dams that could affect the Sacramento County Planning Area and the City; thus, the below analysis reflects information based on available data. Other dams may be identified as a concern to the City.

Figure A-8 City of Citrus Heights – Dam Inundation Areas from Dams Outside the County



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 2/2021.

Table A-17 City of Citrus Heights – Geographical Dam Inundation Extents

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
High Hazard Dams Inside the County							
Folsom	Citrus Heights	2,360.07	26.36%	2,053.12	26.42%	306.95	26.00%

Source: Cal OES, DSOD

Past Occurrences

There has been no state or federal disaster declarations for dam failure in the County. The City noted no other dam failure occurrences that have affected the City.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Warning ability is generally determined by the frequency of inspections for structural integrity, the flood wave arrival time (the time it takes for the flood wave to reach its maximum distance of inundation), or the ability to notify persons downstream and their ability to evacuate. The existence and frequency of updating and exercising an evacuation plan that is site-specific assists in warning and evacuation functions. A failure of the Folsom Dam would leave little time for evacuation of the City of Citrus Heights.

Impacts to the City from a dam failure flood include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

Assets at Risk

Based on the vulnerability of Citrus Heights to the dam failure hazard, the sections that follow describes significant assets at risk in the City of Citrus Heights. This section includes the values at risk, inundated acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Citrus Heights. The methodology described in Section 4.3.9 of the Base Plan was followed in determining structures and values at risk to dam failure. Table A-18 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in dam inundation areas in the City.

Table A-18 City of Citrus Heights – Count and Values of Parcels at Risk by Dam Inundation Area and Property Use

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Folsom Dam – High Hazard Dam Inside of County						
Care / Health	6	6	$1,071,268	$5,417,377	$5,417,377	$11,906,022
Church / Welfare	14	13	$1,872,045	$16,450,757	$16,450,757	$34,773,559
Industrial	5	4	$1,344,275	$1,413,412	$2,120,118	$4,877,805
Miscellaneous	160	0	$291,254	$0	$0	$291,254
Office	27	26	$8,056,621	$15,300,262	$15,300,262	$38,657,145
Public / Utilities	8	0	$0	$0	$0	$0
Recreational	1	1	$478,036	$664,746	$664,746	$1,807,528
Residential	8,196	8,123	$12,205,219,115	$13,597,441,670	$6,798,720,814	$32,601,381,559
Retail / Commercial	69	66	$29,866,814	$41,603,240	$41,603,240	$113,073,294
Unknown	3	3	$0	$271,996	$0	$271,996
Vacant	66	4	$7,204,880	$217,179	$0	$7,422,059
Citrus Heights Total	**8,555**	**8,246**	**$12,255,404,308**	**$13,678,780,639**	**$6,880,277,314**	**$32,814,462,221**

Source: CAL OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data

Population at Risk

The DSOD and Cal OES dam inundation areas were overlayed on the parcel layer. Those residential parcel centroids that intersect the dam inundation areas were counted and multiplied by the Census Bureau average household factors for Citrus Heights – 2.54. This is shown in Table A-29.

Table A-19 City of Citrus Heights – Count of Improved Residential Parcels and Population by Dam Inundation Area

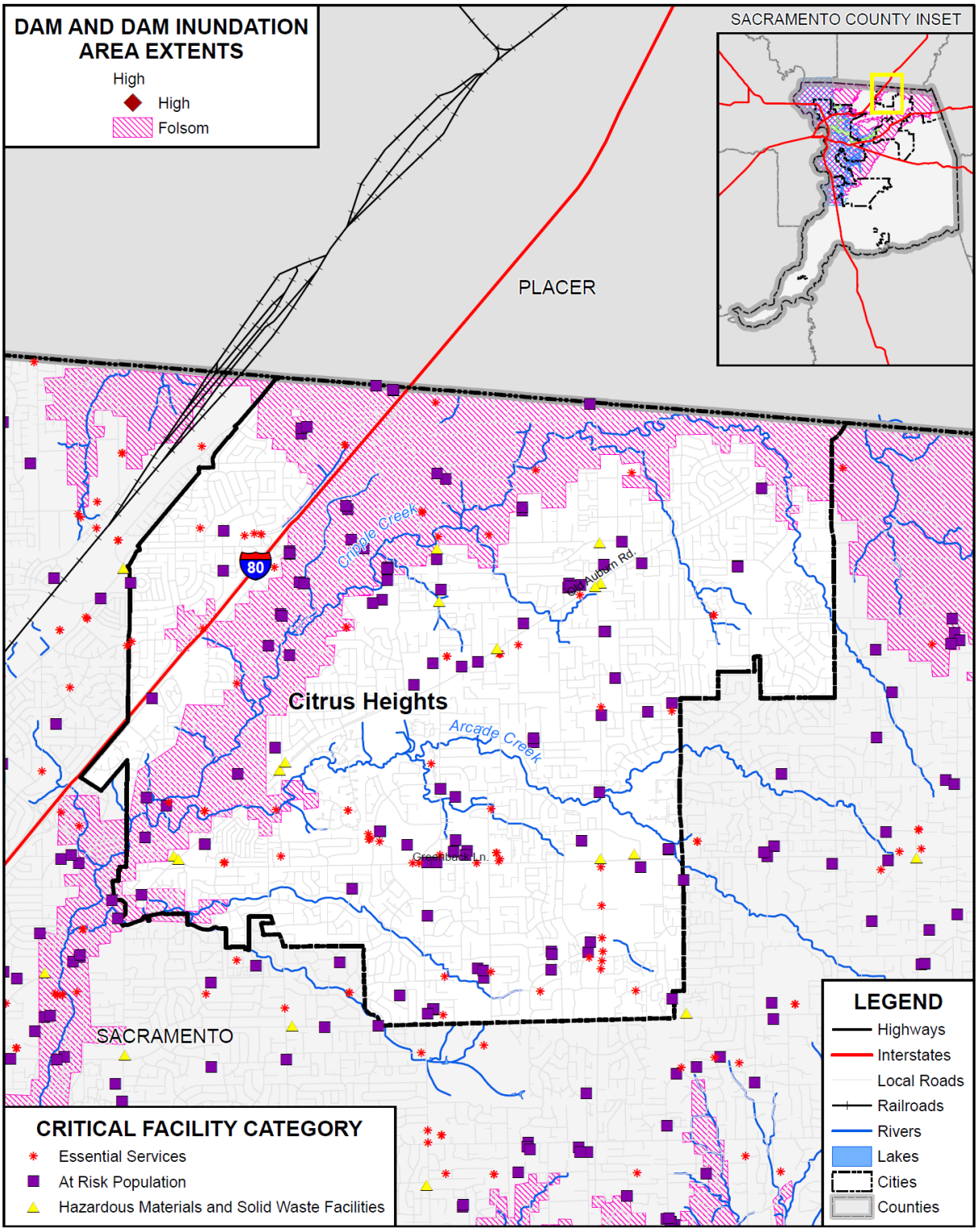
Jurisdiction	Folsom Dam Inundation Area	
	Improved Residential Parcels	Population
Citrus Heights	8,123	20,632

Source: Cal OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Citrus Heights in identified dam inundation areas. GIS was used to determine whether the critical facility locations intersect a DSOD or Cal OES dam inundation area. Details of critical facilities in mapped dam inundation areas in the City of Citrus Heights are shown in Figure A-9 and detailed in Table A-20. Details of critical facility definition, type, name and address and jurisdiction by dam inundation area are listed in Appendix F.

Figure A-9 City of Citrus Heights – Critical Facilities in Dam Inundation Areas



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table A-20 City of Citrus Heights – Critical Facilities in Dam Inundation Areas by Category and Type

Dam Inundation Areas/ Critical Facility Category	Critical Facility Type	Facility Count
Folsom		
Essential Services Facilities	Emergency Evacuation Center	2
	EMS Stations	1
	FDIC Insured Banks	1
	Fire Station	1
	Microwave Service Towers	1
	Water Well	12
	Total	**18**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	1
	Day Care Center	8
	Mobile Home Parks	2
	Places of Worship	8
	School	7
	Total	26
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	1
	Total	1
Folsom Dam Total		45

Source: Cal OES, DSOD, Sacramento County GIS

Future Development

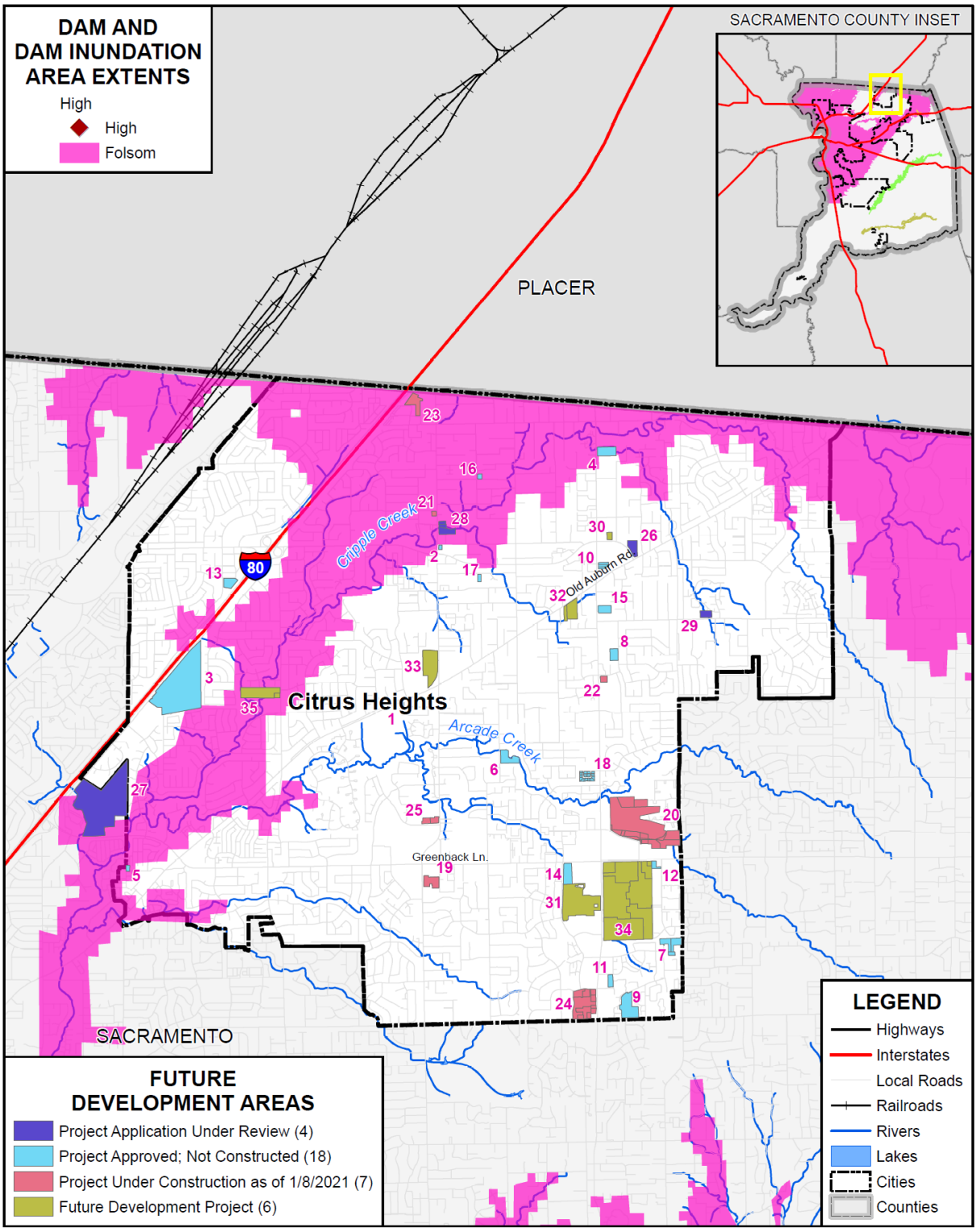
Future dam failures are considered unlikely. However, given the high number of affected parcels and the proximity of Folsom Dam, future development in the City could be affected by a dam failure and associated flooding. The City enforces it floodplain ordinance, which helps to reduce risk to flooding by requiring structures in the 1% annual chance floodplains to be above the base flood elevation, which depending on inundation depths and affected areas may provide some relief. Siting of future development areas should take dam failure flooding into account. The Folsom Dam has seen sizable improvements in recent years, which reduce the risk of a major event in the future.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure A-10 shows the locations of future development areas the City is planning to develop on the dam inundation zones from dams inside the County, while Figure A-11 gives the legend

of these locations. Table A-21 shows the parcels and acreages of each future development area in the City in the dam inundation areas inside the County.

Figure A-10 City of Citrus Heights – Dam Inundations from Dams Inside the County



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Figure A-11 City of Citrus Heights Future Development Area Legend

Table A-21 City of Citrus Heights – Future Development in Dam Inundation Areas

Dam Inundation Area/Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Folsom Dam Inundation Area				
Project Application Under Review				
East Lawn Cemetery Expansion	1	1	1	58.1
Pioneer Baptist Church	1	3	0	3.6
Project Application Under Review Total	**2**	**4**	**1**	**61.7**
Project Approved; Not Constructed				
Calvary Cemetery Adm Center	1	1	1	53.5
Carefield Citrus Heights	1	1	0	4.2
Country Lane Townhome Apartments	1	1	0	0.5
Tentative Parcel Map: Holly Dr	1	1	1	0.5
Project Approved; Not Constructed Total	**4**	**4**	**2**	**58.7**
Project Under Construction as of 1/8/2021				
Rally's Hamburger	1	1	0	0.5
Studio Movie Grill	1	1	1	4.3

Dam Inundation Area/Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Project Under Construction as of 1/8/2021 Total	**2**	**2**	**1**	**4.8**
Future Development Project				
Van Maren Property	1	2	1	10.5
Future Development Project Total	**1**	**2**	**1**	**10.5**
Grand Total	**9**	**12**	**5**	**135.7**

Source: City of Citrus Heights, Cal OES, DSOD

Earthquake

Though ranked as a low significance hazard, due to its importance in the County and the State of California, earthquake is profiled here. It remains a low significance hazard for mitigation planning purposes.

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–Low

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

Since earthquakes are regional events, the whole of the City is at risk to earthquake. Citrus Heights and the surrounding area have limited significant seismic and geologic hazards. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The City of Citrus Heights General Plan Background Report noted that although no active faults are located in the immediate vicinity of Citrus Heights, several large, active and potentially active faults are located within the surrounding region. These faults include the Dunnigan Hills Fault and other unnamed faults on the west side of the Sacramento Valley, and faults associated with the Foothills Fault System along the western slope of the Sierra Nevada. However, the probability that these faults would significantly affect Citrus Heights is considered to be small. Ground shaking felt in Citrus Heights is more likely to be the result of seismic activity along coastal faults.

The closest known active fault mapped by the California Division of Mines and Geology is the Foothills Fault Zone which is located approximately 15 miles northeast of Citrus Heights. Other active or potentially active faults that may be a hazard to the area include Green Valley-Concord, Hayward, San Andreas, and Calaveras.

Three local faults lie within approximately 20 miles of Citrus Heights, all of which are considered inactive (no activity in the Holocene period of the last 10,000 years). These include the Volcano Hill Fault, just east of Roseville, the Linda Creek Fault (which has uncertain existence and activity status) extending southeasterly along a portion of Linda Creek in the southern portion of Roseville and into Sacramento County, and a third unnamed fault. The unnamed fault is a west-east oriented fault between Rocklin and Folsom Reservoir. Portions of this fault are concealed, and may be connected to the Bear Mountain Fault Zone.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The City is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the City fall within a low to moderate shake risk.

Past Occurrences

The City noted no past occurrences of earthquakes or that affected the City in any meaningful way.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured housing is very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. There are none of these building in the City.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC

establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The City of Citrus Heights is located within the less hazardous Zone 3.

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

Impacts from earthquake in the City will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

Earthquake Analysis

Due to the regional effects of an earthquake, a Hazus earthquake analysis was performed on a countywide basis. This can be found in Section 4.3.11 of the Base Plan. While these runs were not done specific to the City, maps showing damage in the County show greater areas of damage near the cities in the County.

Future Development

Although new growth and development corridors would fall in the area affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in areas prone to earthquakes will continue to occur. The City enforces the state building code, which mandates construction techniques that minimize seismic hazards. Future development in the City is subject to these building codes.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

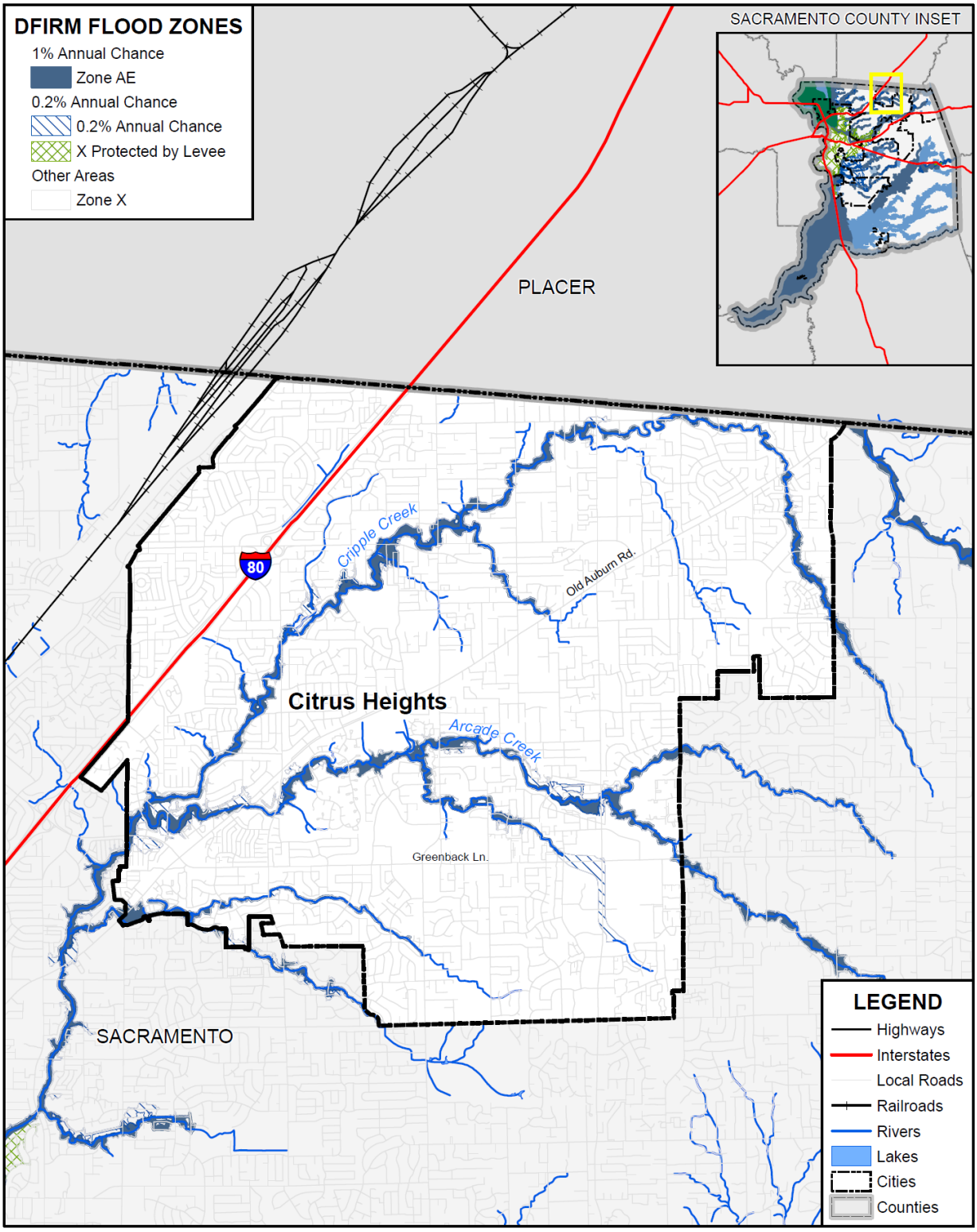
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the City, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the City of Citrus Heights. Historically, the City has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the City of Citrus Heights have been subject to historical flooding. Citrus Heights is traversed by several stream systems and is at risk to the 1% and 0.2% flood.

Location and Extent

The City of Citrus Heights has areas located in the 1% and 0.2% annual chance flood zones. This is seen in Figure A-12.

Figure A-12 City of Citrus Heights – FEMA DFIRM Flood Zones



FOSTER MORRISON CONSULTING

SACRAMENTO COUNTY

Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table A-22 details the DFIRM mapped flood zones located within the City.

Table A-22 City of Citrus Heights– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in City
A	1% annual chance flooding: No base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
AE	1% annual chance flooding: Base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood. Flood insurance is not mandatory but is available.	X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	
X (unshaded)	No flood hazard	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the City vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the City tends to have a shorter speed of onset, due to the amount of water that flows through the City.

Geographical flood extents for the City from the FEMA DFIRMs are shown in Table A-23.

Table A-23 City of Citrus Heights – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
1% Annual Chance	432	4.83%	248	3.19%	184	15.62%
0.2% Annual Chance	209	2.34%	169	2.18%	40	3.38%
Other Areas	8,308	92.83%	7,352	94.63%	956	81.01%
Total	**8,950**	**100.00%**	**7,770**	**100.00%**	**1,180**	**100.00%**

Source: FEMA DFIRM 11/2/2018

*Percentage of total acres is the percent of total acres of the entire County Planning Area, not the total acres of the jurisdiction

The City has 26 miles of natural creek channels within its 14 square miles. Cripple Creek, Arcade Creek, San Juan Creek, Mariposa Creek, Coyle Creek and Brooktree Creek traverse the City and are at risk to bank erosion. All the natural creek channels within the City suffer from suburban runoff causing deep incisions and erosion.

The City has had to implement a couple projects to protect and restore the creek bank that had become a potential hazard to public health and welfare.

- Brooktree Creek Rehabilitation at Paroaks Project
  - ✓ In 2016, the City released an emergency creek bank restoration project. Brooktree Creek had eroded the bank next to 6017 Paroaks Drive. Approximately 100' of Geoweb retaining wall installed along with 130' of rock stabilized channel and check dams.
- Mariposa Avenue Slope Repair Project
  - ✓ In 2016, the City had a contractor construct 50' of concrete poured in drilled hole retaining wall and 100' of guardrail along Cripple Creek. The erosion had threatened the roadway.

Those are the 2 erosion control projects from the previous 5 years. Prior events in the City include.

- Matheny Drainage Project
  - ✓ In 2003, the City released an emergency creek bank restoration project. Arcade Creek had eroded the bank next to Matheny Way and caused the street to crack open. Approximately 250' of gabion baskets were installed along the creek bank just outside the shoulder of the road.
- Stock Ranch Drainage Project
  - ✓ In 2011, the City had a contractor rock the banks along Arcade Creek at a major pedestrian bridge and restore an outfall for a sedimentation basin next to the bridge. Over 30' of bank had been eroded over a 5-year time span. The erosion had threatened the bridge piers and partially collapsed a concrete outfall.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table A-24. These events also likely affected the City to some degree.

Table A-24 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

While the state and region have experienced flooding events in the past 5 years, judicious creek maintenance in the City has protected the community from past occurrences of flooding. There have been occurrences of minor localized flooding of roadways, but no impacts beyond normal operations.

Vulnerability to and Impacts from Flood

Floods have been a part of the City's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

Based on the vulnerability of Citrus Heights to the flood hazard, the sections that follow describes significant assets at risk in the City of Citrus Heights. This section includes the values at risk, flooded acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Citrus Heights. The methodology described in Section 4.3.12 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table A-25 is a summary table for the City of Citrus Heights. Parcel counts, values, estimated contents, and total values in the City are shown for the 1% and 0.2% annual chance flood zones, as well as for those properties that fall outside of the mapped FEMA DFIRM flood zones. Table A-26 breaks down Table A-25 and shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in FEMA flood zones in the City.

Table A-25 City of Citrus Heights – Count and Value of Parcels at Risk in Summary DFIRM Flood Zones

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard	264	171	$16,613,142	$39,944,477	$25,347,062	$81,904,679
0.2% Annual Chance Flood Hazard	372	344	$45,438,707	$69,451,717	$42,174,438	$157,064,851
Other Areas	26,141	25,306	$2,215,185,553	$5,359,158,617	$3,077,500,176	$10,651,844,282
City of Citrus Heights Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$3,145,021,676**	**$10,890,813,812**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table A-26 City of Citrus Heights – Count and Values of Parcels at Risk by Detailed Flood Zone and Property Use

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard						
Zone AE						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	4	3	$327,823	$4,523,907	$4,523,907	$9,375,637
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	62	0	$11,688	$0	$0	$11,688
Office	1	1	$499,392	$697,068	$697,068	$1,893,528
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Residential	176	160	$12,799,237	$29,071,695	$14,535,851	$56,406,781
Retail/ Commercial	6	6	$2,107,730	$5,590,236	$5,590,236	$13,288,202
Unknown	1	1	$0	$61,571	$0	$61,571
Vacant	14	0	$867,272	$0	$0	$867,272
Zone AE Total	**264**	**171**	**$16,613,142**	**$39,944,477**	**$25,347,062**	**$81,904,679**
1% Annual Chance Flood Hazard Total	**264**	**171**	**$16,613,142**	**$39,944,477**	**$25,347,062**	**$81,904,679**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	15	0	$21,293	$0	$0	$21,293
Office	7	6	$1,384,989	$4,458,819	$4,458,819	$10,302,627
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	335	329	$36,327,318	$54,403,179	$27,201,600	$117,932,086
Retail/ Commercial	8	8	$7,287,000	$10,514,019	$10,514,019	$28,315,038
Unknown	1	1	$0	$75,700	$0	$75,700
Vacant	6	0	$418,107	$0	$0	$418,107
0.2% Annual Chance Total	**372**	**344**	**$45,438,707**	**$69,451,717**	**$42,174,438**	**$157,064,851**
0.2% Annual Chance Flood Hazard Total	**372**	**344**	**$45,438,707**	**$69,451,717**	**$42,174,438**	**$157,064,851**
Other Areas						
Zone X						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	37	29	$16,430,609	$73,652,597	$73,652,597	$163,735,803
Church/Welfare	41	36	$9,023,460	$41,690,284	$41,690,284	$92,404,028
Industrial	22	19	$11,535,364	$17,589,132	$26,383,698	$55,508,194
Miscellaneous	276	0	$594,406	$0	$0	$594,406
Office	143	135	$53,763,600	$116,085,697	$116,085,697	$285,934,994
Public/Utilities	24	1	$27,054	$3,837	$3,837	$34,728

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Recreational	6	4	$2,578,894	$12,938,386	$12,938,386	$28,455,666
Residential	24,926	24,729	$1,760,111,261	$4,571,337,602	$2,285,668,855	$8,617,117,654
Retail/ Commercial	352	336	$316,211,973	$521,076,822	$521,076,822	$1,358,365,617
Unknown	2	1	$34,193	$134,725	$0	$168,918
Vacant	312	16	$44,874,739	$4,649,535	$0	$49,524,274
Zone X Total	**26,141**	**25,306**	**$2,215,185,553**	**$5,359,158,617**	**$3,077,500,176**	**$10,651,844,282**
Other Areas Total	**26,141**	**25,306**	**$2,215,185,553**	**$5,359,158,617**	**$3,077,500,176**	**$10,651,844,282**
Citrus Heights Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$3,145,021,676**	**$10,890,813,812**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table A-27 summarizes Table A-26 above and shows City of Citrus Heights loss estimates and improved values at risk by FEMA 1% and 0.2% annual chance flood zones.

Table A-27 City of Citrus Heights – Flood Loss Estimates

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood Hazard	264	171	$39,944,477	$25,347,062	$65,291,539	$13,058,308	0.01%
0.2% Annual Chance Flood Hazard	372	344	$69,451,717	$42,174,438	$111,626,155	$22,325,231	0.01%
Grand Total	**636**	**515**	**$109,396,194**	**$67,521,500**	**$176,917,694**	**$35,383,539**	**0.02%**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table A-26 and Table A-27, the City of Citrus Heights has 171 parcels and $65.3 million of structure and contents values or values in the 1% annual chance flood zone, and 344 improved parcels and

$111.6 million of structure and contents values in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.10 of the Base Plan, there is a 1% chance in any given year of a flood event causing $13.1 million in damage and a 0.2% chance in any given year of a flood event causing $22.3 million in damage in the City of Citrus Heights. The loss ratio of 0.01% and 0.01% indicates that flood losses for 1% and 0.2% annual chance flooding, respectively, would be minimal and somewhat easy to recover from.

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits. The same methodology, as discussed in Section 4.3.12 of the Base Plan, was used for the City of Citrus Heights as well as for the County as a whole. Table A-28 represents a detailed and summary analysis of total acres for each FEMA DFIRM flood zone in the City.

Table A-28 City of Citrus Heights – Flooded Acres by Flood Zone

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard						
Zone AE						
Agricultural	0.0	0.00%	0.0	0.00%	0.0	0.00%
Care/Health	0.1	0.00%	0.1	0.00%	0.0	0.08%
Church/Welfare	11.3	0.13%	10.4	0.13%	0.9	0.00%
Industrial	0	0.00%	0	0.00%	0.0	10.84%
Miscellaneous	127.9	1.43%	0	0.00%	127.9	0.23%
Office	4.5	0.05%	1.8	0.02%	2.7	0.05%
Public/Utilities	0.6	0.01%	0	0.00%	0.6	0.00%
Recreational	0.0	0.00%	0.0	0.00%	0.0	2.30%
Residential	254.2	2.84%	227.1	2.92%	27.2	0.00%
Retail/ Commercial	8.5	0.10%	8.5	0.11%	0.0	0.00%
Unknown	0.0	0.00%	0.0	0.00%	0.0	2.12%
Vacant	25.1	0.28%	0.0	0.00%	25.1	15.62%
Zone AE Total	**432.3**	**4.83%**	**248.0**	**3.19%**	**184.3**	**15.62%**
1% Annual Chance Flood Hazard Total	**432.3**	**4.83%**	**248.0**	**3.19%**	**184.3**	**15.62%**
0.2% Annual Chance Flood Hazard						
Agricultural	0	0.00%	0	0.00%	0.0	0.00%
Care/Health	0.1	0.00%	0.1	0.00%	0.0	0.00%
Church/Welfare	4.5	0.05%	4.2	0.05%	0.2	0.02%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Industrial	0.0	0.00%	0.0	0.00%	0.0	0.00%
Miscellaneous	23.2	0.26%	0.0	0.00%	23.2	1.97%
Office	6.6	0.07%	5.8	0.08%	0.7	0.06%
Public/Utilities	1.0	0.01%	0.0	0.00%	1.0	0.09%
Recreational	0.0	0.00%	0.0	0.00%	0	
Residential	144.5	1.61%	134.7	1.73%	9.8	0.83%
Retail/ Commercial	24.5	0.27%	24.5	0.32%	0.0	0.00%
Unknown	0.0	0.00%	0.0	0.00%	0.0	0.00%
Vacant	4.8	0.05%	0.0	0.00%	4.8	0.41%
0.2% Annual Chance Flood Hazard Total	**209.3**	**2.34%**	**169.5**	**2.18%**	**39.9**	**3.38%**
Other Areas						
Zone X						
Agricultural	0	0.00%	0	0.00%	0	0.00%
Care/Health	116.2	1.30%	92.6	1.19%	23.5	1.99%
Church/Welfare	112.7	1.26%	105.9	1.36%	6.8	0.58%
Industrial	25.9	0.29%	23.3	0.30%	2.6	0.22%
Miscellaneous	291.3	3.25%	0.0	0.00%	291.3	24.68%
Office	183.1	2.05%	162.7	2.09%	20.3	1.72%
Public/Utilities	141.6	1.58%	0.1	0.00%	141.5	11.99%
Recreational	23.1	0.26%	8.0	0.10%	15.1	1.28%
Residential	6,665.1	74.47%	6,429.5	82.75%	235.6	19.96%
Retail/ Commercial	528.0	5.90%	519.7	6.69%	8.3	0.71%
Unknown	3.3	0.04%	0.0	0.00%	3.3	0.28%
Vacant	218.1	2.44%	10.3	0.13%	207.8	17.60%
Zone X Total	**8,308.4**	**92.83%**	**7,352.2**	**94.63%**	**956.3**	**81.01%**
Other Areas Total	**8,308.4**	**92.83%**	**7,352.2**	**94.63%**	**956.3**	**81.01%**
Citrus Heights Total	**8,950.1**	**100.0%**	**7,769.6**	**100.0%**	**1,180.5**	**100.0%**

Source: FEMA 11/2/2018 DFIRM

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Citrus Heights – 2.54. According to this analysis, there is a total population of 406 and 836 residents of the City at risk to flooding in the 1% and 0.2% annual chance floodplains, respectively. This is shown in Table A-29.

Table A-29 City of Citrus Heights – Count of Improved Residential Parcels and Population by Flood Zone

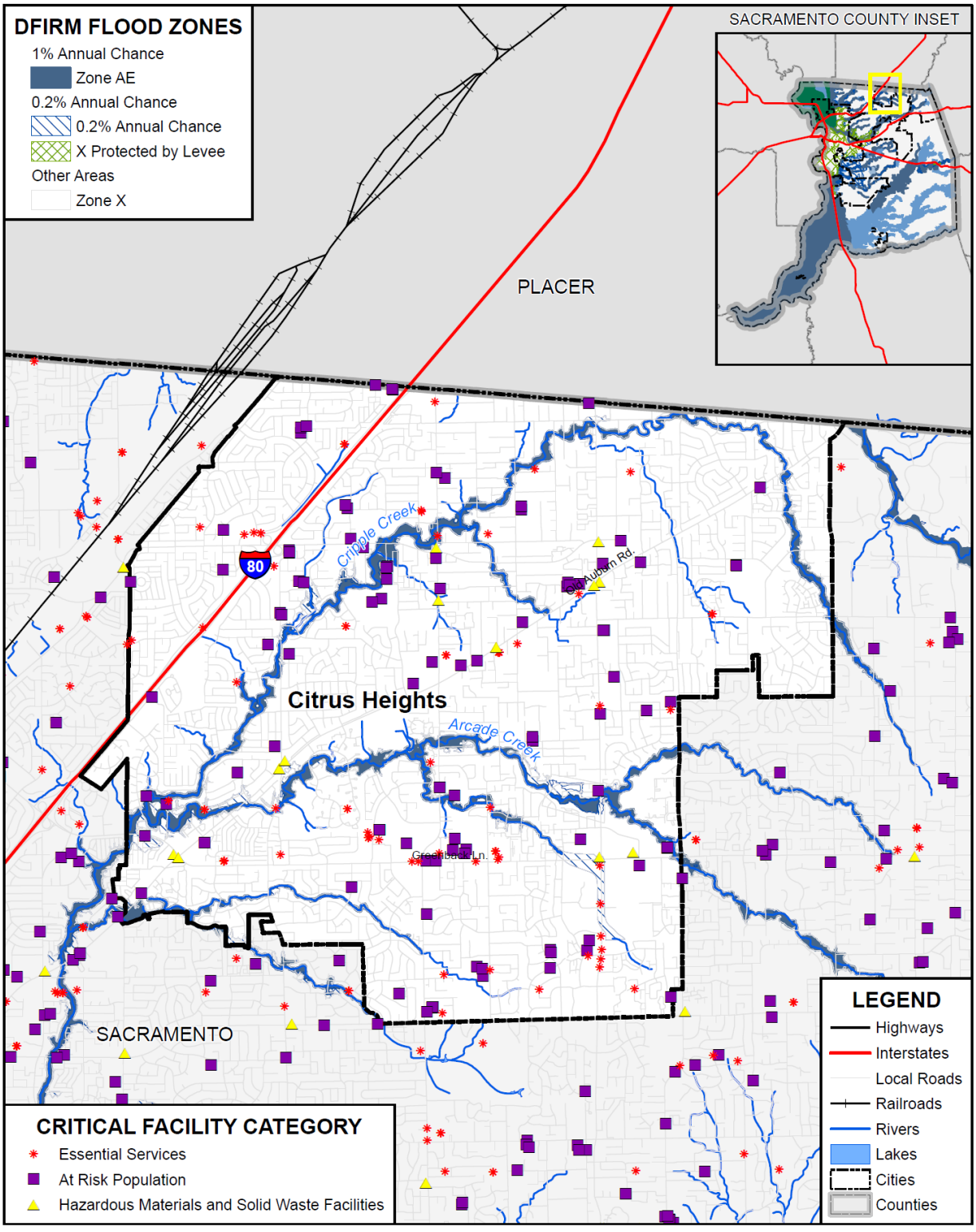
Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Citrus Heights	160	406	329	836

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Citrus Heights in identified DFIRM flood zones. GIS was used to determine whether the critical facility locations intersect a DFIRM flood zone, and if so, which flood zone it intersects. Details of critical facilities in mapped dam inundation areas in the City of Citrus Heights are shown in Figure A-13 and detailed in Table A-30. Details of critical facility definition, type, name and address and jurisdiction by DFIRM Flood Zone are listed in Appendix F.

Figure A-13 City of Citrus Heights – Future Development in DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table A-30 City of Citrus Heights – Critical Facilities in DFIRM Flood Zones by Category and Type

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
1% Annual Chance Flood Hazard		
Essential Services Facilities	Emergency Evacuation Center	1
	Total	**1**
1% Annual Chance Flood Hazard Total		**1**
0.2% Annual Chance Flood Hazard		
Essential Services Facilities	FDIC Insured Banks	2
	Water Well	4
	Total	**6**
At Risk Population Facilities	Mobile Home Parks	2
	Places of Worship	1
	School	1
	Total	**4**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	1
	Total	**1**
0.2% Annual Chance Flood Hazard Total		**11**
Other Areas		
Essential Services Facilities	Emergency Evacuation Center	7
	EMS Stations	4
	FDIC Insured Banks	11
	Fire Station	5
	Law Enforcement	2
	Microwave Service Towers	17
	Water Well	23
	Total	**69**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Day Care Center	27
	Mobile Home Parks	8
	Places of Worship	36
	School	30
	Total	**104**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	11
	Total	**11**
Other Areas Total		**184**

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
Citrus Heights Total		**196**

Source: City of Citrus Heights, FEMA 7/19/2018 DFIRM

Insurance Coverage, Claims Paid, and Repetitive Losses

Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures located within a 100-year floodplain – a requirement that affects nearly all mortgages financed through commercial lending institutions. Flood insurance is also recommended for all structures protected by levees, even if not mapped within a floodplain.

The City of Citrus Heights joined the National Flood Insurance Program (NFIP) on October 15,1997. The City does not participate in CRS program. NFIP data indicates that as of March 24, 2020, there were 337 flood insurance policies in force in the City with $91,063,800 of coverage. Of the 337 policies, 331 were residential (single-family homes) and 6 were non-residential. Of the 337 policies, 130 were in A zones, while 207 were in B, C, and X zones. There have been 15 historical claims for flood losses totaling $335,680.89. NFIP data further indicates that there are 5 repetitive loss (RL) or and 0 severe repetitive loss (SRL) buildings in Citrus Heights. There have been 2 substantial damage claims since 1978.

Based on this analysis of insurance coverage, the City has values at risk to the 1% annual chance and greater floods. Of the171 improved parcels within the 1% annual chance flood zone, 130 (or 76.0 percent) of those parcels maintain flood insurance. This can be seen on Table A-31.

Table A-31 City of Citrus Heights – Percentage of Policy Holders to Improved Parcels in the 1% Annual Chance Floodplain

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Citrus Heights	171	130	76.0%

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, NFIP CIS data 3/2020.

California Department of Water Resources Best Available Maps (BAM)

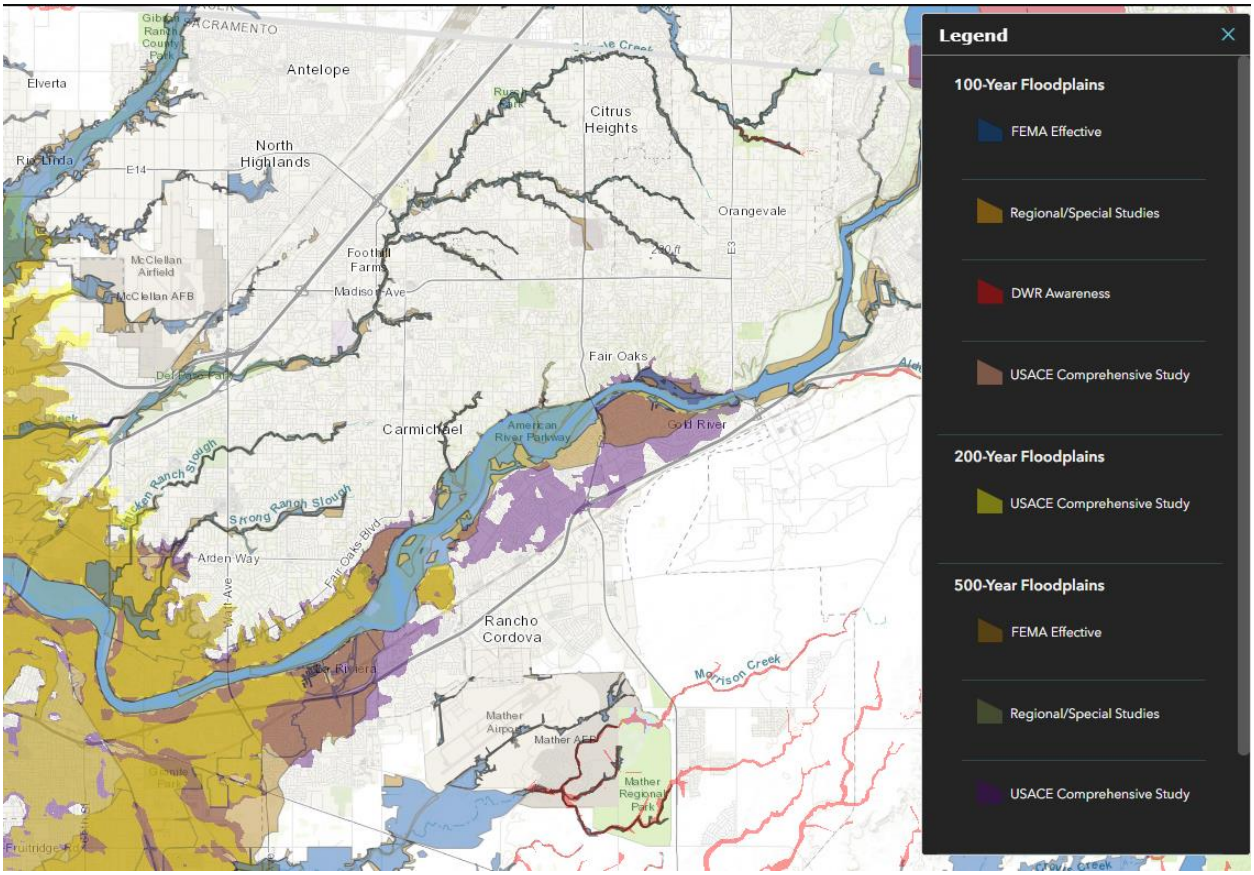
The FEMA regulatory maps provide just one perspective on flood risks in Sacramento County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Nevada-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-(as applicable), and 500-year event risks using the best available data. The 100-year floodplain limits

on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the City than that provided in the FEMA DFIRMs. The BAM map for Citrus Heights is shown in Figure A-14.

Figure A-14 City of Citrus Heights – Best Available Map



Source: California DWR

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1%r (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2% (2002 Sac and San Joaquin River Basins Comp Study).

Future Development

The potential for flooding may increase as floodwaters are channeled due to land development. Such changes can exacerbate flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning should be based on build out property

use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the overall floodplain.

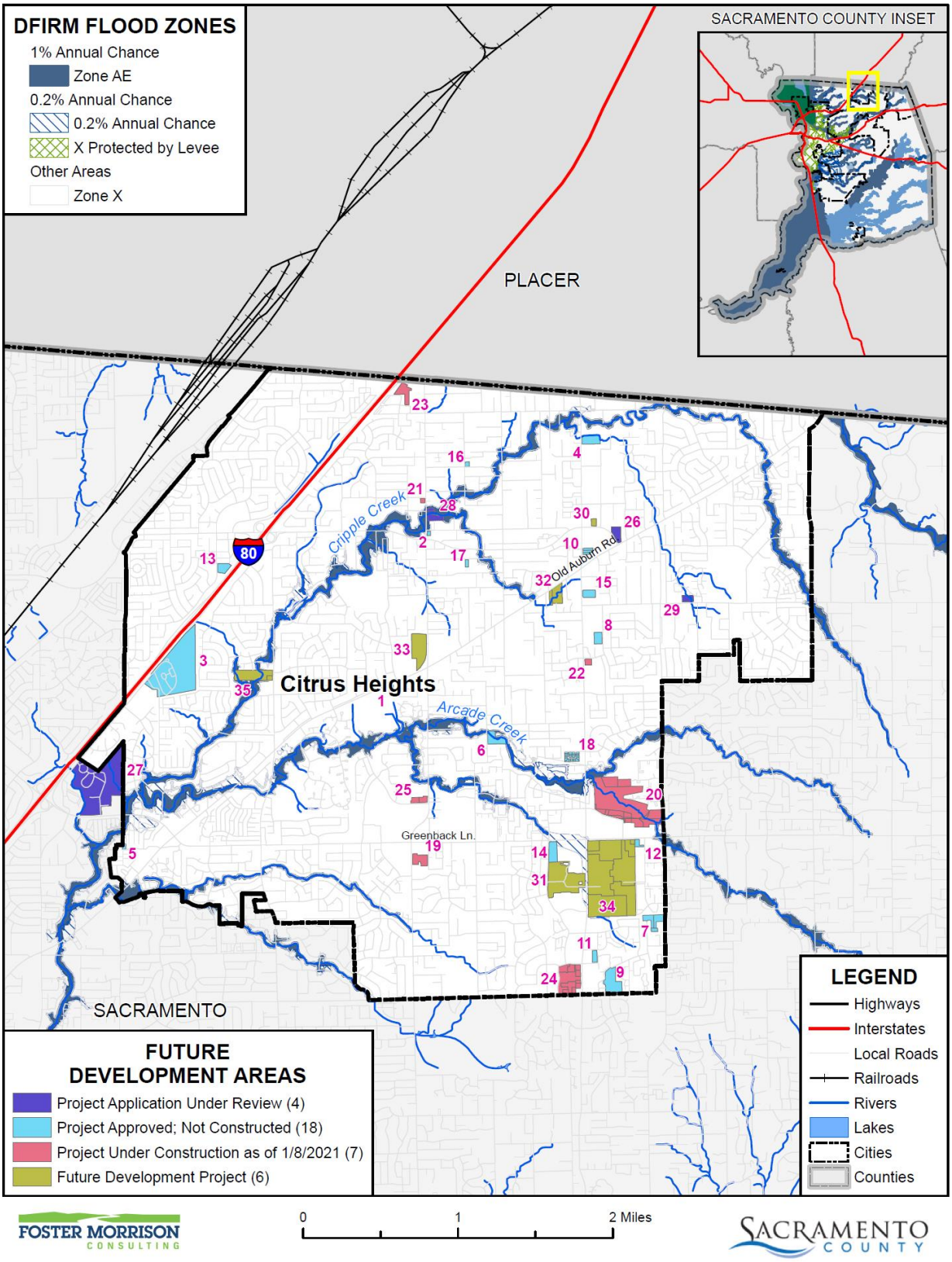
The City enforces the floodplain ordinance and, through the zoning code, has restricted building in the floodplain to only replacing existing structures with conforming structures. If any development is to occur in the floodplain, it would have to conform to the elevation standards of the floodplain ordinance. No development is expected in the floodplain in the future.

The City of Citrus Heights General Plan Background Report (2011) noted that development (structures, bridges, fill) within the 100-year floodplain is evaluated to ensure consistency with the restrictions of the Zoning Code. Development within a floodplain could increase the flood hazard to adjacent properties by raising upstream floodplain elevations and/or increasing downstream flow and water velocities. A raised upstream floodplain can occur with downstream displacement of flood storage, which occurs when a floodplain is filled. Such floodplain disturbance can result in a constriction in the natural flow of water which increases the speed of water traveling downstream. The Citrus Heights Zoning Code prohibits new construction within the 100-year floodplain except for fences. The Zoning Code also includes minimum creek setbacks for development adjacent to creeks. For existing properties that are entirely in the floodplain and comply with the City's Drainage and Development Policy, development may occur, provided that each structure is designed to have the habitable finished floor elevation a minimum of two feet above the 100-year floodplain.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure A-15 shows the locations of future development areas the City is planning to develop on the DFIRM flood zones, with a legend of these locations shown on Figure A-16. Table A-32 shows the parcels and acreages of each future development area in the City in the DFIRM flood zones.

Figure A-15 City of Citrus Heights – Future Development in DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Figure A-16 City of Citrus Heights Future Development Area Legend

Table A-32 City of Citrus Heights – Future Development in FEMA DFIRM Flood Zones

Flood Zone/Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
1% Annual Chance Flood Hazard				
Zone AE				
Project Application Under Review				
Pioneer Baptist Church	1	2	0	1.1
Project Application Under Review Total	***1***	***2***	***0***	***1.1***
Project Approved; Not Constructed				
Dundee Estates II	1	1	0	4.2
Project Approved; Not Constructed Total	***1***	***1***	***0***	***4.2***
Zone AE Total	**2**	**3**	**0**	**5.3**
1% Annual Chance Flood Hazard Total	**2**	**3**	**0**	**5.3**
Other Areas				
Zone X				
Project Application Under Review				
American River Collegiate Academy	1	1	0	3.0
East Lawn Cemetery Expansion	1	1	1	58.1

Flood Zone/Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Pioneer Baptist Church	0	1	0	2.5
Trubchik Parcel Map	1	1	0	1.9
Project Application Under Review Total	***3***	***4***	***1***	***65.4***
Project Approved; Not Constructed				
Auburn Heights	1	1	0	0.5
California Quick Slice	1	1	1	0.4
Calvary Cemetery Adm Center	1	1	1	53.5
Carefield Citrus Heights	1	1	0	4.2
Country Lane Townhome Apartments	1	1	0	0.5
Fair Oaks Senior Apartments	1	3	2	5.0
Lords Grace Church	1	1	1	2.4
Orchard Apartments	1	1	1	8.3
Palms Auto	1	3	2	1.5
Pebble Beach Condo Conversion	1	1	1	1.5
Popeye's Louisiana Kitchen	1	1	1	1.0
Public Storage	1	1	1	2.7
Raising Cane's	1	1	1	4.4
Sunrise Pointe	1	1	0	2.4
Tentative Parcel Map: Holly Dr	1	1	1	0.5
Tentative Parcel Map: Sycamore Dr	1	1	1	0.7
Wyatt Ranch	1	21	0	3.0
Project Approved; Not Constructed Total	***17***	***41***	***14***	***92.6***
Project Under Construction as of 1/8/2021				
Green Acres Nursery & Supply	1	1	1	3.9
Mitchell Village	1	18	0	55.3
Rally's Hamburger	1	1	0	0.5
Starbucks Sunrise Retail Center	1	1	1	1.1
Studio Movie Grill	1	1	1	4.3
Sunrise Village	1	10	10	16.0
USPI ASC	1	2	0	2.4
Project Under Construction as of 1/8/2021 Total	***7***	***34***	***13***	***83.5***
Future Development Project				
Antelope Commons	1	1	0	1.0
Birdcage Apartments	1	1	1	24.2
Elbert Property	1	2	2	5.9

Flood Zone/Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
New Sylvan Project	1	1	0	11.2
Sunrise Mall Specific Plan Area	1	8	8	96.4
Van Maren Property	1	2	1	10.5
Future Development Project Total	***6***	***15***	***12***	***149.2***
Zone X Total	***33***	***94***	***40***	***390.6***
Other Areas Total	**33**	**94**	**40**	**390.6**
Grand Total	**35**	**97**	**40**	**395.9**

Source: City of Citrus Heights, FEMA DFIRM 11/2/2018

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The City of Citrus Heights is subject to localized flooding throughout the City. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the City vary by location. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the City tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

The City noted the following past occurrences of localized flooding:

Between 2006 and 2011, the City experienced 3 occurrences of severe localized flooding caused by a combination of a heavy rain cell and in 2 of the instances excessive tree leaves plugging inlets. In the 3 occurrences, anywhere from a half dozen to as many as 20+ homes flooded. The dates of the 3 events included February 24, 2011; December 12, 2012, and December 3, 2014. House flooding in each of the events never exceeded a foot in depth within the home or business and in every case, the water receded within 45 minutes of flooding the home.

Between 2016 and 2021, there have been eight storm events resulting 178 reports from the public of minor localized flooding of roadways, but no impacts beyond normal operations. The City primarily attributes this to judicious creek maintenance by City staff and contracts.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the City and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

The City experiences recurring flooding problems predominantly in the months of November and December. Rain cells in one-hour duration with a hydraulically measured 30 year + occurrence will pick up leaves from the yards and push them into the street and plug up the inlets. Many times the rainwater will crown the road and enter different drainage basin areas to cause flooding. The severe rain cells will hit random areas of the City. As such, except for extra street sweeping of leaves in the leaf drop season, no drainage projects are contemplated to correct the problem.

The General Services Department maintains a citywide list of past chronic flooding within the City. This list includes flood complaints registered with the General Services Department using data from the past several years. Figure A-17 depicts known ponding and street flooding locations in the City. This map is an initial inventory of key problem areas and is not intended to be a complete inventory of all problems and locations associated with severe weather events and localized flooding in the City of Citrus Heights. Damage estimates due to flooding at these locations was unavailable.

Figure A-17 Localized Flooding Map for the City of Citrus Heights

Source: City of Citrus Heights General Plan Environmental Impact Report (2011)

Table A-33 identifies known and past occurrences of such areas and the associated problems encountered. This list is an initial inventory of key problem areas and is not intended to be a complete inventory of all problems and locations associated with severe weather events and localized flooding in the City of Citrus Heights.

Table A-33 City of Citrus Heights's Road List of Localized Flooding Problem Areas

Road Name	Flooding	Pavement Deterioration	Washout	High Water	Landslide/ Mudslide	Debris	Downed Trees
Auburn Bl @ Grand Oaks Bl	X						
Auburn Bl @ Greenback Bl	X						
Bremen (6500)							
Brookdale Dr (7400)	X						
Carriage (7200)							
Greenbback Ln (6529)	X						
Greenback Ln (7548)	X						
Greenback Bl @ Dewey							
Greenback Bl @ Patterson							
Sunrise Bl (5406)	X						
Sunrise Bl (5900)	X						
Sylvan Oak Wy (7960)	X						
Tiara Wy (7856)	X						
Viscount Wy (6531)	X						

Source: City of Citrus Heights

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Future Development

Future development in the City will add more impervious surfaces causing an increase in stormwater runoff and the continued need to drain these waters. The City will need to be proactive to ensure that increased development has proper siting and drainage for stormwaters. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding will reduce future risks of losses.

Changes in the regional approach for clean water and mitigation of flooding has set standards for future development in the County. The standards include hydromodification to be put in place by the development,

though hydromodification requirements were mapped out of the vast majority of the City of Citrus Heights, though Low Impact Development (LID) is still required in some circumstances. This usually translates into recessed landscape areas to pond the runoff and clean the runoff. Developments have also been using pervious pavements and street projects have added recessed landscape areas to collect and clean the runoff.

Wildfire

Likelihood of Future Occurrence–Unlikely
Vulnerability–Low

Though ranked as a low significance hazard by the City of Citrus Heights, due to its importance in the County and the State of California, wildfire is profiled here. It remains a low significance hazard for mitigation planning purposes for the City.

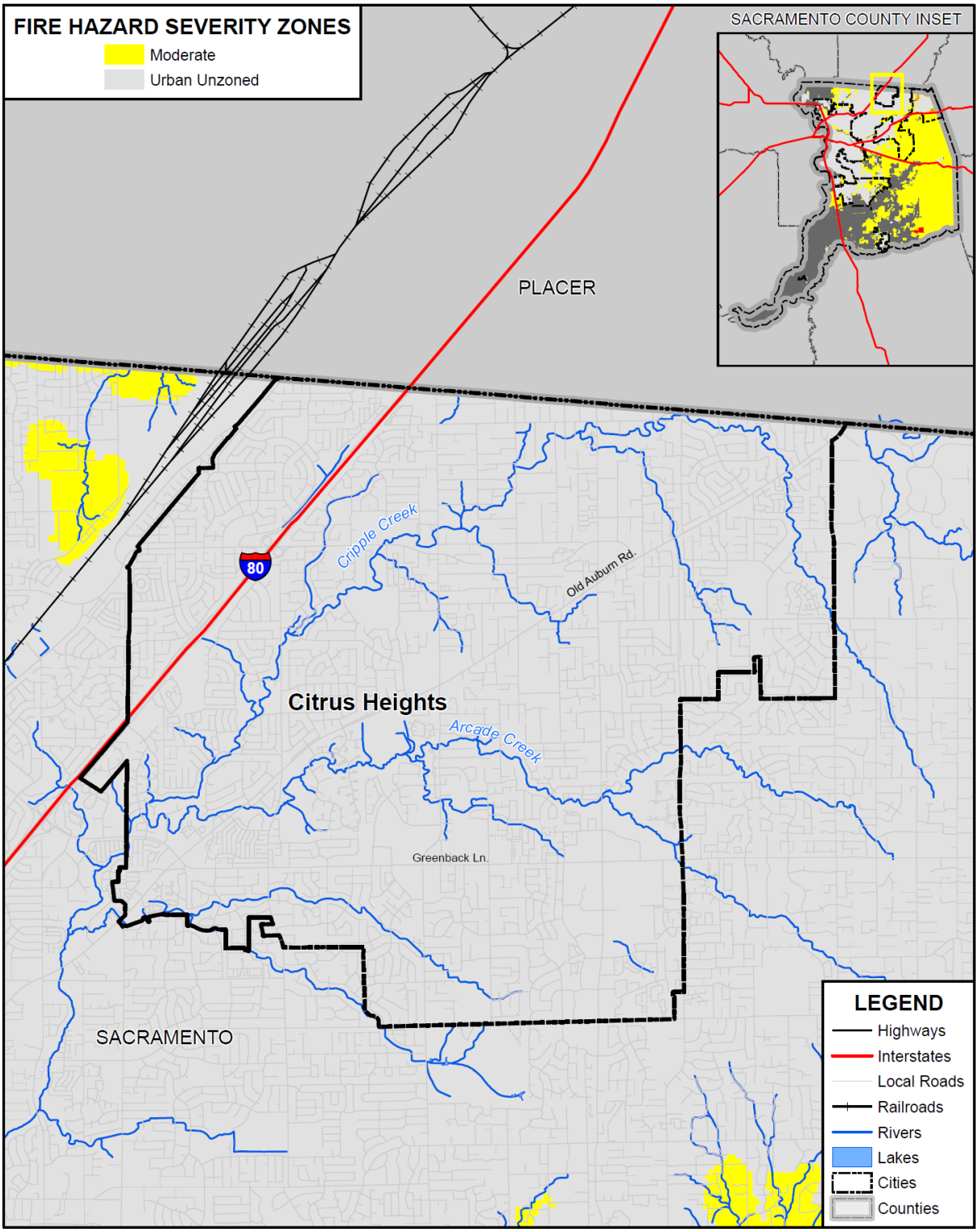
Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the City of Citrus Heights. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. These high winds can result in red flag days, and can result in Public Safety Power Shutoff (PSPS) events in the City. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

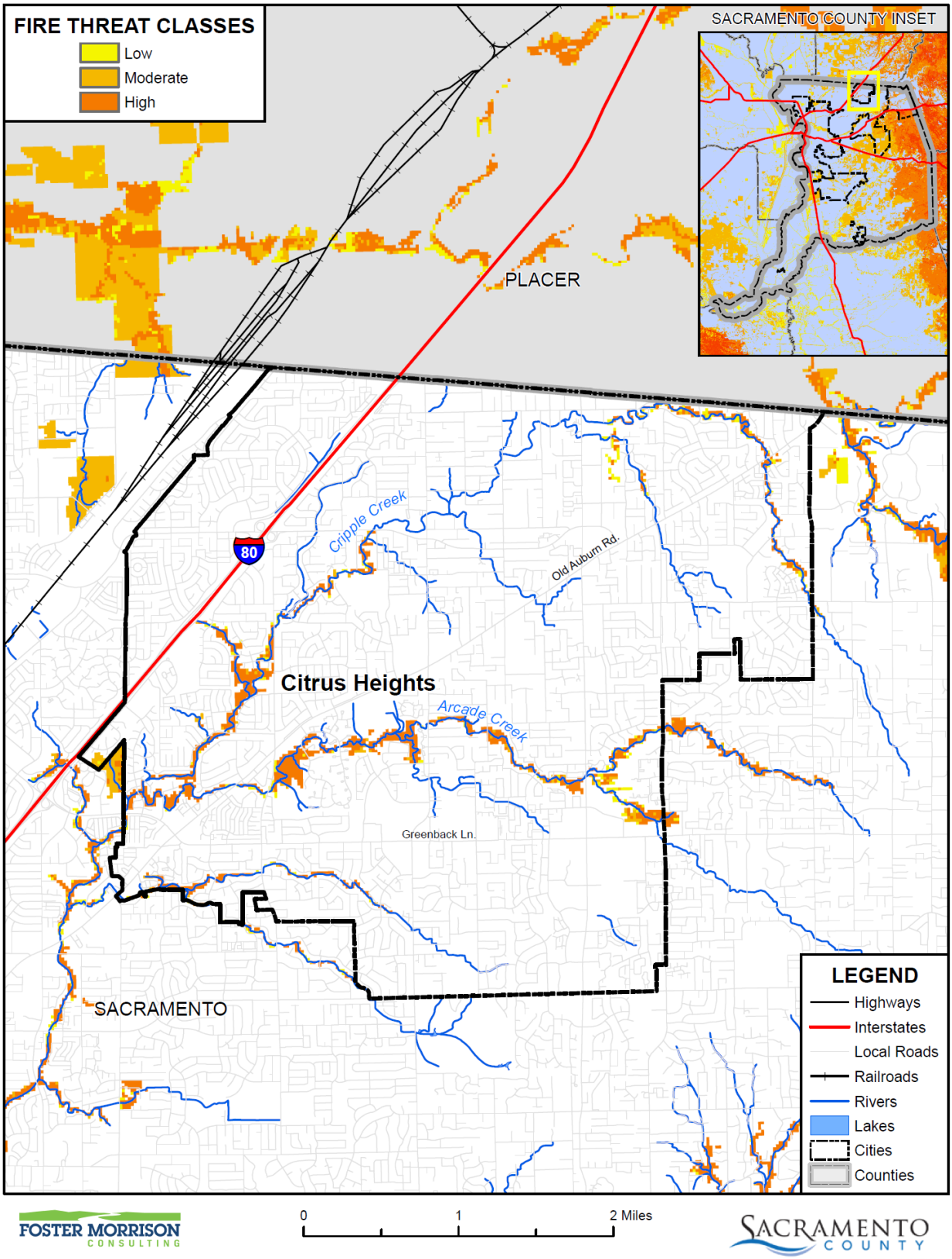
Wildfire can affect all areas of the City. CAL FIRE has estimated that the risk varies across the City and has created maps showing risk variance. Following the methodology described in Section 4.3.19 of the Base Plan, wildfire maps for the City of Citrus Heights were created. Figure A-18 shows the CAL FIRE Fire Hazard Severity Zone (FHSZ) in the City. As shown on the maps, the City is in the Urban/Unzoned FHSZ. Figure A-19 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, the Fire Threat Areas in the City range from No Threat to High.

Figure A-18 City of Citrus Heights – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure A-19 City of Citrus Heights – Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more. Geographical FHSZ extents from CAL FIRE are shown in Table A-34. Geographical Fire Threat Area extents from CAL FIRE are shown on Table A-35.

Table A-34 City of Citrus Heights – Geographical FHSZ Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
Very High	0	0.00%	0	0.00%	0	0.00%
High	0	0.00%	0	0.00%	0	0.00%
Moderate	0	0.00%	0	0.00%	0	0.00%
Non-Wildland/non-Urban	0	0.00%	0	0.00%	0	0.00%
Urban Unzoned	8,950.1	100.0%	7,769.6	100.0%	1,180.5	100.0%
Total	**8,950.1**	**100.0%**	**7,769.6**	**100.0%**	**1,180.5**	**100.0%**

Source: CAL FIRE

*Percentage of total acres is the percent of total acres of the entire County Planning Area, not the total acres of the jurisdiction

Table A-35 City of Citrus Heights – Geographical Fire Threat Area Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
Very High	0	0.00%	0	0.00%	0	0.00%
High	290.6	3.25%	127.5	1.64%	163.2	13.82%
Moderate	35.5	0.40%	15.6	0.20%	19.9	1.69%
Low	48.8	0.55%	23.7	0.31%	25.0	2.12%
No Threat	8,575.2	95.81%	7,602.8	97.85%	972.4	82.37%
Total	**8,950.1**	**100.00%**	**7,769.6**	**100.00%**	**1,180.5**	**100.00%**

Source: CAL FIRE

*Percentage of total acres is the percent of total acres of the entire County Planning Area, not the total acres of the jurisdiction

Past Occurrences

There has been no state and one federal disaster declaration due to fire, as shown in Table A-36. It should be noted that this fire disaster was from an explosion in Roseville, and not from an actual wildfire.

Table A-36 Sacramento County – State and Federal Wildfire Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

The City has not experienced fire events within the city in the past, but has experienced events that occurred outside the city. The City rendered mutual aid during the Paradise fire in 2017, the Oroville Dam evacuation in 2017, and air quality was severely impacted in the city as well as most of the state during the fire storms of 2020, and September in particular.

Vulnerability to and Impacts from Wildfire

Fuel loads in the County and Cities, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. The more urbanized areas within the County are not immune from fire. The dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and City, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Citrus Heights is not immune to numerous types of grass and brush fires and any one of them may accelerate into an urban interface wildfire. Such a situation could lead to evacuation of large portions of the population and the potential for significant loss of personal property, structures, and rangeland. The natural fuels available in or near the City vary greatly in the rate and intensity of burning. Fires in heavy brush and stands of trees burn with great intensity but more slowly than in dry grass and leaves. Dense fuels will propagate fire better than sparse fuels.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and timber; and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the City. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the City by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the City; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate a PSPS which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Assets at Risk

Based on the vulnerability of Citrus Heights to the wildfire hazard, the sections that follow describes significant assets at risk in the City of Citrus Heights. This section includes the values at risk, population at risk, and critical facilities at risk.

Values at Risk in Fire Hazard Severity Zones

GIS was used to determine the possible impacts of wildfire within the City of Citrus Heights. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire hazard severity zones. Summary analysis results for Citrus Heights are shown in Table A-37, which summarizes total parcel counts, improved parcel counts and their structure values by fire hazard severity zone. As previously stated, the City falls fully in the Urban Unzoned FHSZ

Table A-37 City of Citrus Heights – Count and Value of Parcels by Fire Hazard Severity Zone

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Urban Unzoned	26,777	25,821	$2,277,237,402	$5,468,554,811	$3,145,021,676	$10,890,813,812
Citrus Heights Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$3,145,021,676**	**$10,890,813,812**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table A-38 breaks out the Table A-37 by adding the property use details by fire hazard severity zone for the City. As shown in both of these tables, the City has no properties in the very high or high fire hazard severity zone. All of the City falls within the Urban Unzoned FHSZs.

Table A-38 City of Citrus Heights – Count and Value of Parcels by Fire Hazard Severity Zone and Property Use

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Urban Unzoned						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	37	29	$16,430,609	$73,652,597	$73,652,597	$163,735,803
Church/Welfare	45	39	$9,351,283	$46,214,191	$46,214,191	$101,779,665
Industrial	22	19	$11,535,364	$17,589,132	$26,383,698	$55,508,194
Miscellaneous	353	0	$627,387	$0	$0	$627,387
Office	151	142	$55,647,981	$121,241,584	$121,241,584	$298,131,149
Public/Utilities	24	1	$27,054	$3,837	$3,837	$34,728
Recreational	6	4	$2,578,894	$12,938,386	$12,938,386	$28,455,666
Residential	25,437	25,218	$1,809,237,816	$4,654,812,476	$2,327,406,306	$8,791,456,521
Retail / Commercial	366	350	$325,606,703	$537,181,077	$537,181,077	$1,399,968,857

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unknown	4	3	$34,193	$271,996	$0	$306,189
Vacant	332	16	$46,160,118	$4,649,535	$0	$50,809,653
Urban Unzoned Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$3,145,021,676**	**$10,890,813,812**
Citrus Heights Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$3,145,021,676**	**$10,890,813,812**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Values at Risk in Fire Threat Areas

GIS was used to determine the possible impacts of wildfire within the City of Citrus Heights. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in Fire Threat Areas. Summary analysis results for Citrus Heights are shown in Table A-39, which summarizes total parcel counts, improved parcel counts and their structure values by Fire Threat Area. Table A-40 breaks out the Table A-39 by adding the property use details by fire threat areas for the City. As opposed to the FHSZs, the City has areas in the Moderate and High Fire Threat Areas.

Table A-39 City of Citrus Heights – Count and Value of Parcels by Fire Threat Areas

Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	0	0	$0	$0	$0	$0
High	154	83	$10,944,958	$21,098,428	$11,115,363	$43,158,746
Moderate	26	15	$3,862,157	$3,279,905	$1,639,955	$8,782,013
Low	20	17	$1,456,037	$3,126,388	$1,563,197	$6,145,619
No Threat	26,577	25,706	$2,260,974,250	$5,441,050,090	$3,130,703,161	$10,832,727,434
Citrus Heights Total	**26,777**	**25,821**	$2,277,237,402	$5,468,554,811	$3,145,021,676	$10,890,813,812

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table A-40 City of Citrus Heights – Count and Value of Parcels by Fire Threat Area and Property Use

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
High						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	2	2	$74,763	$1,132,289	$1,132,289	$2,339,341
Industrial	0	0	$0	$0	$0	$0

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Miscellaneous	53	0	$73,266	$0	$0	$73,266
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	91	81	$9,124,329	$19,966,139	$9,983,074	$39,073,539
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	8	0	$1,672,600	$0	$0	$1,672,600
High Total	**154**	**83**	**$10,944,958**	**$21,098,428**	**$11,115,363**	**$43,158,746**
Moderate						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	1	0	$80,680	$0	$0	$80,680
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	2	0	$61	$0	$0	$61
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	18	15	$1,175,106	$3,279,905	$1,639,955	$6,094,962
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	5	0	$2,606,310	$0	$0	$2,606,310
Moderate Total	**26**	**15**	**$3,862,157**	**$3,279,905**	**$1,639,955**	**$8,782,013**
Low						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	1	0	$0	$0	$0	$0
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	18	17	$1,420,896	$3,126,388	$1,563,197	$6,110,478
Retail/ Commercial	0	0	$0	$0	$0	$0

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unknown	0	0	$0	$0	$0	$0
Vacant	1	0	$35,141	$0	$0	$35,141
Low Total	**20**	**17**	**$1,456,037**	**$3,126,388**	**$1,563,197**	**$6,145,619**
No Threat						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	36	29	$16,349,929	$73,652,597	$73,652,597	$163,655,123
Church/Welfare	43	37	$9,276,520	$45,081,902	$45,081,902	$99,440,324
Industrial	22	19	$11,535,364	$17,589,132	$26,383,698	$55,508,194
Miscellaneous	297	0	$554,060	$0	$0	$554,060
Office	151	142	$55,647,981	$121,241,584	$121,241,584	$298,131,149
Public/Utilities	24	1	$27,054	$3,837	$3,837	$34,728
Recreational	6	4	$2,578,894	$12,938,386	$12,938,386	$28,455,666
Residential	25,310	25,105	$1,797,517,485	$4,628,440,044	$2,314,220,080	$8,740,177,542
Retail/ Commercial	366	350	$325,606,703	$537,181,077	$537,181,077	$1,399,968,857
Unknown	4	3	$34,193	$271,996	$0	$306,189
Vacant	318	16	$41,846,067	$4,649,535	$0	$46,495,602
No Threat Total	**26,577**	**25,706**	**$2,260,974,250**	**$5,441,050,090**	**$3,130,703,161**	**$10,832,727,434**
Citrus Heights Total	**26,777**	**25,821**	**$2,277,237,402**	**$5,468,554,811**	**$3,145,021,676**	**$10,890,813,812**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Population at Risk

The FHSZ and Fire Threat datasets were overlayed on the parcel layer. Those residential parcel centroids that intersect the FHSZs and Fire Threat Areas were counted and multiplied by the 2010 Census Bureau average household factors for the City of Citrus Heights – 2.54. According to this analysis, there is a total population of 0 residents of Citrus Heights at risk to moderate or higher FHSZs, while there is a total of 168 in the moderate or higher fire threat areas. This is shown in Table A-41 and Table A-42, respectively.

Table A-41 City of Citrus Heights – Count of Improved Residential Parcels and Population by Fire Hazard Severity Zone

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Citrus Heights	0	0	0	0	0	0

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table A-42 City of Citrus Heights – Count of Improved Residential Parcels and Population by Fire Threat Areas

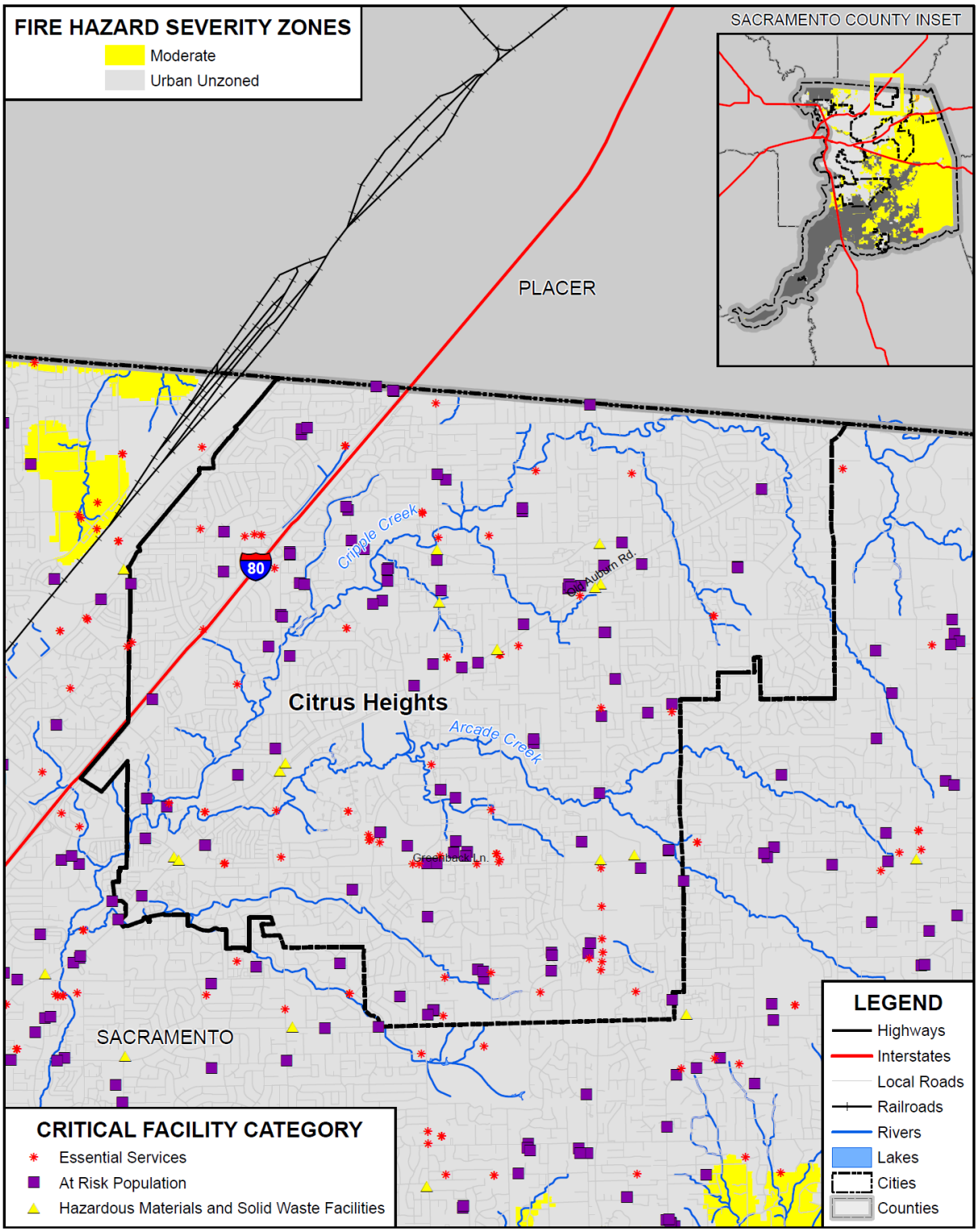
Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Citrus Heights	0	0	81	130	15	38

Source: CAL FIRE, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Citrus Heights (2.14): and unincorporated Sacramento County (2.76)

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Citrus Heights in identified FHSZs. Critical facilities in a FHSZ in the City of Citrus Heights are shown in Figure A-20 and detailed in Table A-43. Critical facilities in a FHSZ in the City of Citrus Heights are shown in Figure A-21 and detailed in Table A-44. Details of critical facility definition, type, name and address and jurisdiction by fire hazard severity zone are listed in Appendix F.

Figure A-20 City of Citrus Heights – Critical Facilities in Fire Hazard Severity Zones



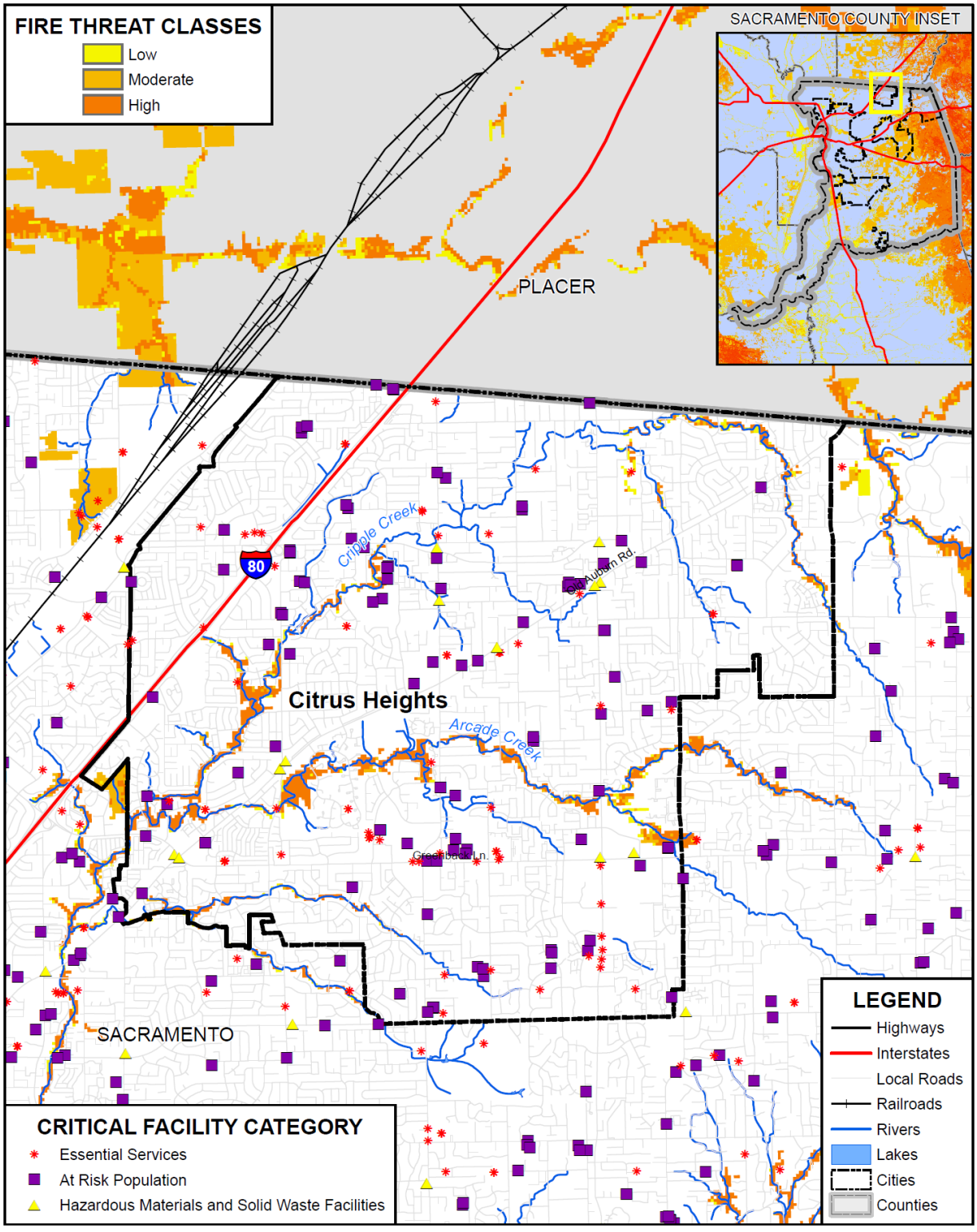
Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table A-43 City of Citrus Heights – Critical Facilities by Fire Hazard Severity Zone by Category and Type

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
Urban Unzoned		
Essential Services Facilities	Emergency Evacuation Center	8
	EMS Stations	4
	FDIC Insured Banks	13
	Fire Station	5
	Law Enforcement	2
	Microwave Service Towers	17
	Water Well	27
	Total	**76**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Day Care Center	27
	Mobile Home Parks	10
	Places of Worship	37
	School	31
	Total	**108**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	12
	Total	**12**
Urban Unzoned Total		**196**
Citrus Heights Total		**196**

Source: CAL FIRE, Sacramento County

Figure A-21 City of Citrus Heights – Critical Facilities in Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table A-44 City of Citrus Heights – Critical Facilities by Fire Threat Area by Category and Type

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
Low		
Essential Services Facilities	Water Well	1
	Total	**1**
Low Total		**1**
No Threat		
Essential Services Facilities	Emergency Evacuation Center	8
	EMS Stations	4
	FDIC Insured Banks	13
	Fire Station	5
	Law Enforcement	2
	Microwave Service Towers	17
	Water Well	26
	Total	**75**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Day Care Center	27
	Mobile Home Parks	10
	Places of Worship	37
	School	31
	Total	**108**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	12
	Total	**12**
No Threat Total		**195**
Citrus Heights Total		**196**

Source: CAL FIRE, Sacramento County

Future Development

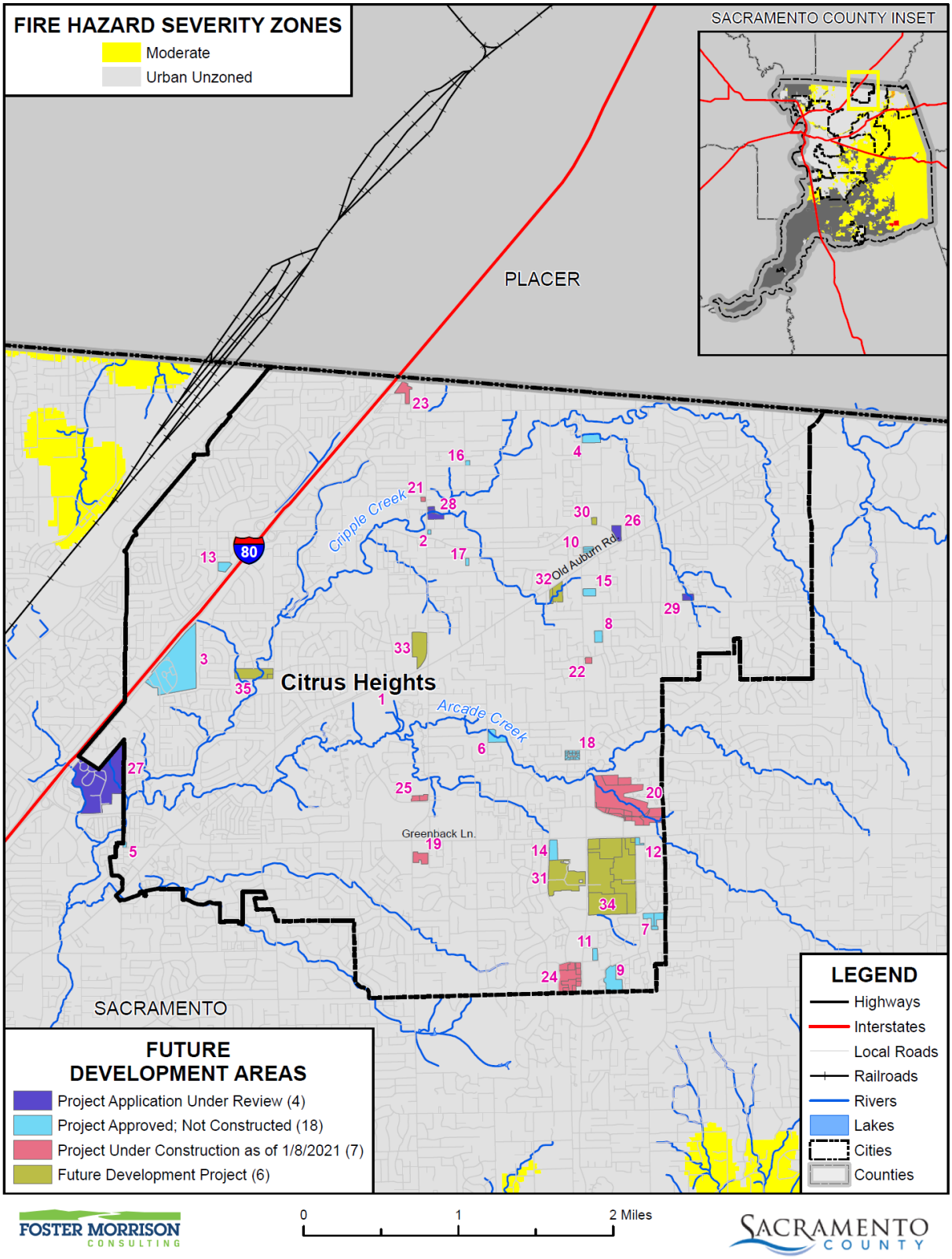
Additional growth and development within moderate or higher fire hazard severity zones in the City would place additional values at risk to wildfire. City building codes are in effect and should continue to be updated as appropriate to reduce this risk. No additional building may occur in high fire hazard areas.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the

future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure A-22 shows the locations of future development areas the City is planning to develop on the FHSZs, while Figure A-23 shows the legend of these locations. Table A-45 shows the parcels and acreages of each future development area in the City in each FHSZ. Figure A-24 shows the locations of future development areas the City is planning to develop on the Fire Threat Area, while Figure A-25 shows the legend of those locations. Table A-46 shows the parcels and acreages of each future development area in the City in each Fire Threat Area.

Figure A-22 City of Citrus Heights – Future Development in FHSZs



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Figure A-23 City of Citrus Heights Future Development Area Legend

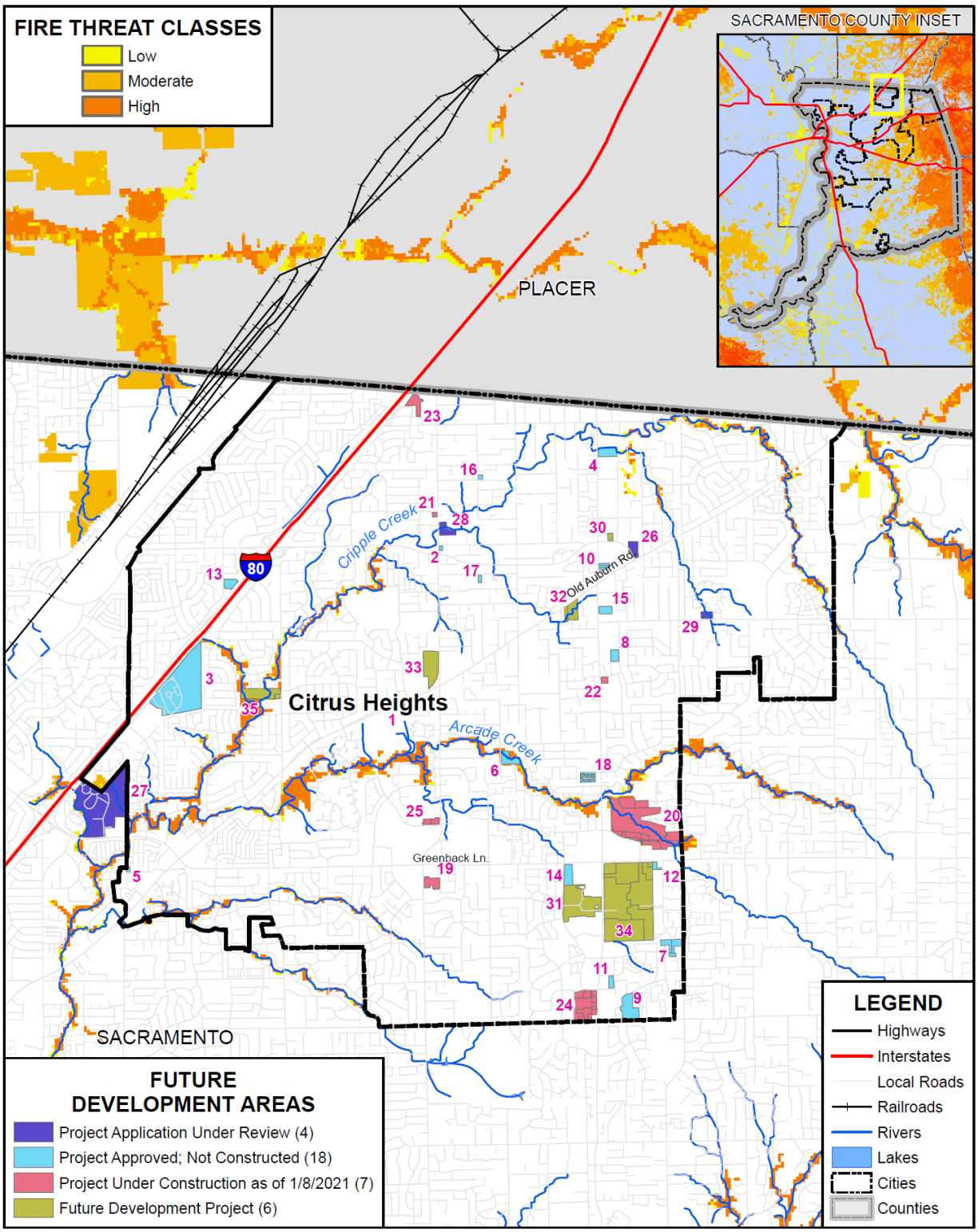
Table A-45 City of Citrus Heights – Future Development in FHSZs

Fire Hazard Severity Zones/ Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Urban Unzoned				
Project Application Under Review				
American River Collegiate Academy	1	1	0	3.0
East Lawn Cemetery Expansion	1	1	1	58.1
Pioneer Baptist Church	1	3	0	3.6
Trubchik Parcel Map	1	1	0	1.9
Project Application Under Review Total	**4**	**6**	**1**	**66.5**
Project Approved; Not Constructed				
Auburn Heights	1	1	0	0.5
California Quick Slice	1	1	1	0.4
Calvary Cemetery Adm Center	1	1	1	53.5
Carefield Citrus Heights	1	1	0	4.2
Country Lane Townhome Apartments	1	1	0	0.5
Dundee Estates II	1	1	0	4.2
Fair Oaks Senior Apartments	1	3	2	5.0

Fire Hazard Severity Zones/ Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Lords Grace Church	1	1	1	2.4
Orchard Apartments	1	1	1	8.3
Palms Auto	1	3	2	1.5
Pebble Beach Condo Conversion	1	1	1	1.5
Popeye's Louisiana Kitchen	1	1	1	1.0
Public Storage	1	1	1	2.7
Raising Cane's	1	1	1	4.4
Sunrise Pointe	1	1	0	2.4
Tentative Parcel Map: Holly Dr	1	1	1	0.5
Tentative Parcel Map: Sycamore Dr	1	1	1	0.7
Wyatt Ranch	1	21	0	3.0
Project Approved; Not Constructed Total	**18**	**42**	**14**	**96.7**
Project Under Construction as of 1/8/2021				
Green Acres Nursery & Supply	1	1	1	3.9
Mitchell Village	1	18	0	55.3
Rally's Hamburger	1	1	0	0.5
Starbucks Sunrise Retail Center	1	1	1	1.1
Studio Movie Grill	1	1	1	4.3
Sunrise Village	1	10	10	16.0
USPI ASC	1	2	0	2.4
Project Under Construction as of 1/8/2021 Total	**7**	**34**	**13**	**83.5**
Future Development Project				
Antelope Commons	1	1	0	1.0
Birdcage Apartments	1	1	1	24.2
Elbert Property	1	2	2	5.9
New Sylvan Project	1	1	0	11.2
Sunrise Mall Specific Plan Area	1	8	8	96.4
Van Maren Property	1	2	1	10.5
Future Development Project Total	**6**	**15**	**12**	**149.2**
Urban Unzoned Total	**35**	**97**	**40**	**395.9**
Grand Total	**35**	**97**	**40**	**395.9**

Source: City of Citrus Heights, CAL FIRE

Figure A-24 City of Citrus Heights – Future Development Areas in Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Figure A-25 City of Citrus Heights Future Development Area Legend

Table A-46 City of Citrus Heights – Future Development in Fire Threat Areas

Fire Threat/Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
High				
Project Approved; Not Constructed				
Dundee Estates II	1	1	0	4.2
Project Approved; Not Constructed Total	**1**	**1**	**0**	**4.2**
Project Under Construction as of 1/8/2021				
Mitchell Village	1	4	0	8.3
Project Under Construction as of 1/8/2021 Total	**1**	**4**	**0**	**8.3**
Future Development Project				
VAN MAREN PROPERTY	1	1	0	9.8
Future Development Project Total	**1**	**1**	**0**	**9.8**
High Total	**3**	**6**		**22.2**
Moderate				
Project Under Construction as of 1/8/2021				
Mitchell Village	0	4	0	6.9

Fire Threat/Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Project Under Construction as of 1/8/2021 Total	**0**	**4**	**0**	**6.9**
Moderate Total	**0**	**4**	**0**	**6.9**
No Threat				
Project Application Under Review				
American River Collegiate Academy	1	1	0	3.0
East Lawn Cemetery Expansion	1	1	1	58.1
Pioneer Baptist Church	1	3	0	3.6
Trubchik Parcel Map	1	1	0	1.9
Project Application Under Review Total	**4**	**6**	**1**	**66.5**
Project Approved; Not Constructed				
Auburn Heights	1	1	0	0.5
California Quick Slice	1	1	1	0.4
Calvary Cemetery ADM Center	1	1	1	53.5
Carefield Citrus Heights	1	1	0	4.2
Country Lane Townhome Apartments	1	1	0	0.5
Fair Oaks Senior Apartments	1	3	2	5.0
Lords Grace Church	1	1	1	2.4
Orchard Apartments	1	1	1	8.3
Palms Auto	1	3	2	1.5
Pebble Beach Condo Conversion	1	1	1	1.5
Popeye's Louisiana Kitchen	1	1	1	1.0
Public Storage	1	1	1	2.7
Raising Cane's	1	1	1	4.4
Sunrise Pointe	1	1	0	2.4
Tentative Parcel Map: Holly Dr	1	1	1	0.5
Tentative Parcel Map: Sycamore Dr	1	1	1	0.7
Wyatt Ranch	1	21	0	3.0
Project Approved; Not Constructed Total	**17**	**41**	**14**	**92.6**
Project Under Construction as of 1/8/2021				
Green Acres Nursery & Supply	1	1	1	3.9
Mitchell Village	0	10	0	40.1
Rally's Hamburger	1	1	0	0.5
Starbucks Sunrise Retail Center	1	1	1	1.1
Studio Movie Grill	1	1	1	4.3
Sunrise Village	1	10	10	16.0
USPI ASC	1	2	0	2.4

Fire Threat/Future Development Stage / Future Development Name	Future Development Count	Total Parcel Count	Improved Parcel Count	Total Acres
Project Under Construction as of 1/8/2021 Total	**6**	**26**	**13**	**68.3**
Future Development Project				
Antelope Commons	1	1		1.0
Birdcage Apartments	1	1	1	24.2
Elbert Property	1	2	2	5.9
New Sylvan Project	1	1		11.2
Sunrise Mall Specific Plan Area	1	8	8	96.4
Van Maren Property		1	1	0.7
Future Development Project Total	**5**	**14**	**12**	**139.4**
No Threat Total	**32**	**87**	**40**	**366.7**
Grand Total	**35**	**97**	**40**	**395.9**

Source: City of Citrus Heights, CAL FIRE

A.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

A.6.1. Regulatory Mitigation Capabilities

Table A-47 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Citrus Heights.

Table A-47 City of Citrus Heights Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2008	
Capital Improvements Plan	Y 2016	
Economic Development Plan		
Local Emergency Operations Plan	Y 2005	
Continuity of Operations Plan		

Transportation Plan		
Stormwater Management Plan/Program	Y 2016	
Engineering Studies for Streams		
Community Wildfire Protection Plan		
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: 2013 CCR Title 24
Building Code Effectiveness Grading Schedule (BCEGS) Score		Score: 2
Fire department ISO rating:		Rating:
Site plan review requirements	Y 2004	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	Ordinance is effective, administered, and enforced.
Subdivision ordinance	Y	Ordinance is effective, administered, and enforced.
Floodplain ordinance	Y	Ordinance is effective, administered, and enforced.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)		
Flood insurance rate maps		
Elevation Certificates		
Acquisition of land for open space and public recreation uses		
Erosion or sediment control program	Y	Ordinance is effective, administered, and enforced.
Other		
How can these capabilities be expanded and improved to reduce risk?		
These plans and safety measures help provide tools and guidance to implement programs and projects to help mitigate short term and long term hazards and exposure. Our masterplans provide a path and schedule to deliver improvements effectively and efficiently based on scientific data, field observations and community input. Future planning mechanisms will seek to take natural hazards into account, thus expanding the mitigation of hazards in seeking to reduce risk to citizens.		

Source: City of Citrus Heights

The City of Citrus Heights General Plan, 2011

California Law requires that every City and County in the state have a General Plan. The Citrus Heights General Plan, adopted in 2000, was prepared over a two-year period that included an extensive public review process. Since that time there have been several minor amendments and a major amendment in 2011 to the General Plan. The 2011 update addressed Legislation requirements and added a Greenhouse Gas Reduction Plan.

The General Plan is the most important policy and planning document in the city, and is used by virtually every department. The General Plan is the city's statement of its vision for the future. The General Plan contains policies covering every aspect of the City: Land Use (how land can be developed), circulation, noise, air quality, housing, open space and conservation, and health and safety.

A.6.2. Administrative/Technical Mitigation Capabilities

Table A-48 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Citrus Heights.

Table A-48 City of Citrus Heights's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	Y	Approves conditions on development based on staff's recommendations
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Citrus Heights contracts out tree trimming, pipe cleaning, street maintenance and other public works services.
Mutual aid agreements	Y	Metro Fire and Citrus Heights Police have agreements in place with sister agencies.
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	Y	Staff is adequate, trained, and coordinates as necessary.
Floodplain Administrator	Y	Staff is adequate, trained, and coordinates as necessary.
Emergency Manager	Y	Staff is adequate, trained, and coordinates as necessary.
Community Planner	Y	Staff is adequate, trained, and coordinates as necessary.
Civil Engineer	Y	Staff is adequate, trained, and coordinates as necessary.
GIS Coordinator	Y	Staff is adequate, trained, and coordinates as necessary.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	
Hazard data and information	Y	
Grant writing	Y	
Hazus analysis	Y	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The City has successfully implemented flood control management through projects and more specifically routine maintenance. The City will continue to build on this success, and expand projects and routing maintenance in the future.		

Source: City of Citrus Heights

Flood Control/Management

The City is provided flood control and management services from the Sacramento County Water Agency (SCWA). The SCWA, through its efforts at managing the flood control system under its jurisdiction, has created three Zones, which the City is covered under. These Zones include Zone 11, Zone 12, and Zone 13. Zone 11 is a drainage fee zone formed to provide funding for the construction of drainage facilities in Sacramento County. Fees are collected through Zone 11 from new development. Zone 12, now a separate utility, provides storm drain maintenance and improvements for Sacramento County, such as channel clearing and servicing pumping plants. Zone 13, an assessment district, provides funding for flood control and water supply planning, groundwater studies, and FEMA programs. Zone 13 collects fees from benefiting parties.

Since July 2010, the City no longer contracts with Sacramento County for the operations and maintenance of drainage facilities. The City contracts with private contractors to provide these services. The City has received many comments from longtime residents indicating that flood events are less significant in the past decade. We attribute this to the focused creek maintenance efforts by city staff.

To date, the city has also developed two of four planned Neighborhood Storm Drain Master Plan. Neighborhoods 6 & 7 were previously completed, and the implementation projects for Neighborhoods 8, 9 & 10 are currently being developed and constructed. The Neighborhood 4, 5 & 11 Storm Drain Master Plan will be developed in the near future with Neighborhood 1, 2 & 3 Storm Drain Master Plan to be the last to be developed. The city has approximately one storm drain specific capital improvement project per year with other storm drain improvements included in various other capital improvement projects.

A.6.3. Fiscal Mitigation Capabilities

Table A-49 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table A-49 City of Citrus Heights's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Drainage projects, erosion projects, street projects with upgrades to Storm drain system, master planning grants
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	Under Sac County drainage fee program
Storm water utility fee	Y	Collecting about $3.1 million per year to fund the drainage program

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	Y	
Community Development Block Grant	Y	
Other federal funding programs	N	
State funding programs	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Utilizing existing fund sources to support outreach and partnerships can help achieve greater compliance and awareness of hazards and their potential mitigation throughout the community.		

Source: City of Citrus Heights

A.6.4. Mitigation Education, Outreach, and Partnerships

Table A-50 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table A-50 City of Citrus Heights's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	CERT SSQP BERC Creek Week Green Planning Academy.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	City Franchisee for Solid Waste provides education in its billing, public relations work and other collection efforts.
Natural disaster or safety related school programs		
StormReady certification		
Firewise Communities certification		
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The City will continue to look for ways to expand mitigation outreach and partnerships. This is included in the mitigation strategy below in Action #2.		

Source: City of Citrus Heights

Regional Mutual Aid Plan

The California Office of Emergency Services' mutual aid plan for Region IV consists of the following counties: Nevada, Placer, Yolo, Sacramento, El Dorado, Alpine, Amador, San Joaquin, Calaveras, Tuolumne, and Stanislaus. The *Region IV Multi-Casualty Incident Plan* develops standard multiple casualty procedures so that jurisdictions can work together effectively in the case of a fire, explosion, chemical spill, or natural disaster that becomes a multiple casualty incident.

The purpose of the *Region IV Multi-Casualty Incident Plan* is to standardize emergency response procedures through the use of consistent response organization responsibilities, mobilization of resources, communications and documentation, patient dispersal and tracking, and regional hospital capabilities. The plan is designed to allow each agency to utilize the multiple casualty procedures both to enhance day-to-day medical response operations, and as a method to ensure that agencies efficiently share resources and communicate rapidly during multi-casualty incidents.

A.6.5. Other Mitigation Efforts

The City of Citrus Heights has many other ongoing mitigation efforts that include the following:

- Drainage Master Planning with follow up projects
- Contract creek cleaning
- Drainage pipe rehab program
- Contract Pipe Cleaning
- Floodplain building policy
- Zoning Code Changes
- Hydro-modification Policy - Pre and Post Development equivalent runoffs
- Streetscape Landscaping with depressed landscape areas to absorb & clean runoff
- City Provided FEMA Elevation Certs on all residential units within a flood hazard

A.7 Mitigation Strategy

A.7.1. Mitigation Goals and Objectives

The City of Citrus Heights adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

A.7.2. NFIP Mitigation Strategy

The City of Citrus Heights joined the National Flood Insurance Program (NFIP) on October 15, 1997. As a participant of the NFIP, the City of Citrus Heights has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the City. The City of Citrus Heights will continue to comply with the requirements of the NFIP in the future.

In addition, the City of Citrus Heights actively participates with Sacramento County to address local NFIP issues through a regional approach. Many of the program activities are the same for the City of Citrus Heights as for Sacramento County since participation at the County level includes all local jurisdictions.

The City of Citrus Heights General Services Department provides public outreach activities which include map information services, public awareness, public hazard disclosure, and flood protection information. This information is readily available to the public and consists of current and accurate flood mapping. In addition, the General Services Department provides information about our stormwater management program and up-to-date information related to the maintenance of our drainage system.

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS which are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The City of Citrus Heights is not a current participant in the CRS program. More information about the floodplain administration in the City of Citrus Heights can be found in Table A-51.

Table A-51 City of Citrus Heights Compliance with NFIP

NFIP Topic	Comments
Insurance Summary	
How many NFIP policies are in the community? What is the total premium and coverage?	337 policies $150,469 in premiums $91,036,800 in coverage
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	15 claims $335,680.89 in claims paid 2 substantial damage claims
How many structures are exposed to flood risk within the community?	171 in 1% annual chance 344 in 0.2% annual chance
Repetitive Loss (RL) and Severe Repetitive Loss Properties (SRL)	5 RL properties 0 SRL properties
Describe any areas of flood risk with limited NFIP policy coverage	None known
Staff Resources	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	The Community Floodplain Administrator is not certified, but 2 reporting staff engineers are certified.
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	permit review, GIS (pending filling staff vacancy), education and outreach, inspections, engineering capability
What are the barriers to running an effective NFIP program in the community, if any?	Limited funding vs. other, more pressing needs.
Compliance History	
Is the community in good standing with the NFIP?	Y

NFIP Topic	Comments
Are there any outstanding compliance issues (i.e., current violations)?	N
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	CAV 05/27/2014
Is a CAV or CAC scheduled or needed?	N
Regulation	
When did the community enter the NFIP?	10/15/1997
Are the FIRMs digital or paper?	Digital
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Exceed. The City requires 2' of freeboard where FEMA requires 1', and has greater restrictions regarding what can be built in the floodplain.
Provide an explanation of the permitting process.	Permits are routed to the development review program and reviewed by one or both staff engineers. Both engineers are CFM.
Community Rating System	
Does the community participate in CRS?	N
What is the community's CRS Class Ranking?	N/A
What categories and activities provide CRS points and how can the class be improved?	N/A
Does the plan include CRS planning requirements?	N/A

A.7.3. Mitigation Actions

The planning team for the City of Citrus Heights identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Dam Failure
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific

projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Hazards Addressed: Multi-hazard (Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, and Dam Failure)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140).

Project Description: Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Safety Element of General Plan

Responsible Office: City of Citrus Heights Planning Department

Priority (H, M, L): High

Cost Estimate: Jurisdictional board/staff time

Potential Funding: Local budgets

Benefits (avoided Losses): Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

Schedule: As soon as possible

Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness

Hazards Addressed: Multi-hazard (Dam Failure, Floods: 1%/0.2% annual chance, Floods: Localized)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City and County play a key role in public outreach/education efforts to communicate the potential risk and vulnerability of their community to the effects of natural hazards. A comprehensive multi-hazard public education program will better inform the community of natural hazards of concern and actions the public can take to be better prepared for the next natural disaster event.

Project Description: A comprehensive multi-hazard outreach program will ascertain both broad and targeted educational needs throughout the community. The City will work with the County and other agencies as appropriate to develop timely and consistent annual outreach messages in order to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will leverage and build upon existing mechanisms.

Other Alternatives: Continue public information activities currently in place.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing County outreach programs will be reviewed for effectiveness and leveraged and expanded upon to reach the broader region.

Responsible Office: City of Citrus Heights in partnership with the County

Priority (H, M, L): High

Cost Estimate: Annual costs to be determined, and will depend on the scope and frequency of activities and events as well as volunteer participation

Benefits (Losses Avoided): Increase residents' knowledge of potential hazards and activities required to mitigate hazards and be better prepared. Protect lives and reduce damages, relatively low cost to implement.

Potential Funding: Local budgets, grant funds

Timeline: Ongoing/Annual public awareness campaign

Action 3. Cable Trellis w/ Vines Shading Project

Hazards Addressed: Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: There is some evidence that rising temperatures are a a result of the increase in manmade surfaces acting as heat sinks, and that increased foliage can provide some relief. Trees provide relief when they are large enough to provide shade in the hard surfaces, but vines could be an alternative if trained to follow a cable lattice network over the hard surfaces.

The vegetation can also help to slow and clean storm water run-off that would otherwise fall and quickly run-off the impervious surfaces.

Project Description: Trees in parking lot islands would be replaced with vertical columns filled with soil medium and vine plugs that would be trained to grow up the columns and then across cables suspended between the columns. A test locations for a pilot project would be 2 uncovered paved patio areas at municipal buildings.

Other Alternatives: Plant slow growing trees. Allow pavement and impervious surfaces to remain a heat sink

Existing Planning Mechanism(s) through which Action Will Be Implemented: Zoning Code and Design Guideline

Responsible Agency/ Department/Partners: CCD & GSD Staff in coordination with consultant

Cost Estimate: $100K

Benefits (Losses Avoided): Reduced heat sink. Reduced storm water run-off

Potential Funding: CalOES, FEMA, CDFW, DWR, Water Board, and other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): Low

Action 4. Trash Racks and Debris Cages Project

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Trash and debris can cause clogs in the storm drain system when conveyed by stormwater runoff. Trash racks and debris cages prevent debris from entering storm drain systems while still allowing water to flow through.

Project Description: The project would identify high impact locations in need of trash racks and debris cages, install the devices and develop a maintenance schedule.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: GSD Staff in coordination with consultant and contractor

Cost Estimate: $500k

Benefits (Losses Avoided): Loss of property and life avoided.

Potential Funding: CalOES, FEMA, CDFW, DWR … other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): Medium

Action 5. Protection of Transportation Infrastructure Project

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The city's roadway network consists of a combination of federal highways and state highways, and local streets. This roadway network is used extensively for personal vehicles travel.

Project Description: The project would retrofit all bridges in the City of Citrus Heights to current seismic standards, elevate roads and bridges above base flood elevations to maintain dry access. In some situations, the mitigation could include reconstruction with stabilization or armoring of vulnerable shoulders or embankments.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: GSD Staff in coordination with consultant and contractor

Cost Estimate: $1M

Benefits (Losses Avoided): Enhanced bridge safety, improved evacuation reliability, reduced disaster response and recover times.

Potential Funding: CalOES, FEMA, CDFW, DWR, other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): Medium

Action 6. Neighborhood Storm Drain Project

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Most of the City of Citrus Heights' storm drain system was constructed prior to incorporation as a city. Portions of the system had little to no design, or was designed to standards that have

since been superseded. Additionally, portions of the storm drain system has passed its useful life and needs to be replaced

Project Description: Neighborhood Storm Drain Master Plans identify various drainage problem locations. The Neighborhood Storm Drain Project implements a solution to at a drainage problem location.

Other Alternatives: Allow ongoing deterioration to the storm drain system and resultant flooding

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: GSD Staff in coordination with consultant

Cost Estimate: $1M

Benefits (Losses Avoided): Reduced risk to critical facilities. Reduced risk to citizens

Potential Funding: Stormwater Fund, CalOES, FEMA, CDFW, DWR, other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): High

Action 7. Neighborhood Storm Drain Master Plan

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Most of the City of Citrus Heights' storm drain system was constructed prior to incorporation as a city. Portions of the system had little to no design, or was designed to standards that have since been superseded. Additionally, portions of the storm drain system has passed its useful life and needs to be replaced

Project Description: The Neighborhood Storm Drain Master Plan evaluates drainage concerns in the city. Since the City of Citrus Heights assumed responsibility for storm drain maintenance following incorporation, a systematic evaluation of the storm drain system has been conducted to address areas of drainage concern. The city is divided into 11 neighborhoods with a group of neighborhoods being included in each master plan.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: GSD Staff in coordination with consultant

Cost Estimate: $500k

Benefits (Losses Avoided): Reduced risk to critical facilities. Reduced risk to citizens

Potential Funding: Stormwater Fund, CalOES, FEMA, CDFW, DWR … other grant sources

Timeline: 2022

Project Priority (H, M, L): High

Action 8. Storm Drain Inlet Retrofit Project

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Storm drain inlet capacity limits have been identified as a cause of localized street flooding.

Project Description: The project would replace existing storm drain inlets with high capacity inlets.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: GSD Staff in coordination with consultant and contractor

Cost Estimate: $250k

Benefits (Losses Avoided): Accident avoidance.

Potential Funding: CalOES, FEMA, CDFW, DWR, other grant sources, and stormwater fund.

Timeline: 2022-2027

Project Priority (H, M, L): Medium

Action 9. Reduce Citrus Heights extreme heat events and associated hazards by Increase tree planting/canopy preservation/enhancement (this is in general plan) Project

Hazards Addressed: Climate Change, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Trees have many benefits, of particular importance during extreme heat events is that trees create cooler environments through the process of evapotranspiration. Evapotranspiration occurs when trees transpire, and trees transpire water to cool themselves. When the transpired water evaporates, the area

surrounding the tree cools as well. The EPA notes that evapotranspiration and shade can help to lessen peak summer temperatures by 2 to 9 degrees. Planting (and maintaining) trees is one of the best ways to combat harmful environmental effects. Introducing more vegetation, like trees, into urban environments helps with everything from basic shade refuge to cleaner air to the reduction of energy costs. Trees and the related shading will help mitigate climate impacts particularly during extreme heat events.

Project Description: The project would maintain healthy urban forests; restore trees and tree canopy in commercial parking lots. Promote and increase tree planting to increase shading and to absorb CO2, PM to improve air quality, reduce urban heat islands and associated hazards.

Other Alternatives: No Action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Tree Preservation Ordinance (existing) and planned update. Code enforcement efforts with commercial property owners to replace lost trees in parking lots (enforcement of parking lot tree canopy requirements). Through support from the Capital Region Climate Readiness Collaborative; monitor and support regional and State-level efforts to forecast the impact of climate change on temperatures and incidence of extreme heat events in Sacramento and the region. Create and maintain shading by sustaining municipal tree planting efforts and continuing to maintain the health of existing trees. On-going implementation of Zoning Code and Design Guideline Tree Planting requirements and recommendations. (New) In collaboration with the Sacramento Tree Foundation, Implementation of a Neighborhood Forest Certification (NFC) program that offers guidelines and educational services on how to optimize the performance of trees in the design and build-out of new neighborhoods.

Responsible Agency/ Department/Partners: Planning and General Services Staff in coordination with consultant and contractor

Cost Estimate: $1M

Benefits (Losses Avoided): Reduce Citrus Heights' vulnerability to extreme heat events and associated hazards.

Potential Funding: CalOES, FEMA, Tree planting: Tree Mitigation Fund, State grants, SMUD, PGE Mitigation Funding, Collaboration with Sacramento Tree Foundation, and other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): Medium

Action 10. Increase pedestrian and bicycle evacuation routes by constructing regional bike/pedestrian trail infrastructure, and expanding connection to neighborhoods (particularly in vulnerable areas) Project

Hazards Addressed: Climate Change, Floods, Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: During extreme weather events and other emergencies, the public may frequently have to walk or bicycle out of areas to seek safety. In the event of an evacuation, pedestrian and bicycle trails can be used and have often served as the secondary transportation backbone.

Filling gaps in trail segments and connections and maintaining important trail infrastructure is not only an important measure for evacuation, but can also provide additional access for emergency vehicles and workers, and provide access for other mitigation work such as fuel reduction.

Project Description: The project would maintain existing regional and local trail systems and infrastructure. Design and construct new trail segments to better connect neighborhoods and communities. Coordinate with cities throughout the county in comprehensive planning of a well-design trail network. Coordinate with Sac Metro Fire, SMUD and others in designing trails.

Other Alternatives: No Action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Coordinate between Planning and General Services in expanding trail network and connecting with public roads, easements and points of access. Coordinate between Planning and General Services in prioritizing bicycle and pedestrian facilities and improvements, on and off street. Coordinate with other partners in trail planning and construction. Include trails and construction in Specific Plans, Subdivisions and new projects.

Responsible Agency/ Department/Partners: GSD & Planning Staff in coordination with Regional Parks, consultants and contractors

Cost Estimate: $1M

Benefits (Losses Avoided): Increase evacuation options and provide a secondary transportation network.

Potential Funding: CalOES, FEMA, CDFW, DWR Measure A Bond Funding-Trails State Grants, Projects with partners, New Development – included in project other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): Medium-High

Action 11. Interconnected Transportation System Project

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Transportation routes have been shown during recent emergencies to be a limiting factor in evacuations.

Project Description: The project would provide the interconnection of all traffic signals to allow the traffic engineer to control signals to optimize evacuations.

Other Alternatives: No Action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: GSD Staff in coordination with consultant and contractor

Cost Estimate: $1M

Benefits (Losses Avoided): Uncalculated based on varied emergencies.

Potential Funding: CalOES, FEMA, other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): Medium

Action 12. Critical Facility Generator Project

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: A wide variety of hazards can lead to power outage during emergencies, which hampers the city's ability to respond to the community needs as well as the need to provide mutual aid to other agencies. The installation of emergency back-up generators allows the city to provide ongoing services during times of crisis.

Project Description: Install 30 kW back-up generators at critical facilities.

Other Alternatives: No Action, Solar back-up with batteries

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: Staff in coordination with SMUD, consultants, and contractors.

Cost Estimate: $200k

Benefits (Losses Avoided): Reduced risk to critical facilities. Reduced risk to citizens

Potential Funding: CalOES, FEMA, … other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): High

Action 13. Critical Street Floodproofing Project

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Various arterial roadways throughout the City of Citrus Heights cross some of the 30+ miles of creeks, and are subject to periodic flooding during major rain events. Flooding of arterial roadways not only impacts the area being flooded, but also hinders the ability of safety and public service providers to respond efficiently in emergencies.

Project Description: The project would raise the roadway and/or increase bridge capacity so that the travel lanes are maintained above the 100 year water surface elevation.

Other Alternatives: Allow ongoing flooding

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: GSD Staff in coordination with consultant and contractor

Cost Estimate: $1M

Benefits (Losses Avoided): Reduced risk to critical facilities. Reduced risk to citizens

Potential Funding: CalOES, FEMA, CDFW, DWR … other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): Medium

Action 14. Creek Maintenance and Restoration Project

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Various portions of the 30+ miles of creeks in the City of Citrus Heights have overgrown vegetation that creates and/or captures natural, man-made, and biological hazards in the riparian corridor. Some portions of the creek, both in the natural channel and near bridge abutments and other man-made features, also have excessive erosion due to increased flows and velocities. Additionally, the creeks historically had deep pools that provided ground water recharge and cool summertime flows for better and more reliable water supply and water quality

Project Description: The project would do 3 things:

1. Manage vegetation to keep the riparian corridor visually and hydraulically,

2. Protect the natural channel and man-made features along it through the use of the most natural improvements possible,

3. Restore the natural channel and floodplain that have become filled over time.

Other Alternatives: Allow ongoing channel and water quantity and quality degradation

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: GSD Staff in coordination with SRPD, consultants, and contractors.

Cost Estimate: $250k

Benefits (Losses Avoided): Reduced risk to critical facilities. Reduced risk to citizens

Potential Funding: SRPD, CalOES, FEMA, CDFW, DWR, TU … other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): Medium

Action 15. CMP Storm Drain Replacement Project

Hazards Addressed: Dam Failure, Floods, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Most of the City of Citrus Heights' storm drain system was constructed prior to incorporation as a city. Portions of the system had little to no design, or was designed to standards that have since been superseded. Storm drain system at that time were commonly constructed using corrugated metal pipes (CMP), which have passed their useful life. This usually means the invert of the pipe is rusted, leading to exposed trench bedding and erosion. The CMP's need to be replaced.

Project Description: The project would verify the material used in all Storm Drains (some pipe material is listed as unknown), and the pipes constructed with CMP's would be cleaned, inspected, and replaced if they have rusted inverts, or placed on an accelerated review program to monitor their condition.

Other Alternatives: Allow ongoing deterioration until roadway or surface failure

Existing Planning Mechanism(s) through which Action Will Be Implemented: EOP, Continuity of Operation Plan

Responsible Agency/ Department/Partners: GSD Staff in coordination with consultant

Cost Estimate: $500K

Benefits (Losses Avoided): Reduced risk to critical facilities. Reduced risk to citizens

Potential Funding: CalOES, FEMA, CDFW, DWR … other grant sources

Timeline: 2022-2027

Project Priority (H, M, L): High

Annex B City of Elk Grove

B.1 Introduction

This Annex details the hazard mitigation planning elements specific to the City of Elk Grove, a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to Elk Grove, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

B.2 Planning Process

As described above, Elk Grove followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table B-1. Additional details on Plan participation and City representatives are included in Appendix A.

Table B-1 City of Elk Grove – Planning Team

Name	Position/Title	How Participated
Rachael Brown	Economic Development Program Manager	Provided review and information on the economy section and the pandemic section.
Shane Diller	Assistant Director of Development Services	Provide review and input on building permits and municipal codes/policies and earthquake vulnerability and future development.
Sean Gallagher	Maintenance and Operations Manager	Provide review and input on assets at risk and mitigation efforts
Jamie Hudson	Real Time Information Center Supervisor	Provided review and input on emergency operations, vulnerability assessments, mitigations, extreme heat, wildfires, policies/procedures.
Christopher Jordan	Director of Strategic Planning and Innovation	Provided review and input on the General Plan, growth and development trends, and municipal codes/policies. Provided review and input on Climate Change and Drought.
Amittoj Thandi	Engineering Services Support Manager	Provided review and input on identifying hazards, vulnerability assessments, mitigations, critical facilities, development in a hazard area, flood, localized stormwater flooding, levees failures, heavy rains and storms, plans, municipal codes/policies. Attended meetings.

Name	Position/Title	How Participated
Carrie Whitlock	Strategic Planning and Innovation Program Manager	Facilitated LHMP update. Provided review and input on population trends, special populations, climate change, and pandemic sections.
Matt DeMarco Cosumnes Community Service District	Battalion Chief of Administration, CSD Fire	Provided review and input on the wildfire section.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the City integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the City incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table B-2.

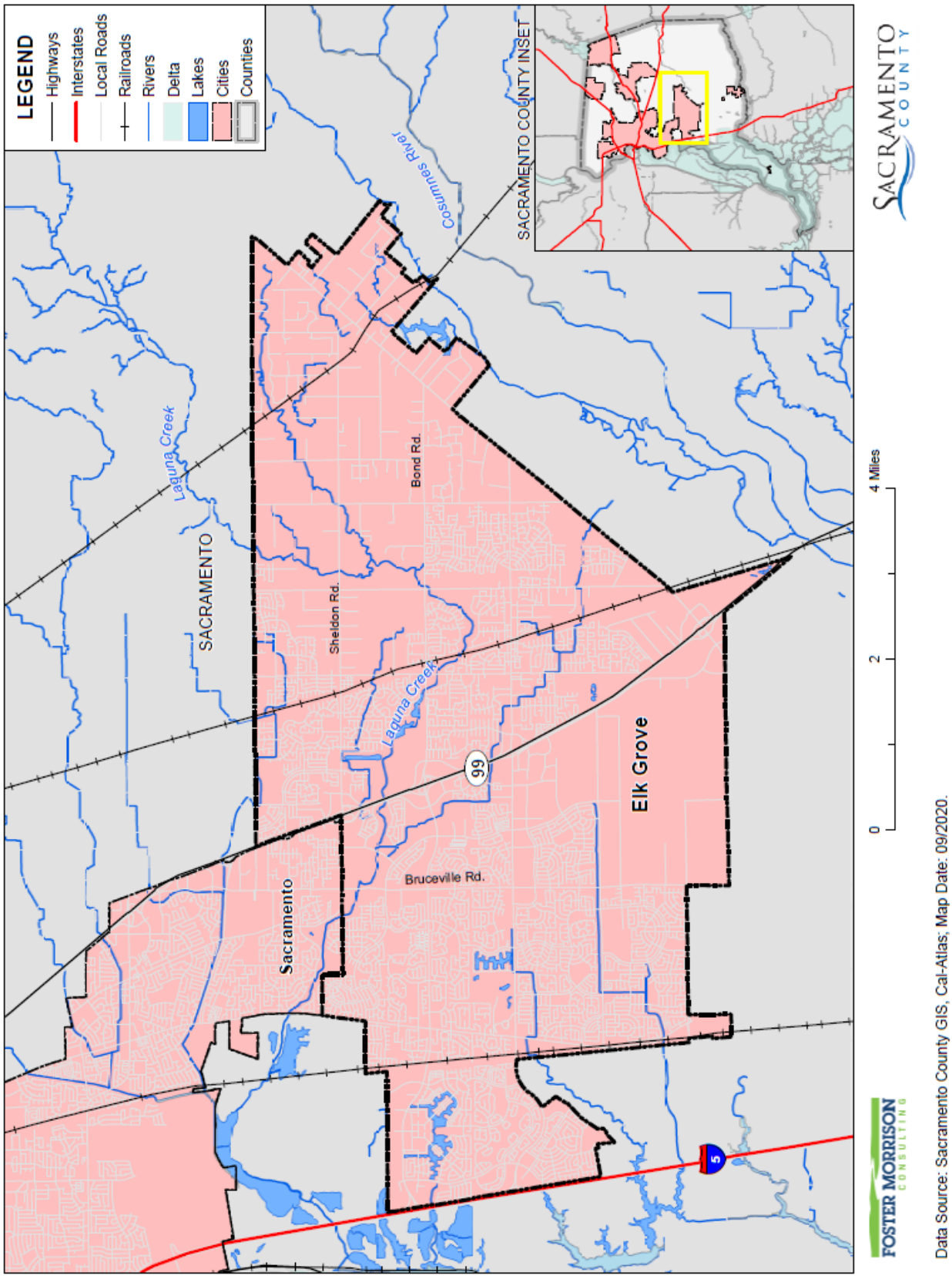
Table B-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
General Plan	The General Plan was adopted in February 2019. The Safety Element was updated along with the General Plan update and incorporated as part of the document. A Vulnerability Assessment was also completed in October 2017 as part of the General Plan update.
Community Mobility Resilience Plan	The Community Mobility Resilience Plan was adopted in February 2021. The document outlines how the city will be impacted by several climate change related scenarios, including increased heat, increased precipitation and flooding, and fiscal concerns as a result of vehicle related changes, and proposes strategies to address these impacts. The flooding section, in particular, used the 2016 LHMP in the analysis of impacts.
Capital Improvement Program	Projects to mitigate flood risk and other hazards are programmed in the CIP annually. Constructed several projects during the previous 5-year period.
Emergency Operations Plan (EOP)	The Emergency Operations Plan was implemented in September 2018. It established an Emergency Management Organization and assigns functions and tasks consistent with the County of Sacramento, California's Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS). It provides for the integration and coordination of planning efforts of multiple jurisdictions within the City of Elk Grove.
Storm Drainage Master Plan	The Storm Drainage Master Plan was adopted in 2011. A minor update was completed in 2019 to provide a summary of projects completed since 2011, provide details on remaining projects and information regarding new regulatory requirements.

B.3 Community Profile

The community profile for the City of Elk Grove is detailed in the following sections. Figure B-1 displays a City map and the location of Elk Grove within Sacramento County.

Figure B-1 City of Elk Grove



B.3.1. Geography and Climate

Elk Grove contains 42 square miles of land and sits at 46 ft. above mean sea level. The City is located within the Great Valley geomorphic province, which is primarily described as a relatively flat alluvial plain, about 50 miles wide and 400 miles long, with thick sequences of sedimentary deposits of Jurassic through Holocene age.

Shielded by the Sierra Nevada Mountains to the east, the California Coast ranges to the west, and the Siskiyou Mountains to the north, the City enjoys a mild climate for most of the year. In the summer, however, "northerns" blow from the Siskiyou Mountains, bearing pollens and heat. This is mitigated by the City's extremely low humidity and the cool delta breezes. The winters are rainy. Rain generally falls only between November and March, with the rainy season tapering off almost completely by the end of April. Average yearly precipitation is 17" to 18", with almost no rain during the summer months, to an average rainfall of 3.7" in January. It rains, on average, 58 days of the year and there are 266 sunny days. In February of 1992, Sacramento had 16 consecutive days of rain (6.41"). A record 7.24" of rain fell on April 20, 1880.The average temperature throughout the year is 61°F, with the daily average ranging from 46°F in December and January to 76°F in July. Average daily high temperatures range from 53°F in December and January to 92°F in July (with many days of over 100°F highs). Daily low temperatures range from 38 to 58°F. The average year has 73 days with a high over 90°F, with the highest temperature on record being 114°F on July 17, 1925, and 18 days when the low drops below 32°F, with the coldest day on record being December 11, 1932, at 17°F.

On average, 96 days in the year have fog, mostly in the morning (tule fog), primarily in December and January. The fog can get extremely dense, lowering visibility to less than 100 feet and making driving conditions hazardous.

B.3.2. History

A portion of the City lies within the former territory of six Plains Miwok tribelets along the Cosumnes River drainage and two, possibly three tribelets along the Sacramento River. James A. Bennyhoff's research[1] revealed that the Plains Miwok were recognized as a distinct language group as early as 1806 when Spanish explorers first entered the region.

In 1850, the City was established as a hotel and a stop for the stage. The City is located about 15 miles south of historic Sutter's Fort and thus became a crossroads for business, entertainment, mail service and agriculture, and acted as home base for gold miners in nearby communities. After it played its part in the early gold rush and statehood history in California, a close-knit community evolved with a distinctly rural and western lifestyle.

[1] James A. Bennyhoff (1926-1993) was an anthropologist and professor at UC Berkeley, California.

Initially, the town developed around a stage stop on the Monterey Trail, though after the railroad passed by east of town, the City's center shifted to its present location. "Old Town" Elk Grove is located about a mile east of State Route 99 (formerly U.S. Route 99, the north-south artery of the California Central Valley).

Despite the City's close proximity to California's capital city, Elk Grove remained quietly independent of Sacramento's growth and development as it expanded into adjoining countywide areas until the 1980s. The City was incorporated as a general law city on July 1, 2000.

B.3.3. Economy and Tax Base

Elk Grove is a rapidly growing City with one of the highest per capita incomes in the Sacramento region. In 2004 and 2005, the US Census Bureau named the City as the fastest growing city in the country. In 2008, the Gadberry Group recognized Elk Grove as one of eight most notable high-growth cities in the nation with the highest increase in average household income. US Census estimates show economic characteristics for the City of Elk Grove. These are shown in Table B-3 and Table B-4. Mean household income in the City was $113,090. Median household income in the City was $94,971.

Table B-3 City of Elk Grove – Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	686	0.8%
Construction	4,720	5.5%
Manufacturing	3,743	4.4%
Wholesale trade	2,109	2.5%
Retail trade	7,679	9.0%
Transportation and warehousing, and utilities	5,142	6.0%
Information	1,117	1.3%
Finance and insurance, and real estate and rental and leasing	6,087	7.1%
Professional, scientific, and management, and administrative and waste management services	8,068	9.5%
Educational services, and health care and social assistance	21,046	24.7%
Arts, entertainment, and recreation, and accommodation and food services	7,556	8.9%
Other services, except public administration	4,306	5.0%
Public administration	13,044	15.3%

Source: US Census Bureau American Community Survey 2019 Estimates

Table B-4 City of Elk Grove – Income and Benefits

Income Bracket	Percent
<$10,000	3.4%
$10,000 – $14,999	2.5%
$15,000 - $24,9999	4.7%
$25,000 – $34,999	5.1%

Income Bracket	Percent
$35,000 – $49,999	8.3%
$50,000 – $74,999	14.2%
$75,000 – $99,999	13.7%
$100,000 – $149,999	22.0%
$150,000 – $199,999	12.7%
$200,000 or more	13.5%

Source: US Census Bureau American Community Survey 2019 Estimates

Major employers in the vicinity are shown in Table B-5.

Table B-5 Top Ten Employers in the Vicinity of Elk Grove

Company	Est. Employees[1]
Apple, Inc.[2]	5,000
Elk Grove Unified School District	4,263
California Correctional Health Care Services[3]	1,731
Raley's	889
Wal-Mart Stores, Inc.	681
Kaiser Foundation Hospitals	524
Autozone, Inc. (including ALLDATA)	400
Elk Grove, City of[3, 4]	398
County of Sacramento	337
State of California	313

Source: EPS, Elk Grove Employment Dynamics

Notes:

1. Constitutes best estimate of current employment from available sources, based on Elk Grove Employment Dynamics Study completed by EPS in 2018.
2. While some employees at this location are contracted by other employment agencies, for purposes of this analysis, all employees at this location are considered Apple employees.
3. Based on 2018 estimates from the City of Elk Grove.
4. Includes permanent and contract staff.

B.3.4. Population

The California Department of Finance estimated the January 1, 2020, total population for the City of Elk Grove was 176,154.

B.4 Hazard Identification

Elk Grove identified the hazards that affect the City and summarized their location, extent, likelihood of future occurrence, potential magnitude, and significance specific to Elk Grove (see Table B-6).

Table B-6 City of Elk Grove—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Limited	Unlikely	Limited	High	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Medium	High
Earthquake	Significant	Occasional	Limited	Medium	Low
Earthquake Liquefaction	Limited	Unlikely	Negligible	Low	Low
Floods: 1%/0.2% annual chance	Significant	Occasional/ Unlikely	Critical	High	Medium
Floods: Localized Stormwater	Significant	Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Significant	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Limited	Occasional	Negligible	Low	Low
Subsidence	Limited	Unlikely	Negligible	Low	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Limited	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

B.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile Elk Grove's hazards and assess the City's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City is included in this Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards ranked of medium or high significance specific to the City (as identified in the Significance column of Table B-6) and also includes a vulnerability assessment to the three primary hazards to the State of California: earthquake, flood, and wildfire. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

B.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section B.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

B.5.2. Vulnerability Assessment and Assets at Risk

This section identifies Elk Grove's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

Values at Risk

The following data from the Sacramento County Assessor's Office is based on the 2020 Assessor's data. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitations are created by Proposition 13 and the Williamson Act as detailed in the Base Plan. With respect to Proposition 13, instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is most likely low and does not reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table B-7 shows the 2020 Assessor's values and content replacement values (e.g., the values at risk) broken down by property type for the City.

Table B-7 City of Elk Grove – Total Values at Risk by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	19	7	$1,376,347	$1,239,312	$1,239,312	$3,854,971
Care/Health	36	27	$37,940,058	$152,964,107	$152,964,107	$343,868,272
Church/Welfare	51	47	$32,627,506	$131,084,326	$131,084,326	$294,796,158
Industrial	206	175	$100,426,145	$329,611,799	$494,417,691	$924,455,646
Miscellaneous	1,588	1	$1,365,864	$1,100	$1,100	$1,368,064
Office	326	296	$101,150,230	$531,234,209	$531,234,209	$1,163,618,648
Public/Utilities	72	0	$110	$0	$0	$110
Recreational	20	16	$13,821,318	$54,974,841	$54,974,841	$123,771,000
Residential	51,008	50,779	$5,112,674,533	$14,134,632,301	$7,067,316,270	$26,314,623,069
Retail/ Commercial	433	400	$389,355,339	$1,006,778,621	$1,006,778,621	$2,402,912,581
Unknown	1	1	$0	$127,600	$0	$127,600
Vacant	1,824	60	$471,773,843	$12,326,932	$0	$484,100,775
Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**

Source: Sacramento County 2020 Parcel/Assessor's Data

Critical Facilities and Infrastructure

Critical facilities and infrastructure are those buildings and infrastructure that are crucial to a community. Should these be damaged, it makes it more difficult for the community to respond to and recover from a disaster. For purposes of this Plan, a critical facility is defined as:

Put in the critical facility definition.

> *Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities. Critical facilities in the City are shown on Figure B-2 and detailed in Table B-8.

Figure B-2 City of Elk Grove – Critical Facilities

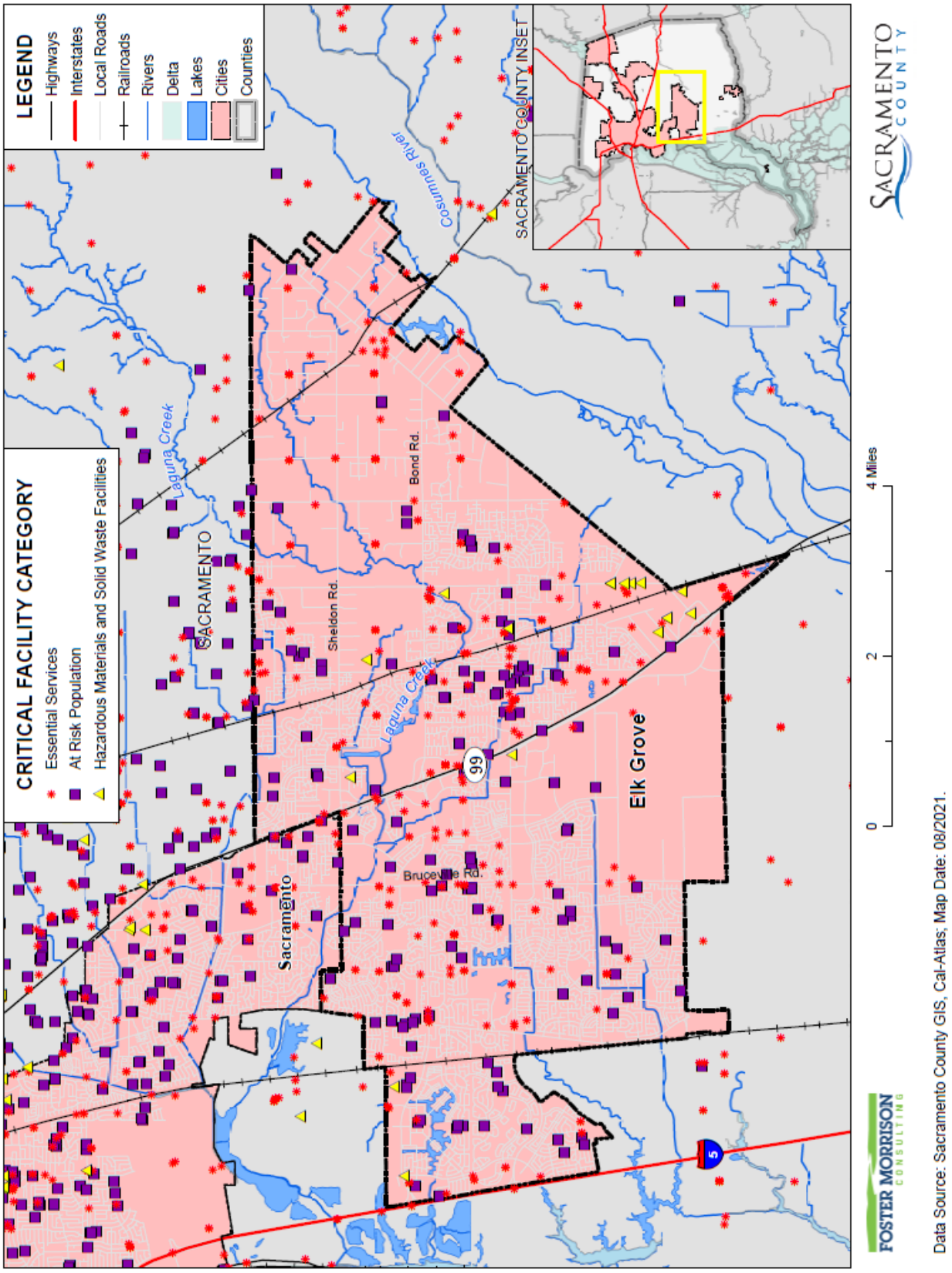


Table B-8 City of Elk Grove – Critical Facilities by Category and Type

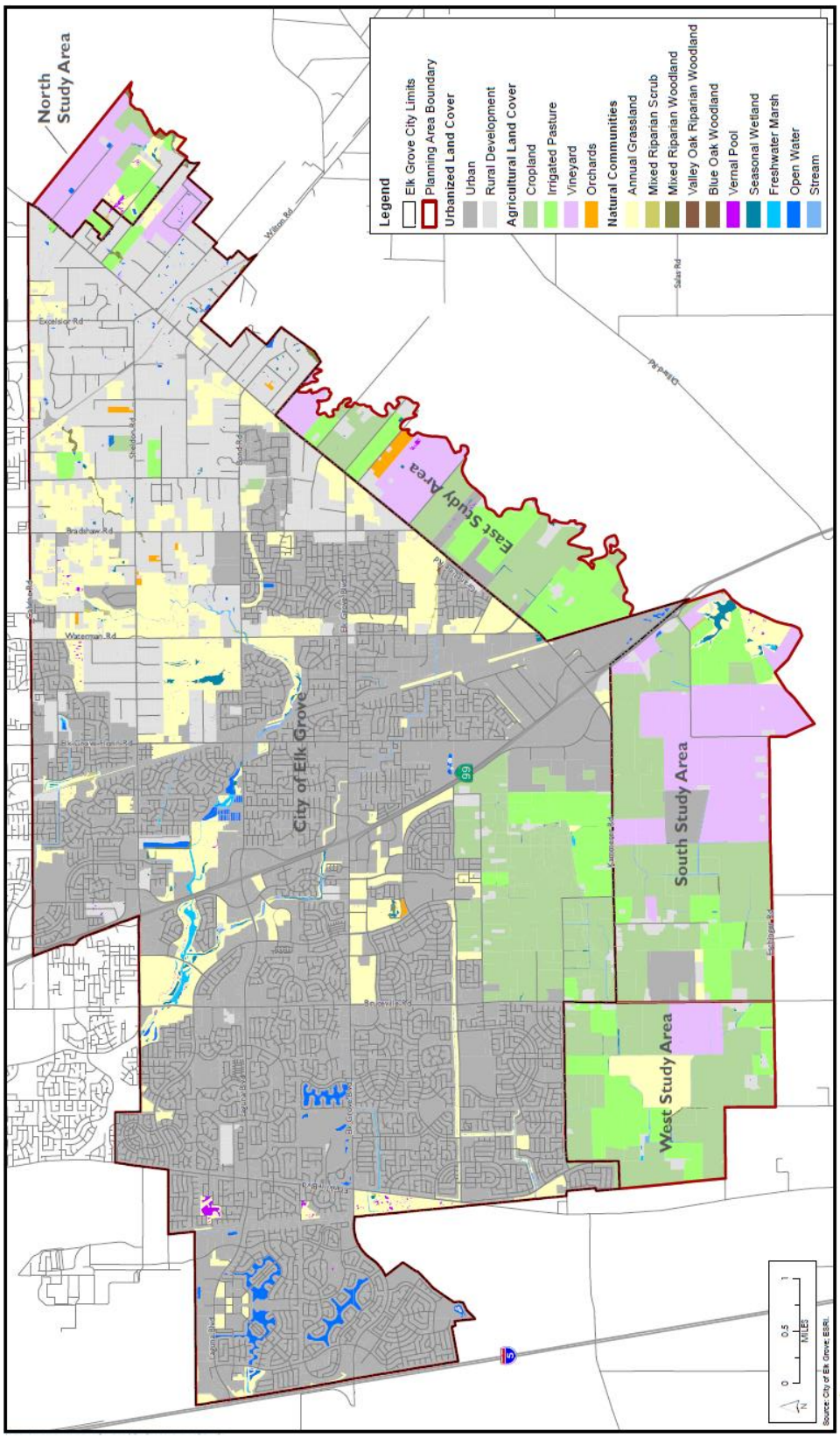
Critical Facility Category	Critical Facility Type	Facility Count
Essential Services Facilities	Cellular Tower	2
	Emergency Evacuation Center	8
	EMS Stations	7
	FDIC Insured Banks	26
	Fire Station	6
	Hospital or Urgent Care	1
	Law Enforcement	2
	Microwave Service Towers	107
	Sewage Treatment Plant	1
	Water Well	158
	Total	**318**
At Risk Population Facilities	Day Care Center	36
	Mobile Home Parks	1
	Places of Worship	89
	School	45
	Total	**171**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	6
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	4
	Solid Waste Facility	4
	Waste Transfer Station	1
	Total	**18**
Elk Grove Total		**507**

Source: City of Elk Grove

Natural Resources

Natural resources are unique to each area and are difficult to replace. Should a natural disaster occur, these species and locations are at risk. The City consists of a mix of urban, agricultural, and natural land cover types. Agricultural lands are divided into subcategories including cropland, irrigated pasture, vineyard, and orchard. Natural land covers include annual grasslands, mixed riparian scrub, mixed riparian woodland, valley oak riparian woodland, blue oak woodland, seasonal wetlands, vernal pools, freshwater marshes, open water, and streams. Land cover type and land uses in the City are shown in Figure B-3.

Figure B-3 City of Elk Grove – Vegetative Communities and Land Uses



Source: City of Elk Grove General Plan 2018 Environmental Impact Report

Special Status Species

The following special-status species are known to occur within the natural habitats most likely to be present within the City boundaries. These and other species potentially occurring in the City can be found in Table B-9. Figure B-4 shows the locations of sensitive elements within the City.

Table B-9 Special-Status Species Potentially Occurring in the City of Elk Grove

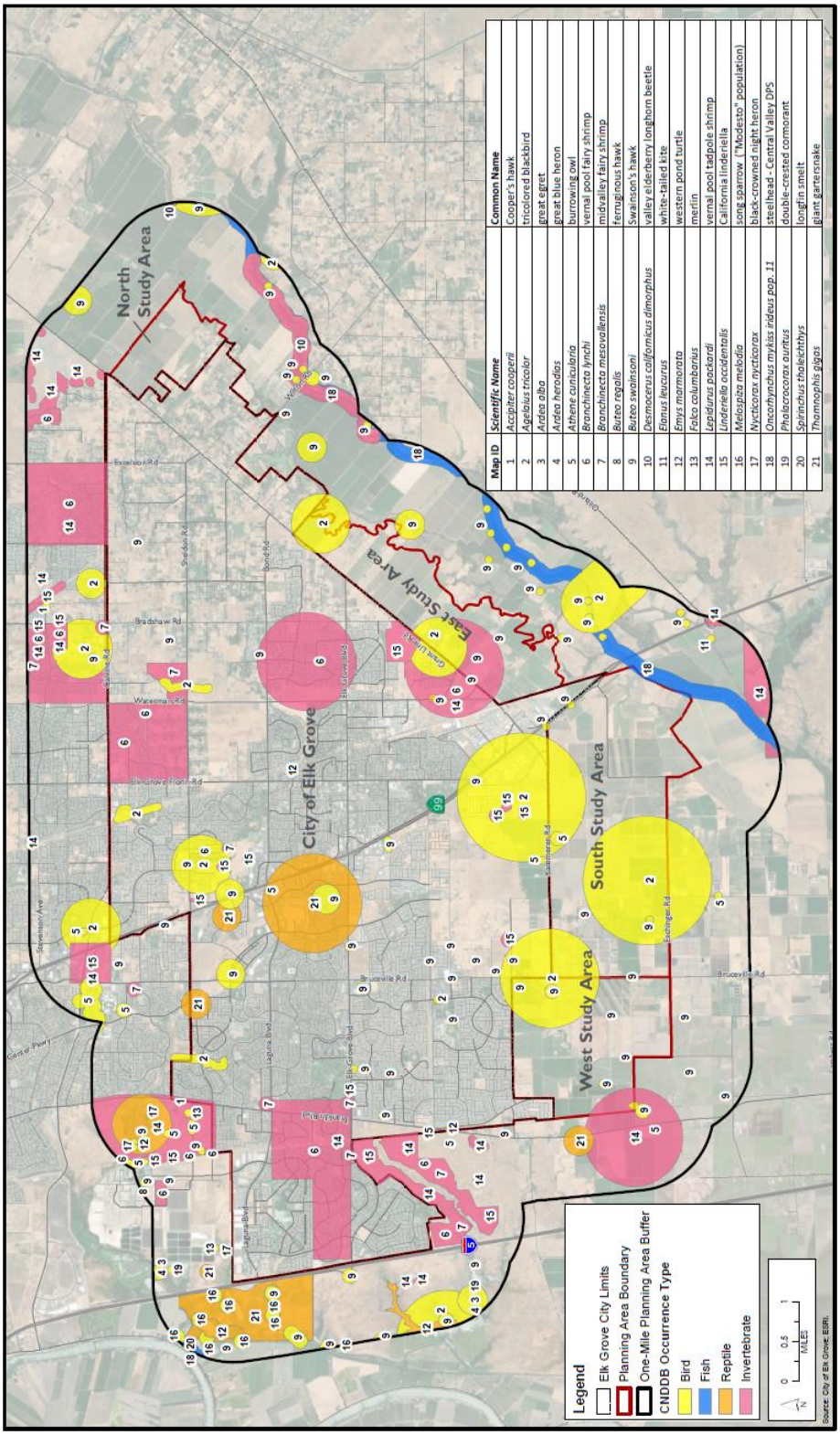
Common Name	Scientific Name	Regulatory Status
Ahart's Dwarf Rush	*Juncus leiospermus var. ahartii*	SC; --; 1 B
Boggs Lake Hedge- hyssop	*Gratiola heterosepala*	--; CE; 1 B
Delta Tule-pea	*Lath yrus jepsonii var. jepsonii*	SC; --; 1 B
Dwarf Downingia	*Downingia pusilla*	--; --; 2
Legenere	*Legenere limosa*	SC; --; 1 B
Mason's Lilaeopsis	*Lilaeopsis masonii*	SC; CR; 1 B
Northern California Black Walnut	*Juglans californica var. hindsii*	SC; --; 1 B
Pincushion navarettia	*Naverretia myersii spp. Myersii*	SC; --; 1 B
Rose Mallow	*Hibiscus lasiocarpus*	SC; --; 1 B
Sacramento Orcutt Grass	*Orcuttia viscida*	FE; CE; 1 B
Sacramento Orcutt Grass Critical Habitat	*Orcuttia viscida Critical Habitat*	--
San Joaquin Saltbrush	*Atriplex joaquiniana*	SC; --; 1 B
Sanford's Arrowhead	*Sagittaria sanfordii*	SC; --; 1 B
Slender Orcutt Grass	*Orcuttia tenuis*	FT; CE; 1 B
Slender Orcutt Grass Critical Habitat	*Orcuttia tenuis Critical Habitat*	--
California linderiella	*Linderiella occidentalis*	SC; --; --
Conservancy fairy shrimp	*Brachinecta conservation*	FE; --; --
Midvalley Fairy Shrimp	*Branchinecta mesovallensis*	SC; --; --
Valley Elderberry Longhorn beetle	*Desmocerus californicus dimorphus*	FT (PX); --; --
Vernal Pool Fairy Shrimp	*Branchinecta lynchi*	FT; --; --
Vernal Pool Tadpole Shrimp	*Lepidurus packardi*	FE; --; --
California Horned Lizard	*Phrynosoma coronatum frontale*	SC; CSC (protected full species); --
California Tiger Salamander	*Ambystoma californiense*	C; CSC (protected); --
Giant Garter Snake	*Thamnophis gigas*	FT; CT (protected); --
Northwestern Pond Turtle	*Clemmys marmorata marmorata*	SC; CSC; --
Silvery Legless Lizard	*Anniella pulchra pulchra*	SC; CSC; --
Western Spadefoot Toad	*Scaphio pus hammondii*	SC; CSC (protected); --

Common Name	Scientific Name	Regulatory Status
Central Valley Fall/Late Fall-run Chinook Salmon and Critical Habitat	*Oncorhynchus tshawytscha*	C; CSC; --
Central Valley Spring-run Chinook Salmon	*Oncorhynchus tshawytscha*	FT; CT; --
Central Valley Winter – run Chinook Salmon and Critical Habitat	*Oncorhynchus tshawytscha*	FE; CE; --
Central Valley Steelhead	*Oncorhynchus mykiss*	FT; --; --
Delta Smelt	*Hypomesus transpacificus*	FT; CT; --
Green Sturgeon	*Acipenser medirostris*	SC; CSC; --
Pacific Lamprey	*Lam petra trident ata*	SC; --; --
River Lamprey	*Lam petra ayresi*	SC; CSC; --
Sacramento Splittail	*Pogonichthys macrolepidotus*	FT; CSC; --
Aleutian Canada Goose	*Branta Canadensis leucopareia*	FD; --; -- (Wintering)
American Bittern	*Botaurus lentiginosus*	SC; --; --
Bank Swallow	*Riparia riparia*	--; CT; -- (nesting)
Black Rail	*Laterallus jamaicensis coturniculus*	SC; CT (fully protected); --
Black Tern	*Chlidonias niger*	SC; CSC; -- (nesting colony)
Cooper's Hawk	*Accipiter cooperi*	--; CSC; -- (nesting)
Grasshopper Sparrow	*Ammodramus savannarum*	SC; --; -- (nesting)
Great Blue Heron	*Ardea herodias*	--; CDF (sensitive); -- (rookery)
Great Egret	*Ardea alba*	--; CDF (sensitive); -- (rookery)
Greater Sandhill Crane	*Grus canadensis tabida*	--; CT (fully protected); --
Lesser Sandhill Crane	*Grus canadensis canadensis*	--;CSC;--
Loggerhead Shrike	*Lanius ludovivianus*	SC; CSC; -- (nesting)
Mountain Plover	*Charadrius montanus*	FPT; CSC; -- (wintering)
Northern Harrier	*Circus cyaneus*	--;CSC;--
Nuttall's Woodpecker	*Picoides nuttallii*	SLC; --; --
Oak Titmouse	*Baeolophus inornatus*	SLC; --; --
Snowy Egret	*Egretta thula*	SC; --; -- (rookery)
Song Sparrow (Modesto Population)	*Melospiza melodia*	--;CSC;--
Swainson's Hawk	*Buteo swainsoni*	--; CT; --
Tricolored Blackbird	*Agelaius tricolor*	SC; CSC; -- (nesting colony)
Vaux's Swift	*Chaetura vauxi*	--;CSC;--
Western Burrowing Owl	*Athene cunicularia hypugea*	SC; CSC; -- (burrowing sites)
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	SC; CE (fully protected); -- (nesting)
White-tailed Kite	*Elanus caeruleus*	SC; (fully protected); - - (nesting)

Common Name	Scientific Name	Regulatory Status
Yellow-breasted chat	*Icteria virens*	--;CSC;--
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	--;CSC;--
Yellow Warbler	*Setophaga petechia*	--;CSC;--
Fringed Myotis	*Myotis thysanodes*	SC; --; --
Greater Western Mastiff bat	*Eumops perotis californicus*	SC; CSC; --
Long-eared Myotis	*Myotis evotis*	SC; --; --
Long-legged Myotis	*Myotis volans*	SC; --; --
Pacific Western Big- eared bat	*Corynorhinus townsendii townsendii*	SC; CSC (full species); --
Pale Townsend's Big- eared bat	*Corynorhinus townsendii pallescens*	SC; CSC (full species); --
San Joaquin Pocket Mouse	*Perognathus inornatus*	SC; --; --
San Joaquin Woodrat	*Neotoma fuscipes riparia*	FE; CSC; --
Small-footed Myotis	*Myotis ciiolabrum*	SC; --; --
Yuma Myotis	*Myotis yumanensis*	SC; --; --

Source: Foothill Associates, 2002 and updated by Michael Baker International May 2016.
FE = federally endangered FT = federally threatened
SC = federal species of concern
C = candidate
CDF- California Department of Fish and Game (sensitive)
FPT = federal proposed threatened
FPE = federal proposed endangered
CE = State endangered
CT = State threatened
CR = State rare
CSC = California species of special concern
C = candidate for listing
1 B = CNPS (California Native Plant Society) list plants rare, threatened, or endangered in California or elsewhere
2 = CNPS list plants rare, threatened, or endangered in California, but more numerous elsewhere * = not enough information available on this species
3 = CNPS list plants about which CNPS needs more information
4 = CNPS list plants of limited distribution – a watch list
D = Delisted
MNBMC = Migratory Non-Game Bird of Management Concern
PX = Proposed Critical Habitat
SLC = Species of Local Concern

Figure B-4 City of Elk Grove Habitat Conditions and Known Occurrences of Special-Status Species



Map ID	Scientific Name	Common Name
1	*Accipiter cooperii*	Cooper's hawk
2	*Agelaius tricolor*	tricolored blackbird
3	*Ardea alba*	great egret
4	*Ardea herodias*	great blue heron
5	*Athene cunicularia*	burrowing owl
6	*Branchinecta lynchi*	vernal pool fairy shrimp
7	*Branchinecta mesovallensis*	midvalley fairy shrimp
8	*Buteo regalis*	ferruginous hawk
9	*Buteo swainsoni*	Swainson's hawk
10	*Desmocerus californicus dimorphus*	valley elderberry longhorn beetle
11	*Elanus leucurus*	white-tailed kite
12	*Emys marmorata*	western pond turtle
13	*Falco columbarius*	merlin
14	*Lepidurus packardi*	vernal pool tadpole shrimp
15	*Linderiella occidentalis*	California linderiella
16	*Melospiza melodia*	song sparrow ("Modesto" population)
17	*Nycticorax nycticorax*	black-crowned night heron
18	*Oncorhynchus mykiss irideus pop. 11*	steelhead - Central Valley DPS
19	*Phalacrocorax auritus*	double-crested cormorant
20	*Spirinchus thaleichthys*	longfin smelt
21	*Thamnophis gigas*	giant gartersnake

Source: City of Elk Grove General Plan Background Report 2018 Environmental Impact Report,

Trees

Although native trees such as oaks (*Quercus sp.*) and California black walnuts (J*uglans californica var. jepsonii*) are not afforded special protection under State or federal law, loss of these species is of concern to the California Department of Fish and Wildlife and California Native Plant Society because of their continued depletion throughout California. In addition, the City regulates all projects with the potential to affect "Trees of Local Importance" as defined in Chapter 19.12 of the City's Municipal Code, which is the City's Tree Preservation and Protection Title. Trees of Local Importance include Coast live oak, Valley oak, Blue oak, Interior live oak, Oracle oak, California sycamore, and California black walnut with a diameter at breast height of six inches or greater; or multi-trunked trees with a combined diameter at breast height of six inches or greater.

In November 2005, the City Council formally adopted the Sacramento Tree Foundation's regional Greenprint Program in order to achieve the sustainability and livability goals in the Sacramento region by expanding urban forests and optimizing the benefits of tree canopies. Since inception, the City has worked with the Sacramento Tree Foundation to plant over 2,000 trees throughout the City.

Each planting effort has been very successful in providing additional aesthetic and biological value to the community. The planting areas were strategically selected to benefit the public at large, while providing an environment for a high survival rate for the trees. All planting areas are located on City properties and Cosumnes Community Services District (CCSD) properties. Such planting areas include along creeks/channels, open spaces, parks, interchanges, and various streetscapes.

Historic and Cultural Resources

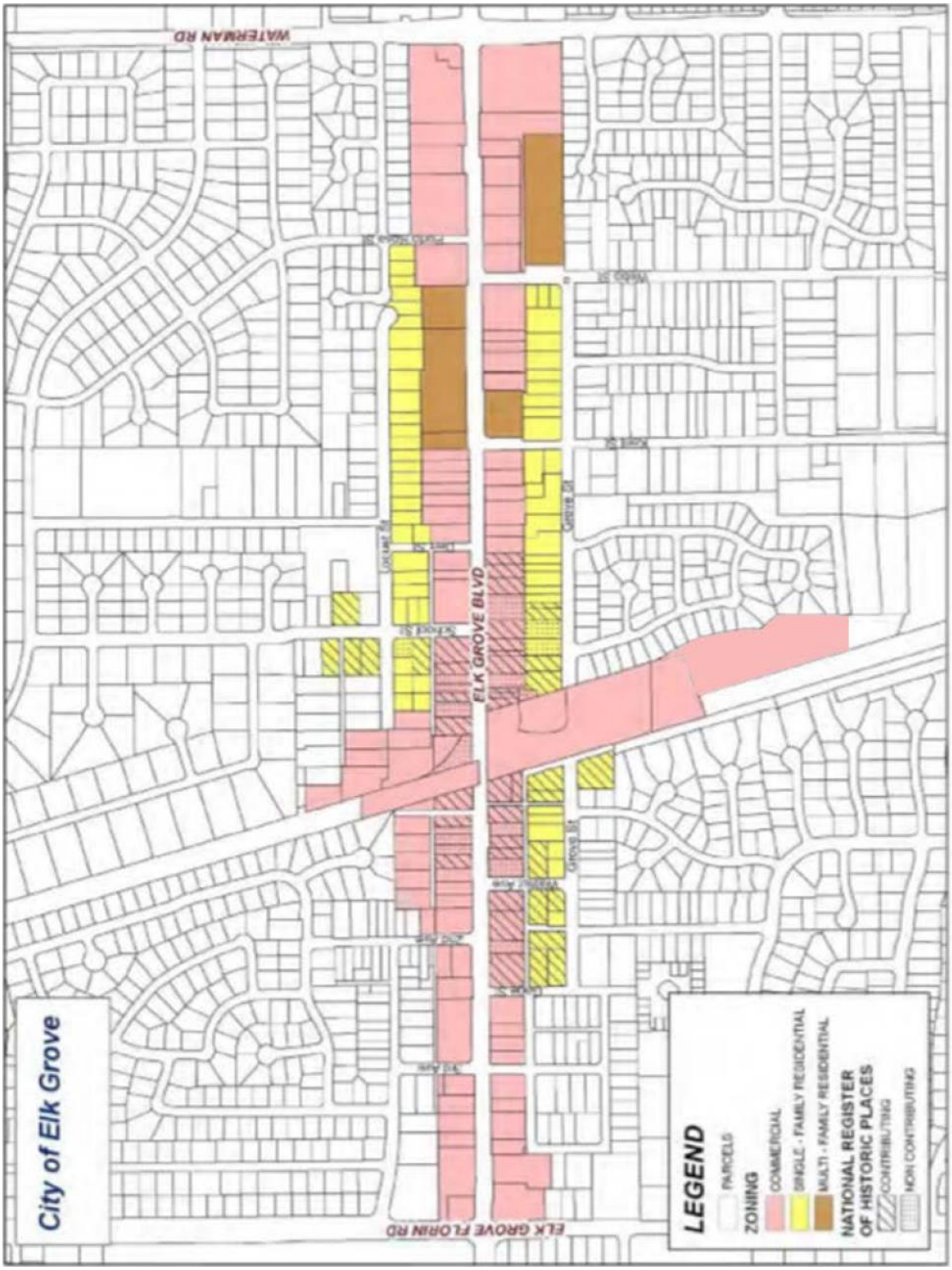
Historic and cultural resources are difficult to replace. Should a natural disaster occur, these properties and locations can be at risk. Within the City's vicinity there are ten commonly used place names representing historic communities, stations, schools or post offices, these include: Bruceville, Elk Grove, Franklin, Hood, McConnell Station, Pleasant Grove, Point Pleasant, Sheldon, Sloughhouse and Walsh. Portions of two Mexican land grants lie within the City: Leidesdorff's Rancho Rio de los Americanos and Sheldon and Daylor's Rancho Omochumnes.

The North Central Information Center's records search identified 93 prehistoric and historic Native American archaeological sites within the area of Elk Grove. Many of these archaeological sites are village mounds; some of these could contain human remains.

Euro-American settlement of Elk Grove began in the mid-19th Century with a Mexican land grant of 11 square leagues of land in the Sacramento Valley to John Sutter, including the Rancho Del San Juan subgrant. This subgrant area occupied 20,000 acres, including the modern-day Elk Grove area. The area developed as an agricultural community consisting of families settling small farms surrounding the Sylvan Corners area, located at the present-day intersection of Sylvan Road, Auburn Boulevard, and Old Auburn Road. The 20th Century saw a boom in urbanization of the area, particularly after World War II, when subdivisions began springing up to accommodate an influx of new residents to the area. The area continued to grow, in part as the rocket manufacturing plant at Aerojet in nearby Rancho Cordova attracted employees and their families to the region. As this new development occurred, many older structures throughout the

community were demolished and replaced by tract housing and new commercial development to serve the booming population. As this shift occurred, Elk Grove saw its historical character change to a more urbanized, suburban community, losing its character as a rural agricultural community. Figure B-5 illustrates properties included in the Elk Grove Historic District, which is within the Old Town Elk Grove Special Planning Area.

Figure B-5 Elk Grove Old Town Historic Property District



Source: City of Elk Grove

The City of Elk Grove has a stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. OHP administers the National Register of Historic Places, the California Register of Historical Resources, California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the Base Plan. Table B-10 lists the historical buildings in the City.

Table B-10 City of Elk Grove – Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Ehrhardt, William, House (N2209)	X				7/10/2003	Elk Grove
Elk Grove Grammar School / Elk Grove Unified School District (P717)				X	6/12/1989	Elk Grove
Elk Grove Historic District (N1553)	X				3/1/1988	Elk Grove
Grave of Elitha Cumi Donner Wilder (719)		X			12/2/1959	Elk Grove
Murphy's Ranch (680)		X			5/11/1959	Elk Grove
Site of First County Free Library Branch in California (817)		X			6/1/1967	Elk Grove

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. Information from the City of Elk Grove General Plan 2013-2021 Housing Element, the California Department of Finance, the US Census Bureau form the basis of this discussion.

Historic Population Trends and Current Population

Population growth can increase the number of people living in hazard prone areas. Elk Grove has generally seen rapid growth. The City annexed the Laguna West area in 2003, which accounted for an instant population increase of approximately 13,400 persons. While population growth has slowed over the past

decade, it has still continued at an estimated 1.5% per year, with the population expected to top 200,000 within the next decade. Elk Grove has seen growth rates as shown in Table B-11.

Table B-11 City of Elk Grove – Population Changes Since 1960

Year	Population	Change	% Change
1960	2,205	–	–
1970	3,721	1,516	68.8%
1980	10,959	7,238	194.5%
1990	17,483	6,884	59.5%
2000	59,984	42,501	243.1%
2010[1]	153,012	93,028	155.1%
2020[2]	176,154	23,142	15.1%

Source: [1]US Census Bureau, [2]California Department of Finance

Special Populations and Disadvantaged Communities

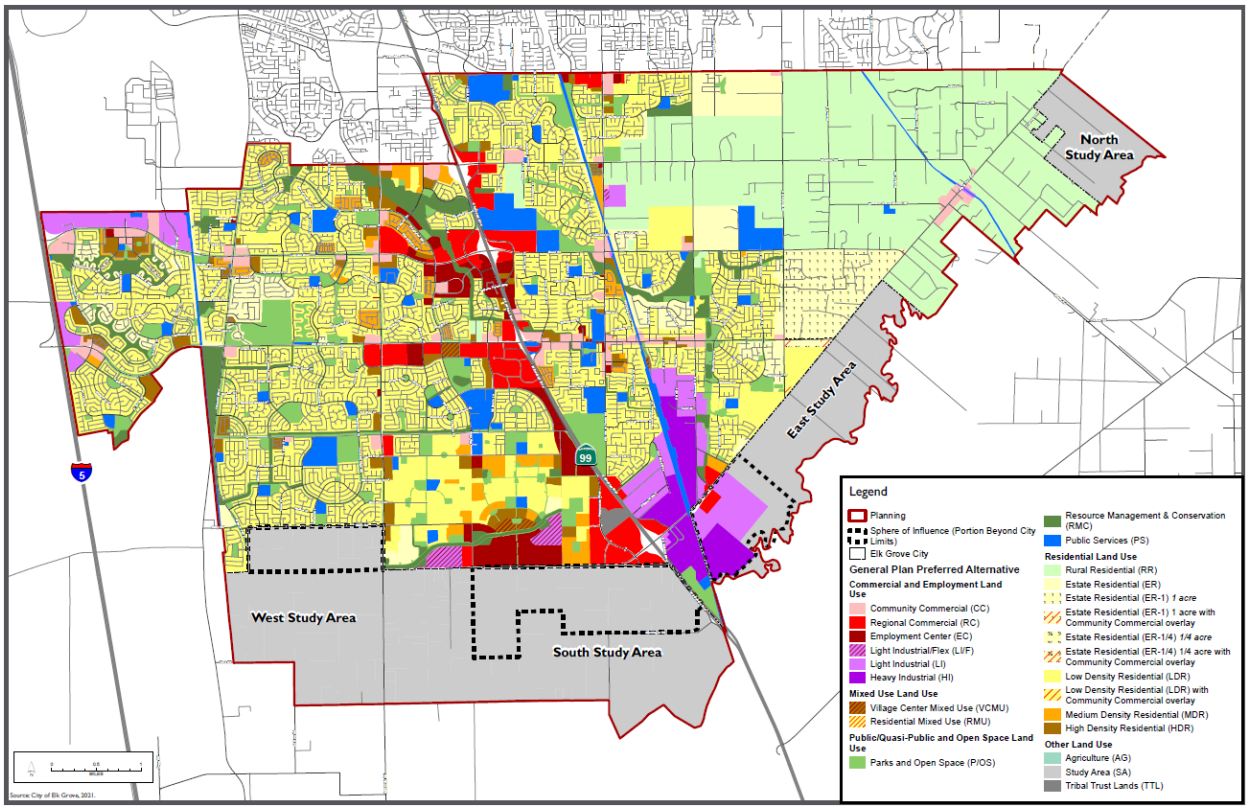
Disadvantaged communities as defined under Senate Bill 535 are not located within the City' limits. There are locations within the City with higher percentages of individuals who would be particularly vulnerable during a hazard event. This includes those who are over 65 years, individuals and families living below the poverty level, disabled individuals, those with limited English skills and those without access to vehicles. The east side of Highway 99 has several locations with higher percentages of households living in poverty and a higher percentage of the population that is over 65 years.

Land Use

State planning law requires that the land use element of a general plan include a statement of the standard population density, building intensity, and allowed uses for the various land use designations in the plan (Government Code Section 65302(a)). The City's land use designations are generally described below and mapped on the Land Use Diagram (Figure B-6). The Elk Grove Municipal Code provides detailed land use and development standards for development.

With this General Plan, a variety of new land use designations have been established to reflect the more mixed and, in some cases, more intense land uses envisioned for Elk Grove. New mixed-use designations provide the opportunity for a combination of residential, commercial, and office uses on a single site, depending on the designation. The Land Use Policy Map illustrates the planned land uses for lands within the City limits – see Figure B-6. The land use designations are used in assigning zoning categories and in the review of proposed projects.

Figure B-6 City of Elk Grove Land Use



Source: City of Elk Grove 2019 General Plan Land Use Element.

Development since 2016 Plan

As discussed in Section 4.3.1 of the Base Plan, future development has occurred in the County since the last plan. Some of this has occurred in hazard prone areas. The City Building Department tracked total building permits issued since 2016 for the City. These are tracked by total development, property use type, and hazard risk area. These are shown in Table B-12 and Table B-13.

Table B-12 City of Elk Grove – Total Development Since 2016

Property Use	2016	2017	2018	2019	2020
Agricultural	0	0	0	0	0
Commercial	8	14	123	101	384
Industrial	1	1	3	3	0
Residential	455	410	609	697	404
Unknown	0	4	9	8	5
Total	**464**	**492**	**744**	**809**	**793**

Source: City of Elk Grove Building Department

Table B-13 City of Elk Grove – Development in Hazard Areas since 2016

Property Use	1% Annual Chance Flood	Levee Protected Area	Wildfire Risk Area[1]	Other
Agricultural	0	0	0	0
Commercial	0	42	0	0
Industrial	0	1	0	0
Residential	0	102	0	0
Unknown	0	1	0	0
Total	**0**	**146**	**0**	**0**

Source: City of Elk Grove Building Department
[1]Moderate or higher wildfire risk area

In Elk Grove, development occurred in the levee protected areas. While the data shows changes in development in the City since the 2016, including development in mapped hazard areas, all development is subject to current building standards to include any requirements for building in hazard areas which act to mitigate hazard exposure. Further development in hazard areas is only one factor of many that contribute to an overall change in hazard vulnerability. Based on these considerations, it cannot be definitively stated as to whether the development or even lack of development contributed to an increase or decrease in vulnerability for Elk Grove.

Future Development

The Sacramento Council on Governments (SACOG) modeled population projections for the City of Elk Grove and other areas of the region in 2020 for a Metropolitan Transportation Plan/Sustainable Communities Strategy report. SACOG shows 65,660 housing units for 2035. With average people per household of 3.23 from the US Census Bureau Average Household size, SACOG estimates 2035 would be 212,082.

Table B-14, from the 2019 City of Elk Grove General Plan, identifies the development capacity associated with the planned distribution of land uses described in the Land Use Plan. As the density and intensity standards for each land use designation are implemented by future development projects and land use decisions, the activities occurring on properties will (consistent with the General Plan) transition from one activity to another, and land uses and intensities will shift to align with the intent of this Plan. The General Plan does not directly specify a maximum population for Elk Grove. The maximum possible number of residential units is determined by the different maximum densities allowed for each land use designation and the amount of land area within that designation. However, this maximum number of units is unlikely to be reached because every lot in Elk Grove would need to be developed to its maximum potential. Because much of the Planning Area is built out and existing buildings are generally in good condition, these changes will primarily occur on underutilized or vacant properties in the City and the Study Areas. Forecasting assumptions using reasonable inferences to determine the realistic expected development that could occur in Elk Grove after development or redevelopment of all properties that are expected to be developed, or redeveloped, are reflected in the development capacity.

Table B-14 City of Elk Grove – General Plan Development Capacity

	Acres	Dwelling Units	Population[1]	Employment (Jobs)	Jobs/ Housing Ratio
Existing Development Total[2]	31,449	53,829	171,059	45,463	0.84
General Plan Total	34,956	102,865	332,254	122,155	1.21
City Limits Subtotal	26,946	72,262	233,406	81,784	
Study Areas Subtotal	8,008	30,603	98,848	40,371	
North Study Area	*646*	*323*	*1,043*	*0*	
East Study Area	*1,772*	*4,806*	*15,523*	*3,875*	
South Study Area	*3,675*	*16,250*	*52,488*	*30,367*	
West Study Area	*1,915*	*9,224*	*29,794*	*6,129*	

Table Notes: Numbers may not sum due to rounding.

1. *Based on 3.23 persons per household, average.*

2. *Existing development represents 2017 population and dwelling information and derived from 2013 jobs data (the most current year available at time of writing the General Plan).*

Source: 2019 City of Elk Grove General Plan

GIS Analysis

The City of Elk Grove Development Services provided a list of projects that the City is seeing be developed. These were separated into three groups:

- Approved Projects (25 areas)
- In Plan Review (36 areas)
- Under Construction (20 areas)

Using GIS, the following methodology was used in determining parcel counts and acreages with future development projects in the City of Elk Grove. Future development areas in the City were provided in mapped format by the City. 3 categories of areas were provided. Using the GIS parcel spatial file for each of these areas, the 3 categories and 81 areas associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure B-7 shows the locations of future development areas the City is planning to develop. Table B-15 shows the summary of parcels and acreages of each future development area in the City, while Table B-16 breaks down the 3 categories into the 81 areas and shows the parcels and acres for each.

Figure B-7 City of Elk Grove – Future Development Areas

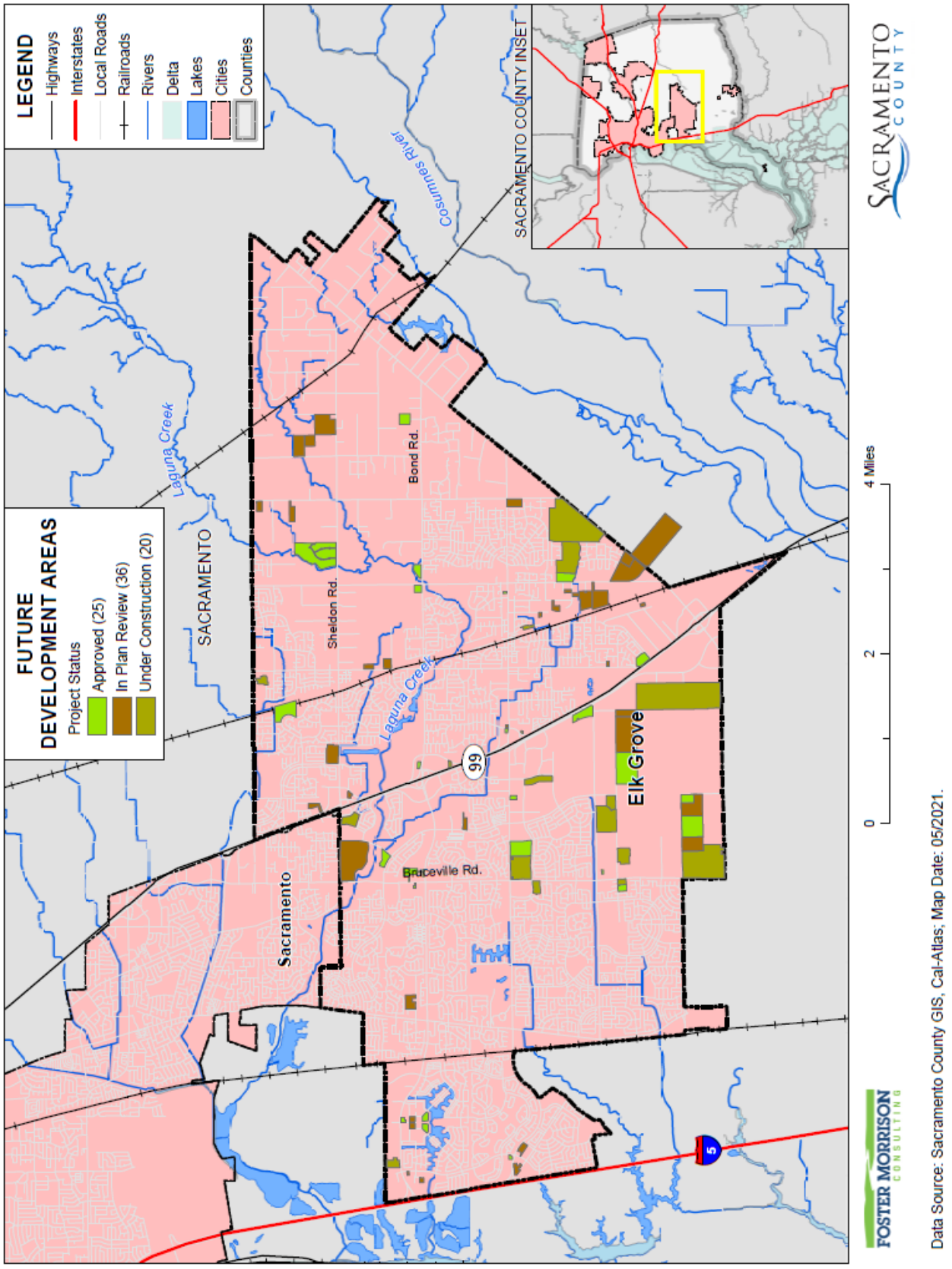


Table B-15 City of Elk Grove – Summary of Future Development Area Parcels and Acres

Future Development Status	Total Parcel Count	Improved Parcel Count	Total Acres
Approved	72	17	373.2
In Plan Review	54	21	675.5
Under Construction	2,064	888	713.5
Grand Total	**2,190**	**926**	**1,762.1**

Source: City of Elk Grove GIS

Table B-16 City of Elk Grove – Detail of Future Development Area Parcels and Acres

Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Approved			
AAA Services Building	1		0.7
Arco AM/PM Car Wash Expansion	1	1	1.2
Bond Road Rezone and Tentative Map	2	2	10.1
Buffalo Wild Wings	1		1.0
Creekside Estates	1		7.0
Crooked Creek Industrial Park	2	1	14.2
Dignity Health Medical Campus	7	1	28.0
Elk Grove Masonic Lodge	1		0.7
GreenSpace Self Storage Facility	1		3.0
Laguna West Plaza Pads 1 & 2	2		1.6
New Faze Skilled Nursing	1		15.1
Poppy Keys Southwest	3		60.2
Quail Run II	1		4.8
Raising Cane's Restaurant	1	1	1.7
Seasons at Stonebrook Master Home Plan	3		79.5
Sheldon Park Estates North Gated Community	28	9	71.9
Shell Gas Station	1		1.0
Shell with 7-Eleven & Storage Facility	4		4.5
Target Exterior Remodel	1	1	10.1
T-Mobile Evergreen Springs	1	1	2.3
T-Mobile Jones Family Park	1		26.7
Toscano Apartments	2		7.9
Trojan Storage II	1		8.9
U-Haul	4		10.2
Vineyard at Madeira Pad E	1		0.7
Approved Total	**72**	**17**	**373.2**

Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
In Plan Review			
10069 Elk Grove Florin Road TPM	1	1	1.1
10075 Sheldon Road Tentative Parcel Map	1	1	35.3
8580 Bradshaw Road	1	0	8.3
8633 Bader Road Map	1	1	20.3
8651 Bader Road TPM and Rezone	1	1	10.0
9730 Kent Street Addition	1	0	1.3
Bartholomew Vineyard Amendment	1	1	10.3
Bow Stockton Apartments	2	1	5.6
Burger King Remodel	1	1	0.7
California Northstate University Medical Center	6	5	5.3
Candlewood Hotel	1	0	1.9
Eden Gardens Banquet Hall	1	1	5.2
Elk Grove Food Bank	1	1	2.0
Elk Grove Independent Senior Housing	2	0	5.2
Elk Grove Muslim Center	2	1	6.9
Grant Line Construction Aggregate Production and Recycling Facility	1	0	24.8
Hotel at Sheldon Place	1	0	2.3
In-N-Out Burger - The Ridge Pad 14	1	0	0.9
Kubota Tractor Corporation	1	1	101.6
Laguna Main Street Apartments	4	0	5.8
Laguna Springs Corporate Center - Building A	1	0	4.9
Life Storage Expansion	1	0	4.6
Mendes Villages 2 & 3	1	0	30.6
Mountain Elk Villas	1	0	12.1
Poppy Keys Southeast	4	0	66.5
S&J Storage	1	0	4.3
Sheldon Farms MHP	2	0	80.9
Sheldon Grove Subdivision	1	0	19.8
Tegan Estates	3	3	11.9
Telos Greens TSM and Rezone	1	0	26.4
Tractor Supply Company	1	0	67.4
Triangle Point TSM Phase 2	1	0	67.4
Warda Warehouse 3	1	0	1.5
Waterman Brinkman Logistics Center	3	1	21.6

Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Wendy's Remodel	1	1	0.8
In Plan Review Total	**54**	**21**	**675.5**
Under Construction			
Bruceville Meadows Residential	253	0	96.5
Bruceville Point	2	1	8.3
Cafeteria Expansion	1	1	9.2
Calvine Pointe	1	0	7.1
Fieldstone North and South	514	234	113.6
Fortune School	2	0	40.0
Madeira South (Poppy Lane)	221	92	35.1
Madeira South Lot A Master House Plans	1	0	10.6
McGeary Ranch	84	3	13.3
Mendes Subdivision	1	0	39.5
Milestone	126	29	45.5
Railroad Street	4	1	3.2
Sheldon Farms North	1		43.8
Sheldon Terrace	204	74	14.3
Sterling Meadows	623	444	172.2
The Gardens at Quail Run	1	0	4.4
The Park Senior Housing	3	0	15.1
The Ridge Shopping Center	20	8	39.6
Towneplace Suites	1	1	1.7
Wienerschnitzel	1	0	0.4
Under Construction Total	**2,064**	**888**	**713.5**
Grand Total	**2,190**	**926**	**1,762.1**

Source: City of Elk Grove GIS

B.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table B-6 as high or medium significance hazards. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow.

Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, populations at risk, critical facilities and infrastructure, and future development.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the City, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. Climate change is already beginning to affect the City's annual average temperature and high temperatures. New record daily high temperatures were set for the weather station nearest to the City, at the Sacramento Executive Airport, for both August (112˚F) and September (109˚F) of 2020. Increases in extreme heat and in annual precipitation are expected to continue.

Vulnerability to and Impacts from Climate Change

The California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the City and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

The 2019 Elk Grove Climate Action Plan (CAP) noted the following impacts to be expected from climate change:

- Increased Rate of Wildfires
  - ✓ Wildfire risk is based on a combination of factors including precipitation, winds, temperature, and vegetation. Wildfires are likely to grow in number and size throughout the State because of increased temperatures induced by climate change. Even under the "medium" warming scenario predicted by IPCC, wildfire risk will likely increase by 55 percent in California. Further, as wildfires increase in frequency and size, they will also increase in intensity.
  - ✓ Wildfire hazards in the mostly urbanized City are low, although they could occur with greater frequency in areas where development has expanded into previously rural areas. Grass fires could occur in portions of the South and East Study Areas that are currently undeveloped.
  - ✓ Although urbanized Elk Grove itself is unlikely to experience increased fire risk directly, wildfires in the Sierra Nevada and areas outside the county affect air quality in the Planning Area. Wildland

fires produce substantial emissions of particulate matter (i.e., smoke, soot), which may cause adverse health effects.

- Negative Impacts on Wildlife
  - ✓ As temperatures rise, species are moving north in California or to higher elevations. This change in migration disrupts the food chain and prevents some plant species from being pollinated. Water and food supplies are expected to be more variable and to shift as the seasons change on different time frames.
  - ✓ Further, those species that are unable to migrate face the danger of extinction: "The amount of future warming expected in California may likely exceed the tolerance of endemic species (i.e., those that are native to a specific location and that only occur there) given their limited distribution and microclimate."
  - ✓ With vegetation, reduction in soil moisture will result in early dieback of many plants, potentially leading to conflicts with animal breeding seasons and other natural processes. Many of the potential effects on wildlife are still being studied, but due to an inability to adapt to new climates, the potential for severe species loss is present.
  - ✓ Several potential hydrological changes associated with global climate change could also specifically influence the ecology of aquatic life in California and have negative effects on cold-water fish. For example, if a rise in air temperature by just a few degrees Celsius occurs, this change could be enough to raise the water temperatures above the tolerance of salmon and trout in many streams, favoring instead non-native fishes such as sunfish and carp. Unsuitable summer temperatures would be particularly problematic for many of the threatened and endangered fish that spend summers in cold-water streams, either as adults or juveniles or both.

- Heat and Deteriorating Public Health
  - ✓ When extreme heat is experienced over a period of five or more days, they are known as heat waves. In the past (1950-2000) in Sacramento County, heat waves occurred at a rate of about one to two per decade. In the next 50 years, Elk Grove would be expected to experience approximately three heat waves per year.
  - ✓ Heat waves are expected to have a major impact on public health, as well as decreasing air quality and increasing mosquito breeding and mosquito-borne diseases. Further, climate change is expected to alter the spread and prevalence of disease vectors, in addition to leading to a possible decrease in food quality and security. Vector control districts throughout the state are already evaluating how they will address the expected changes to the State's climate.
  - ✓ Taking cost-effective measures to reduce GHG emissions and protect public health is important for local governments. The new study provides evidence of what is becoming known as the "climate penalty," where rising temperatures increase ground-level ozone and airborne health-damaging particles, despite the reductions achieved by programs targeting smog-forming emissions from cars, trucks, and industrial sources. Vulnerable populations, such as the elderly and the young, are more likely to be impacted by the effects of climate change, populations which also often lack sufficient resources to adapt to these effects. These vulnerable populations require assistance to respond to the short and long-term impacts of climate change. Additionally, social equity issues related to the unequal distribution of resources and increased costs to address community-wide health risks will need to be addressed proactively to reduce the potential for financial strain on local governments.

- A Decreasing Supply of Fresh Water
  - ✓ The State's water supply is already under stress and is anticipated to shrink under even the most conservative climate change scenario. Warmer average global temperatures cause more rainfall than snowfall, making the winter snowfall season shorter and accelerating the rate at which the snowpack melt in the spring. The Sierra snowpack is estimated to experience a 25 to 40 percent reduction from its historic average by 2050 and 48 to 65 percent by 2100. With rain and snow events becoming less predictable and more variable, the rate of flooding could increase and the State's ability to store and transport fresh water for consumption could decrease. Further, warmer weather will lead to longer and hotter growing seasons and increase water demand for agricultural uses.
  - ✓ The City is supplied by a mix of surface water, groundwater, and recycled water. Much of this water ultimately originates as snowmelt from the Sierra Nevada and reaches Elk Grove through the State Water Project and the Central Valley Project. With these supplies declining, water shortages for all uses in the planning area may be affected.

- Increased Severity and Frequency of Flood Events
  - ✓ Climate change forecasts indicate more intense rainfall events, generating more frequent or extensive runoff, and flooding. Localized flood events may increase in periods of heavy rain due to increased precipitation rates. As explained by the Climate Adaptation Strategy, the State's water system is structured and operated to balance between water storage for dry months and flood protection during rainy seasons. Although climate change is likely to lead to a drier climate overall, risks from regular, more intense rainfall events can generate more frequent and/or more severe flooding that upsets this managed balance between storage and protection. Several areas in the City have been determined by the Federal Emergency Management Agency (FEMA) and California Department of Water Resources (DWR) to fall within 500-, 200-, and 100-year floodplains. The City is within the larger Sacramento-San Joaquin Delta, and flooding in the Delta will be dependent on the resilience of the existing levee system, which is undergoing deterioration due to several stressors beyond land subsidence. Areas within the floodplains will likely be more vulnerable to the heightened flooding threats that are anticipated to result from climate change. Areas within the City that are at increased risk of flooding should remain a high priority for flood risk planning and efforts to address the local impacts of climate change.

Future Development

The City could see population fluctuations as a result of climate impacts relative to those experienced in other regions, and these fluctuations are expected to impact demand for housing and other development. As with the Sacramento region, extreme heat and flooding are the two main climate change related concerns for the area, in addition to smoke from wildfires. The Community Mobility Resilience Plan, adopted by the City in February 2021, includes strategies such as climate-smart green infrastructure and climate-smart building codes to mitigate these impacts.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The City would be affected for as long as the flood waters from the dam failure took to drain downstream.

Geographic flood extent from the DWR DSOD and Cal OES dam inundation areas are shown on Figure B-8 and Figure B-9. The City also falls in the Folsom Dam 235,000 cfs scenario, as discussed in Section 4.3.7 of the Base Plan as shown in Figure B-10. Geographical extents for these are shown in Table B-17. Based on available data, the City falls within the inundation areas of Calero and Folsom dams, as well as the Folsom Dam 235,000 cfs Scenario.

Note, the Cal OES and DSOD dam inundation data did not include inundation mapping of all dams that could affect the Sacramento County Planning Area and the City; thus, the below analysis reflects information based on available data. Other dams may be identified as a concern to the City. This includes Sly Park Dam (which stores water diverted from the North Fork Cosumnes River at Jenkinson Lake) which has the potential to cause flooding in the Planning Area, specifically in the northwestern and southeastern portions, in the event of dam failure.

Figure B-8 City of Elk Grove – Dam Inundation Areas for Dams Inside County

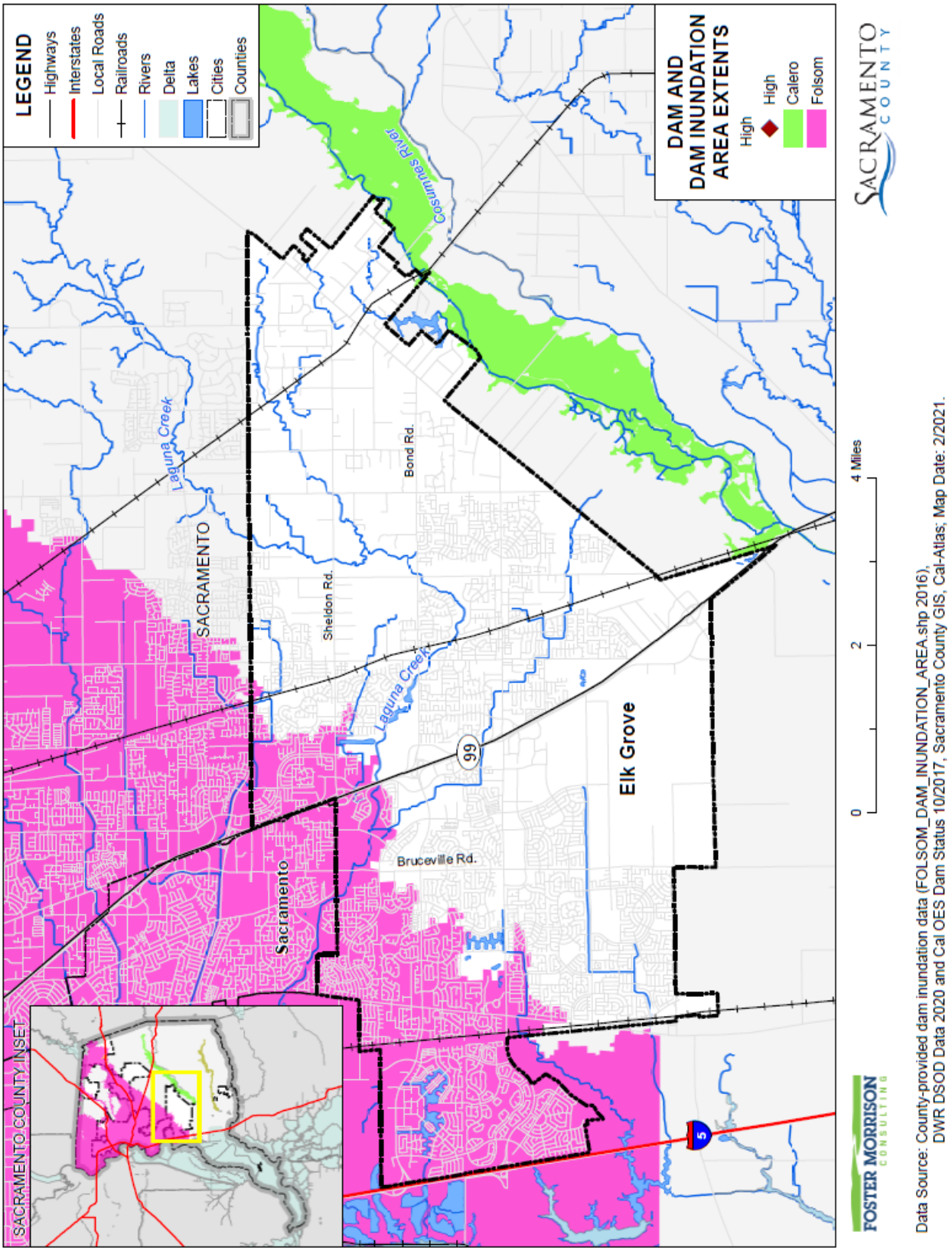


Figure B-9 City of Elk Grove – Dam Inundation Areas from Dams Outside County

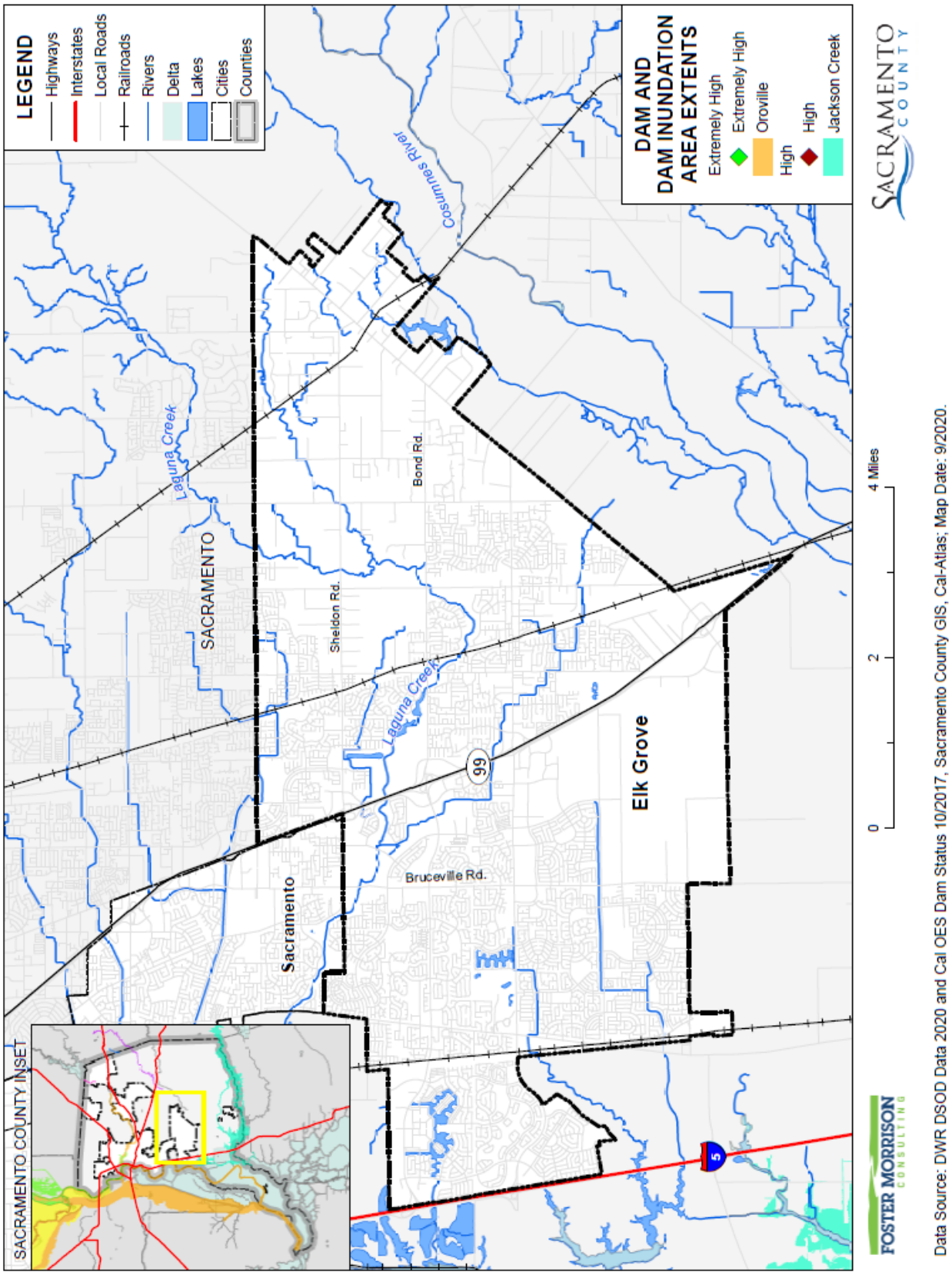


Figure B-10 City of Elk Grove – Dam Inundation from Folsom Dam 235,000 cfs Scenario

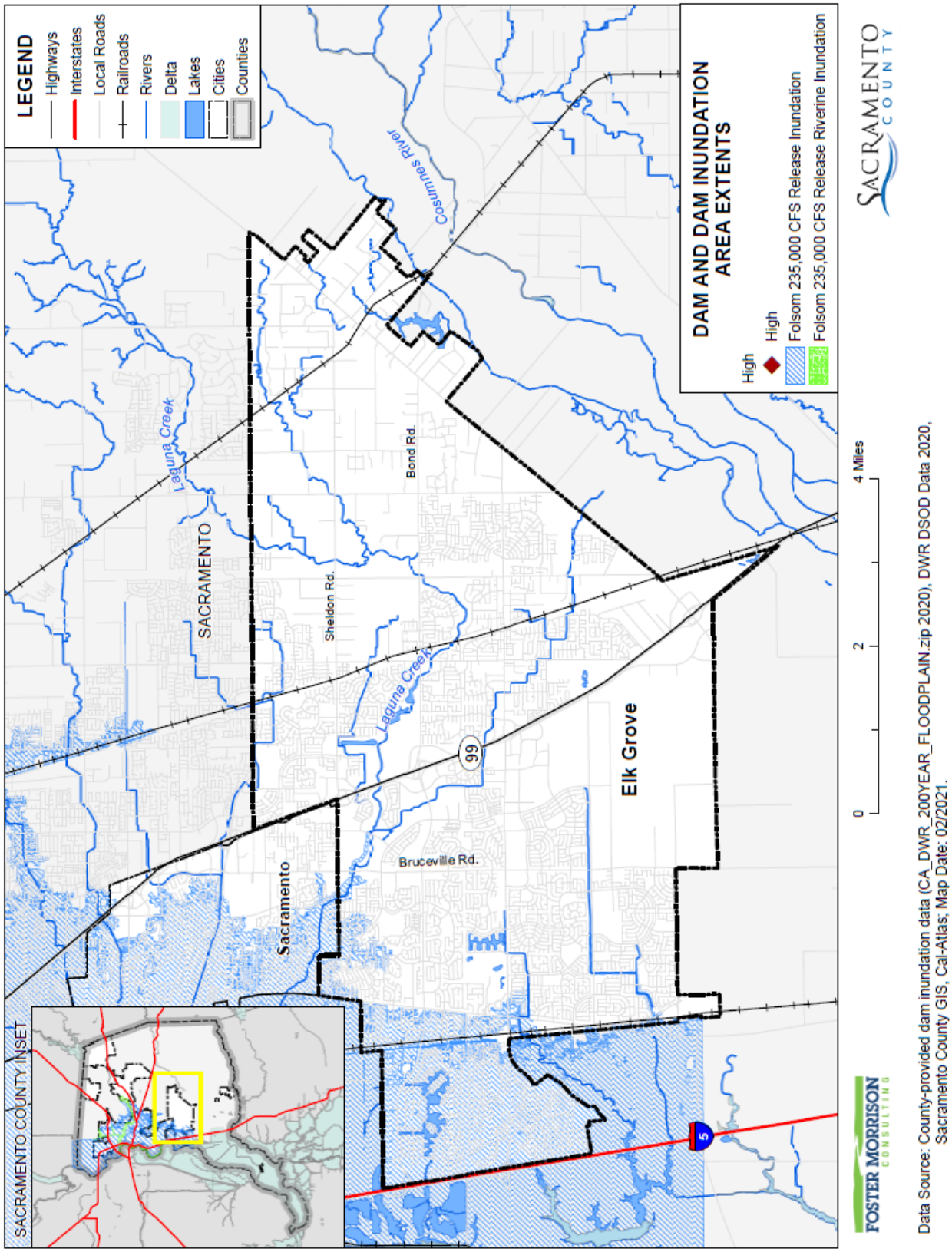


Table B-17 City of Elk Grove – Geographical Dam Inundation Extents

Dam Inundation Area	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Calero	20.11	0.08%	18.89	0.10%	1.22	0.02%
Folsom	6,834.83	25.74%	5,297.04	27.89%	1,537.79	20.34%
Folsom 235,000 cfs Scenario	3,726.59	14.03%	2,923.81	15.39%	802.78	10.62%

Source: Cal OES, DSOD

Past Occurrences

There has been no state or federal disaster declarations for dam failure in the County. The City noted no other dam failure occurrences that have affected the City.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. The City of Elk Grove General Plan Environmental Impact Report noted that although they are not located in the City Planning Area, Folsom Dam (South Fork American River) and Sly Park Dam (which stores water diverted from the North Fork Cosumnes River at Jenkinson Lake) have the potential to cause flooding in the Planning Area, specifically in the northwestern and southeastern portions, in the event of dam failure.

Mass evacuation of the inundation area may be essential to save lives if warning time should permit. Extensive search and rescue operations may be required to assist trapped or injured persons. Emergency medical care, food, and temporary shelter would be required for injured or displaced persons. Identification and burial of many dead persons would pose difficult problems; public health would be a major concern. Many families would be separated, particularly if the failure should occur during working hours, and a personal inquiry or locator system would be essential. These and other emergency operations could be seriously hampered by the loss of communications, damage to transportation routes, and the disruption of public utilities and other essential services.

Governmental assistance could be required and may continue for an extended period. These efforts would be required to remove debris and clear roadways, demolish unsafe structures, assist in re-establishing public services and utilities, and provide continuing care and welfare for the affected population including, as required, temporary housing for displaced persons.

Impacts to the City from a dam failure flood also include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses could also be significant.

Assets at Risk

Based on the vulnerability of Elk Grove to the dam failure hazard, the sections that follow describes significant assets at risk in the City of Elk Grove. This section includes the values at risk, inundated acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Elk Grove. The methodology described in Section 4.3.9 of the Base Plan was followed in determining structures and values at risk to dam failure. Table B-18 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in dam inundation areas in the City.

Table B-18 City of Elk Grove – Count and Values of Parcels at Risk by Dam Inundation Area and Property Use

Dam Inundation Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Calero Dam – High Hazard Dam Inside the County						
Public / Utilities	2	0	$0	$0	$0	$0
Residential	13	13	$2,645,281	$5,415,691	$2,707,844	$10,768,819
Vacant	1	0	$224,176	$0	$0	$224,176
Elk Grove Total	**16**	**13**	**$2,869,457**	**$5,415,691**	**$2,707,844**	**$10,992,995**
Folsom Dam– High Hazard Dam Inside the County						
Care / Health	9	8	$12,434,157	$82,370,114	$82,370,114	$177,174,385
Church / Welfare	13	12	$8,567,571	$43,063,886	$43,063,886	$94,695,343
Industrial	26	23	$25,768,374	$107,568,427	$161,352,639	$294,689,440
Miscellaneous	577	0	$203,895	$0	$0	$203,895
Office	86	76	$20,753,116	$113,186,570	$113,186,570	$247,126,256
Public / Utilities	20	0	$20	$0	$0	$20
Recreational	4	4	$4,162,053	$21,101,563	$21,101,563	$46,365,179
Residential	17,099	16,961	$1,623,858,907	$4,625,937,466	$2,312,968,777	$8,562,765,034
Retail / Commercial	90	85	$67,973,067	$178,671,359	$178,671,359	$425,315,785
Vacant	217	3	$43,907,440	$759,939	$0	$44,667,379
Elk Grove Total	**18,141**	**17,172**	**$1,807,628,600**	**$5,172,659,324**	**$2,912,714,908**	**$9,893,002,716**
Folsom Dam 235,000 Scenario – High Hazard Dam Inside the County						
Care / Health	4	4	$2,144,377	$5,510,457	$5,510,457	$13,165,291

Dam Inundation Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Church / Welfare	7	6	$5,760,071	$26,586,168	$26,586,168	$58,932,407
Industrial	17	14	$21,689,632	$92,610,251	$138,915,376	$253,215,258
Miscellaneous	343	0	$34,244	$0	$0	$34,244
Office	76	67	$16,928,508	$103,827,371	$103,827,371	$224,583,250
Public / Utilities	12	0	$0	$0	$0	$0
Recreational	4	4	$4,162,053	$21,101,563	$21,101,563	$46,365,179
Residential	9,224	9,125	$955,938,275	$2,799,519,623	$1,399,759,850	$5,155,217,662
Retail / Commercial	60	57	$38,983,036	$102,430,403	$102,430,403	$243,843,842
Vacant	67	0	$30,695,841	$0	$0	$30,695,841
Elk Grove Total	**9,814**	**9,277**	**$1,076,336,037**	**$3,151,585,836**	**$1,798,131,188**	**$6,026,052,974**

Source: CAL OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data

Population at Risk

The DSOD and Cal OES dam inundation areas were overlayed on the parcel layer. Those residential parcel centroids that intersect the dam inundation areas were counted and multiplied by the Census Bureau average household factors for Elk Grove – 3.20. This is shown in Table B-31.

Table B-19 City of Elk Grove – Count of Improved Residential Parcels and Population by Dam Inundation Area

Jurisdiction	Calero Dam Inundation Area		Folsom Dam Inundation Area		Folsom Dam 235,000 cfs Inundation Area	
	Improved Residential Parcels	Population	Improved Residential Parcels	Population	Improved Residential Parcels	Population
Elk Grove	13	42	16,961	54,275	9,125	29,200

Source: Cal OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Elk Grove in identified dam inundation areas. GIS was used to determine whether the critical facility locations intersect a DSOD or Cal OES dam inundation area. Details of critical facilities in mapped dam inundation areas in the City of Elk Groves are shown in Figure B-11 and detailed in Table B-20. Details of critical facility definition, type, name and address and jurisdiction by dam inundation area are listed in Appendix F.

Figure B-11 City of Elk Grove – Critical Facilities in Dam Inundation Areas from Dams Inside County

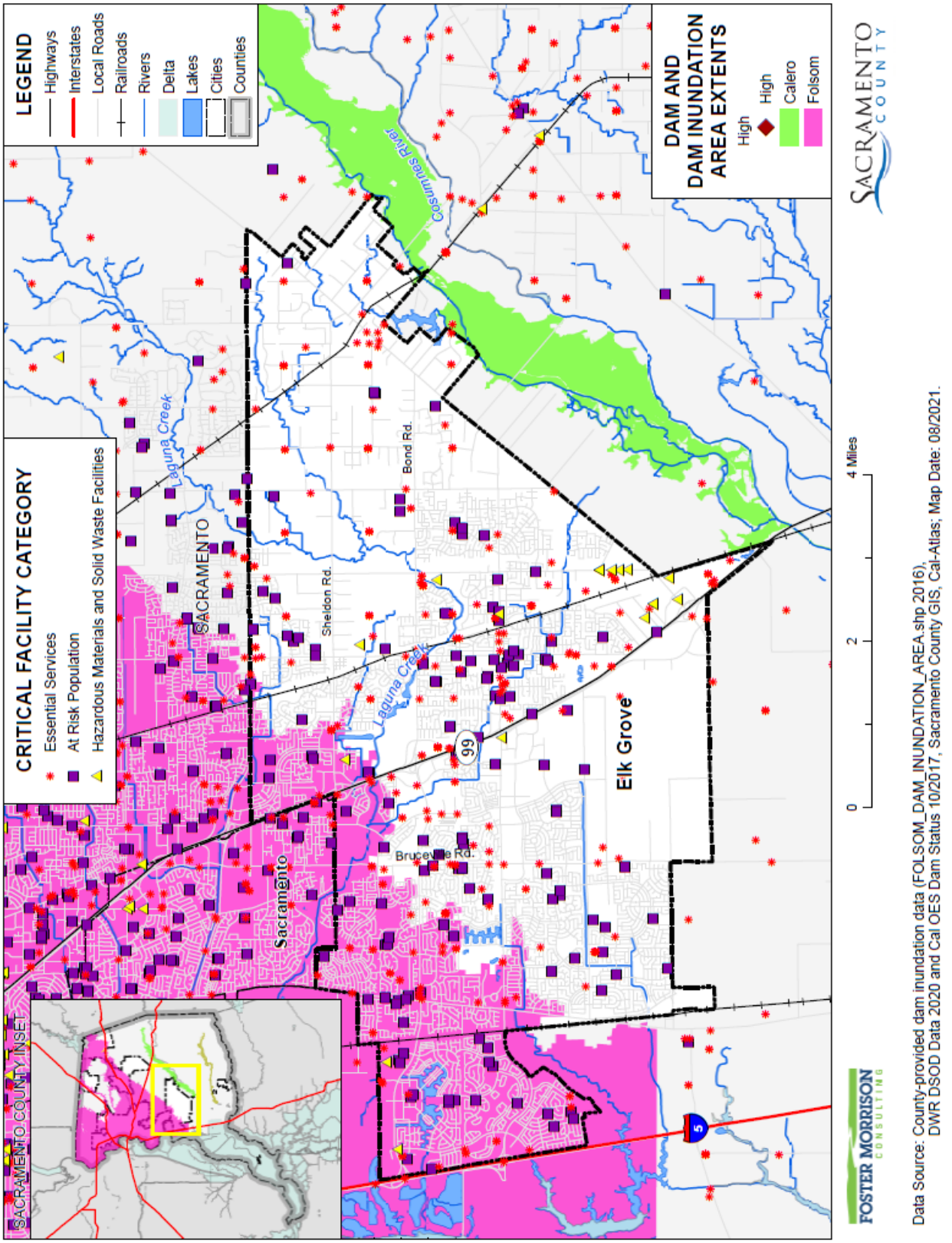


Figure B-12 City of Elk Grove – Critical Facilities in Folsom 235,000 cfs Scenario Dam Inundation Areas

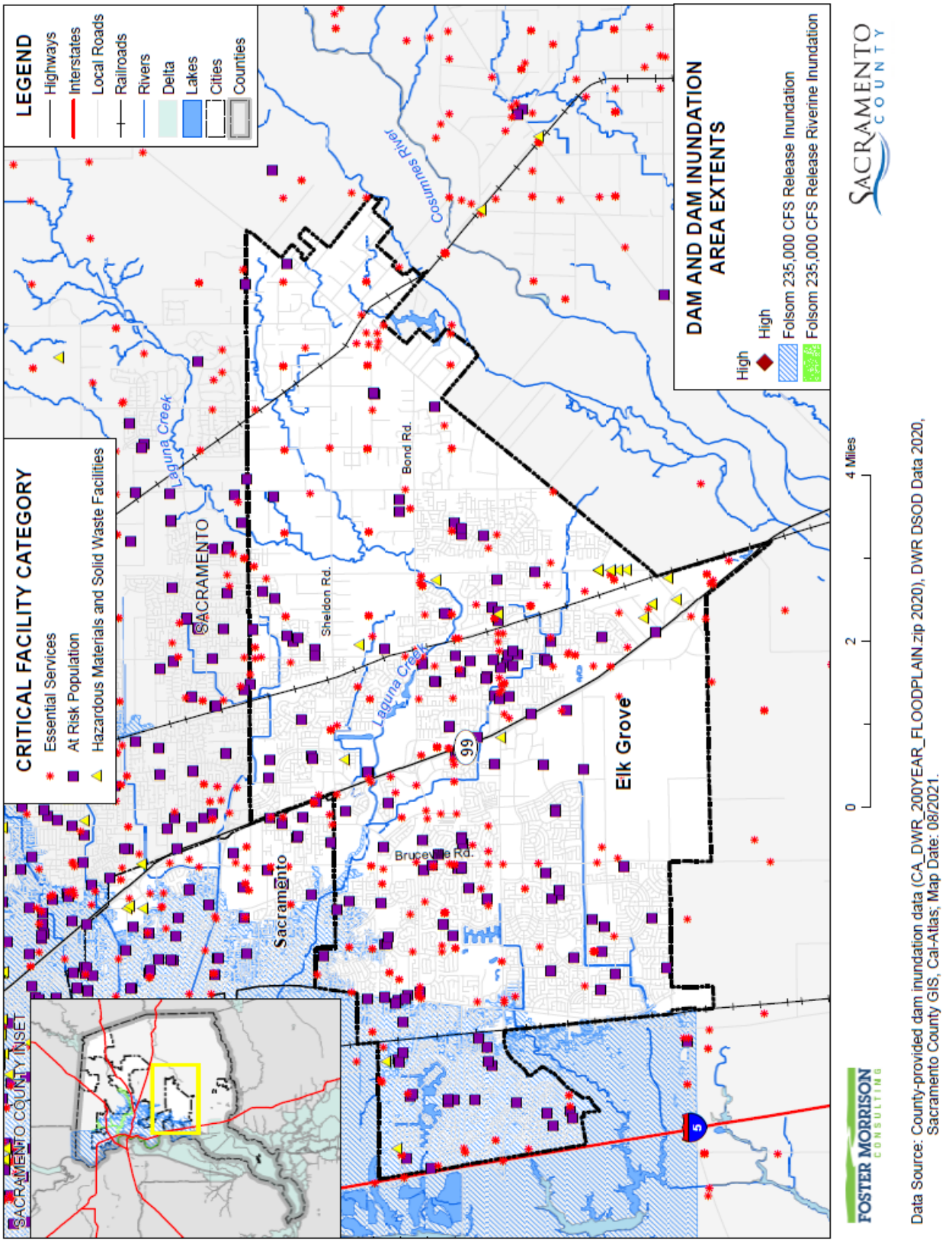


Table B-20 City of Elk Grove – Critical Facilities in Dam Inundation Areas by Category and Type

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
Folsom Dam (High Hazard Dam Inside the County)		
Essential Services Facilities	Emergency Evacuation Center	3
	EMS Stations	3
	FDIC Insured Banks	6
	Fire Station	2
	Microwave Service Towers	33
	Water Well	22
	Total	**69**
At Risk Population Facilities	Day Care Center	14
	Places of Worship	27
	School	11
	Total	**52**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	1
	Leaky Underground Storage Tank	1
	Solid Waste Facility	1
	Total	**3**
Folsom Dam Total		**124**
Folsom Dam 235,000 cfs Scenario		
Essential Services Facilities	Emergency Evacuation Center	2
	EMS Stations	1
	FDIC Insured Banks	2
	Fire Station	1
	Microwave Service Towers	14
	Water Well	8
	Total	**28**
At Risk Population Facilities	Day Care Center	6
	Places of Worship	15
	School	4
	Total	**25**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	1
	Leaky Underground Storage Tank	1
	Total	**2**
Folsom Dam 235,000 cfs Total		**124**

Source: Cal OES, DSOD, Sacramento County GIS

Future Development

Future dam failures are considered unlikely. However, given the high number of affected parcels, future development in the City could be affected by dam failures and associated flooding. The City enforces it floodplain ordinance, which helps to reduce risk to flooding by requiring structures in the 1% annual chance floodplains to be above the base flood elevation, which depending on inundation depths and affected areas may provide some relief. Siting of future development areas will take dam failure flooding into account.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure B-13 shows the locations of future development areas the City is planning to develop on the dam inundation zones from dams inside the County. Table B-21 shows the parcels and acreages of each future development area in the City in the dam inundation areas inside the County. Figure B-14 shows the locations of future development areas the City is planning to develop on Folsom Dam 235,000 cfs scenario inundation zones. Table B-22 shows the parcels and acreages of each future development area in the City in the Folsom 235,000 cfs release inundation area.

Figure B-13 City of Elk Grove – Dam Inundation Areas from Dams Inside the County and Future Development Areas

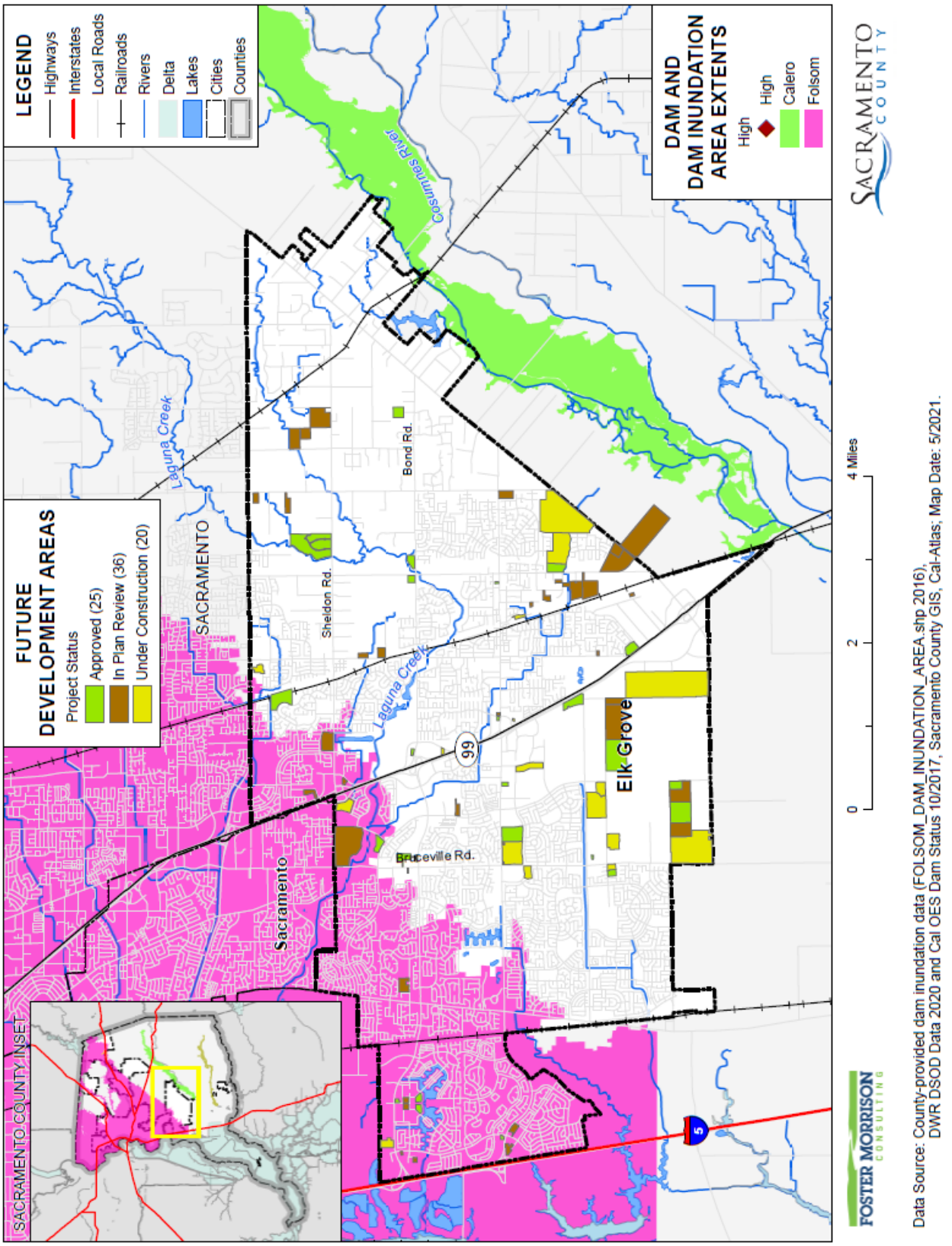


Table B-21 City of Elk Grove – Dam Inundation Areas from Dams Inside the County and Future Development Areas

Dam Inundation Areas / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Folsom			
Approved			
Arco AM/PM Car Wash Expansion	1	1	1.2
Laguna West Plaza Pads 1 & 2	2	0	1.6
Toscano Apartments	2	0	7.9
Trojan Storage II	1	0	8.9
Approved Total	**6**	**1**	**19.5**
In Plan Review			
Bow Stockton Apartments	2	1	5.6
California Northstate University Medical Center	6	5	5.3
Candlewood Hotel	1	0	1.9
Elk Grove Independent Senior Housing	2	0	5.2
Hotel at Sheldon Place	1	0	2.3
Laguna Main Street Apartments	4	0	5.8
Sheldon Farms MHP	2	0	80.9
Sheldon Grove Subdivision	1	0	19.8
Tegan Estates	3	3	11.9
Wendy's Remodel	1	1	0.8
In Plan Review Total	**23**	**10**	**139.3**
Under Construction			
Cafeteria Expansion	1	1	9.2
Sheldon Farms North	1	0	43.8
Sheldon Terrace	204	74	14.3
Under Construction Total	**206**	**75**	**67.3**
Grand Total	**235**	**86**	**226.1**

Source: City of Elk Grove GIS, Cal OES, DSOD

Figure B-14 City of Elk Grove – Folsom Dam 235,000 cfs Scenario and Future Development Areas

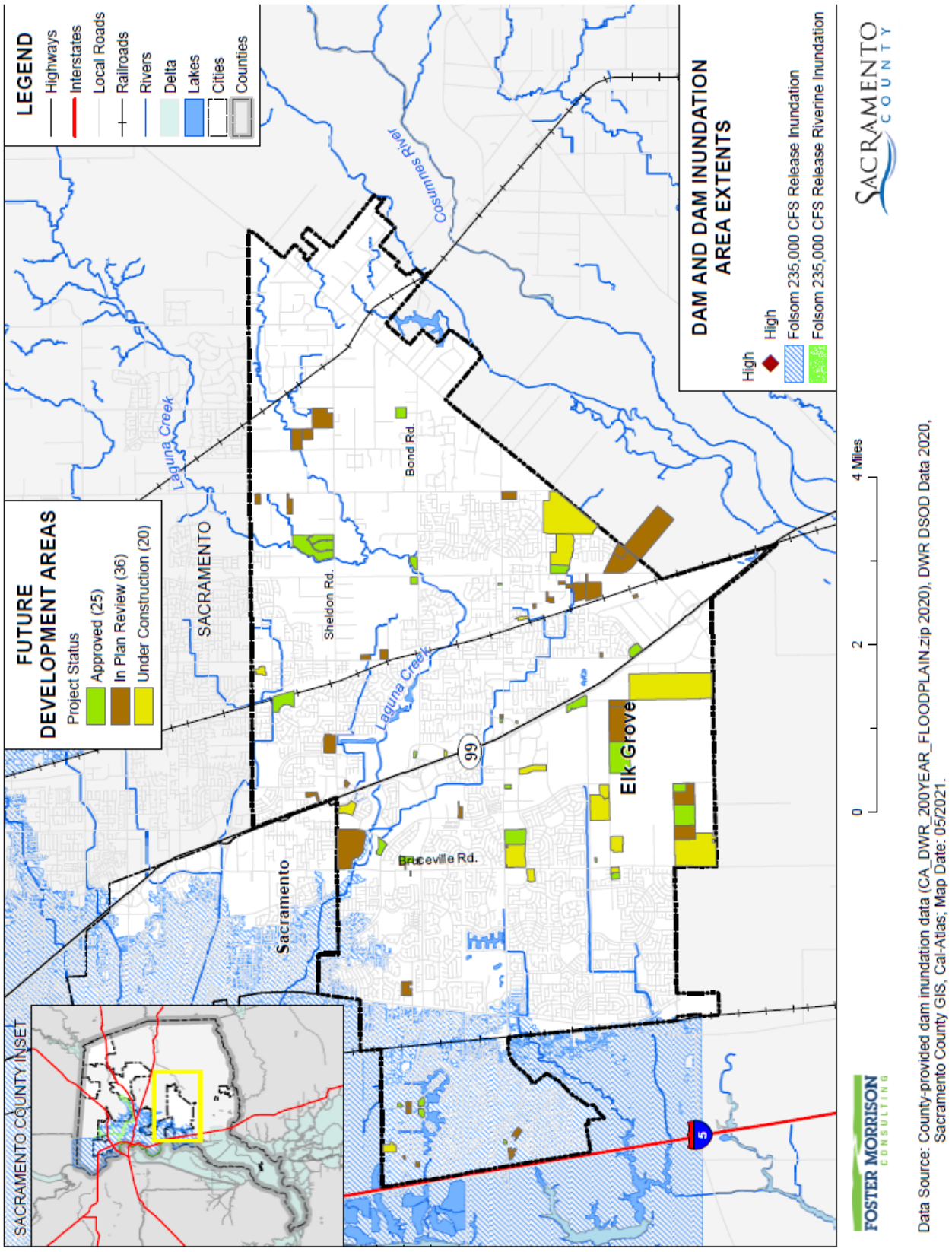


Table B-22 City of Elk Grove – Dam Inundation Areas from Folsom Dam 235,000 cfs Release and Future Development Areas

Dam Inundation Areas / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Folsom 235,000 cfs Release			
Approved			
Arco AM/PM Car Wash Expansion	1	1	1.2
Laguna West Plaza Pads 1 & 2	2	0	1.6
Toscano Apartments	2	0	7.9
Approved Total	**6**	**1**	**10.7**
In Plan Review			
California Northstate University Medical Center	6	5	5.3
Candlewood Hotel	1	0	1.9
Elk Grove Independent Senior Housing	2	0	5.2
Laguna Main Street Apartments	4	0	5.8
Wendy's Remodel	1	1	0.8
In Plan Review Total	**14**	**6**	**18.9**
Under Construction			
Cafeteria Expansion	1	1	9.2
Under Construction Total	**1**	**1**	**9.2**
Grand Total	**20**	**8**	**38.7**

Source: City of Elk Grove GIS, Cal OES, DSOD

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the City, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the City and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There have been two state and one federal disaster declaration from drought. This can be seen in Table B-23.

Table B-23 Sacramento County – State and Federal Drought Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the City are the same as those for the County and includes 4 multi-year droughts since 1950. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

The City had moderate issues during the 2014-2016 drought. Quality of life was impacted due to severe cutbacks in irrigation, leaving many private landscape areas as browned out. The parks district limited watering to only certain facilities, leaving many neighborhood parks without irrigation. In addition, water was limited for construction-related use, such as fugitive dust mitigation.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the City, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users.

Water for the City comes from the south American sub basin, as well as surface water from the Sacramento River. The Elk Grove Water District gets water from the aquifer and wholesale from the Sacramento County Water Agency (SCWA). SCWA gets its water from a number of sources, including a network of wells in Elk Grove and around the south county area, in addition to using surface water through conjunctive use.

Water resources are essential assets to communities and a shared economic responsibility of business and industry, farms and factories, individuals and communities. Water resource management is an urgent and growing need. Without water, neither small businesses nor major global industries can function. Nor can family farms, major agribusinesses, energy production facilities, computer manufacturers, or steel companies. Similarly, poor water quality, or limited or unreliable access to water means higher costs for all businesses – and all consumers. Water scarcity means greater risks for a community's long-term viability and a negative impact on their competitiveness. It also means that a community's ability to grow and create jobs is at risk.

The vulnerability of the City to drought is City-wide, but impacts may vary and include reduction in water supply and an increase in dry fuels. The potential for a reduction in water supply during drought conditions generally leads to both mandated and voluntary conservations measures during extended droughts. During these times, the costs of water can also increase. The increased dry fuels and fuel loads associated with drought conditions can also result in an increased fire danger. In areas of extremely dry fuels, the intensity and speed of fires can be significant. Water supply and flows for fire suppression can also be an issue during extended droughts.

Other qualitative impacts associated with drought in the City and Sacramento County Planning Area are those related to water intensive activities such as, municipal usage, commerce, tourism, recreation and agricultural use. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

With more precipitation likely falling as rain instead of snow in the Sierra's, and warmer temperatures causing decreased snowfall to melt faster and earlier, water supply is likely to become more unreliable. In addition, drought and water shortage is predicted to become more common. This means less water available for use over the long run, and additional challenges for water supply reliability, especially during periods of extended drought.

Future Development

As the population in the area continues to grow, so will the demand for water. Water shortages in the future may be worsened by drought, as the City relies on surface water and groundwater for its water source. Increased planning including conjunctive use will be needed to account for population growth and increased water demands.

Earthquake

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

Since earthquakes are regional events, the whole of the City is at risk to earthquake. Elk Grove and the surrounding area are at limited risk from significant seismic and geologic hazards. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The City is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the City fall within a low to moderate shake risk.

Past Occurrences

The City noted no past occurrences of earthquakes or that affected the City in any meaningful way.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured housing is very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. The City has a few URM buildings in the Old Town area, and no soft story buildings.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The City of Elk Grove is within the less hazardous Zone 3.

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable. Impacts from an earthquake in the City will vary depending on the fault that the earthquake occurs on, the distance to the epicenter, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life. A variety of industrial uses are located in the City of Elk Grove, primarily in the southern portion of Elk Grove and in the Laguna West area west of the City. Many of these industrial facilities use and/or store chemicals and other materials that could result in damage both on- and off-site in the event of seismic event.

Earthquake Analysis

Due to the regional effects of an earthquake, a Hazus earthquake analysis was performed on a countywide basis. This can be found in Section 4.3.11 of the Base Plan. While these runs were not done specific to the City, maps showing damage in the County show greater areas of damage near the cities in the County.

Future Development

Although new growth and development corridors would fall in the area affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in areas prone to earthquakes will continue to occur. The City enforces the state building code, which mandates construction

techniques that minimize seismic hazards. Future development in the City is subject to these building codes.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the City, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the City of Elk Grove. Historically, the City has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the City of Elk Grove have been subject to historical flooding. Elk Grove is traversed by several stream systems and is at risk to the 1% and 0.2% flood.

Location and Extent

Location and extent of flooding for the City is discussed using three sources:

- FEMA 11/2/201/ DFIRM
- CA DWR 200-Year Flood Study
- Local Drainage and Flood Control

FEMA DFIRM Extents

The City of Elk Grove has areas located in the 1% and 0.2% annual chance flood zones. This is seen in Figure B-15. According to the 2019 City of Elk Grove General Plan, the areas most susceptible to flooding are in the eastern portion of Elk Grove where major drainage facilities have not been built and stormwater flows either in natural channels or in small ditches where capacity is frequently exceeded. Another area susceptible to flooding is the Sheldon area, where local flooding is widespread but generally minor; the flat land causes floodwaters to spread out, reducing threats to life and property. Finally, along the eastern and southern edges of the City, the Cosumnes River (and Deer Creek tributary) represents a major flood hazard. The Cosumnes River is the last river in California that remains undammed along its entire length, so flooding caused by this river can be extensive. In the City, 1% annual chance flood zones include areas along Laguna Creek in the northwest and north-central portion of the City, and along the Cosumnes River to the southeast, primarily outside of City limits. Flood risk is intensified in the lower stream reaches by the likelihood of coincident high tides and strong offshore winds during heavy rainfall.

Figure B-15 City of Elk Grove – FEMA DFIRM Flood Zones

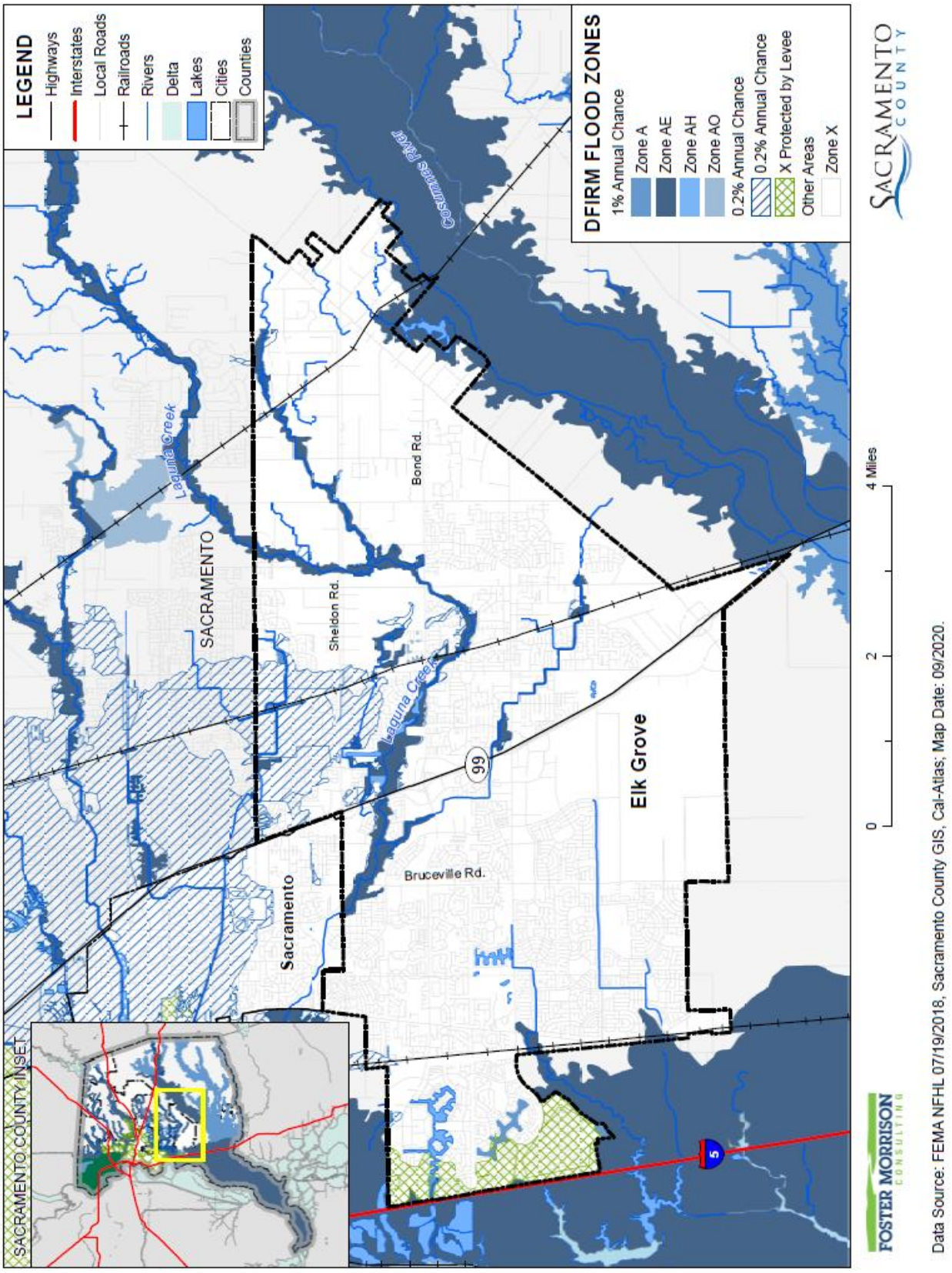


Table B-24 details the DFIRM mapped flood zones located within the City.

Table B-24 City of Insert– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in City
A	1% annual chance flooding: No base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AE	1% annual chance flooding: Base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X*
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood. Flood insurance is not mandatory but is available.	X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	X
X (unshaded)	No flood hazard	X

Source: FEMA

* Some of these parcels were actually removed from the SFHA by a Letter of Map Revision from FEMA (the FEMA maps still show the areas in the SFHA since the maps have not been updated.

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the City vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the City tends to have a shorter speed of onset, due to the amount of water that flows through the City.

Geographical flood extents for the City from the FEMA DFIRMs are shown in Table B-25.

Table B-25 City of Elk Grove – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance	1,266	0.20%	477	0.13%	789	0.28%
0.2% Annual Chance	3,176	0.49%	2,607	0.72%	569	0.20%
Other Areas	22,114	3.43%	15,912	4.41%	6,202	2.19%
Total	**26,556**	**4.12%**	**18,996**	**5.26%**	**7,560**	**2.67%**

Source: FEMA DFIRM 11/2/2018

CA DWR 200-Year Flood Study

The limits of the 200-year floodplain for the City of Elk Grove are shown in Figure B-16. This map identifies areas where higher standards of development and flood protection may be required prior to the issuance of building permits. Figure B-16 was developed using data provided by DWR, supplemented by floodplain studies commissioned by the City, covering local creek systems that have watershed areas of at least 10 square miles. These areas include the Laguna Creek and Deer Creek/Cosumnes River watersheds, as well as the Sacramento River watershed, which affects local creek systems.

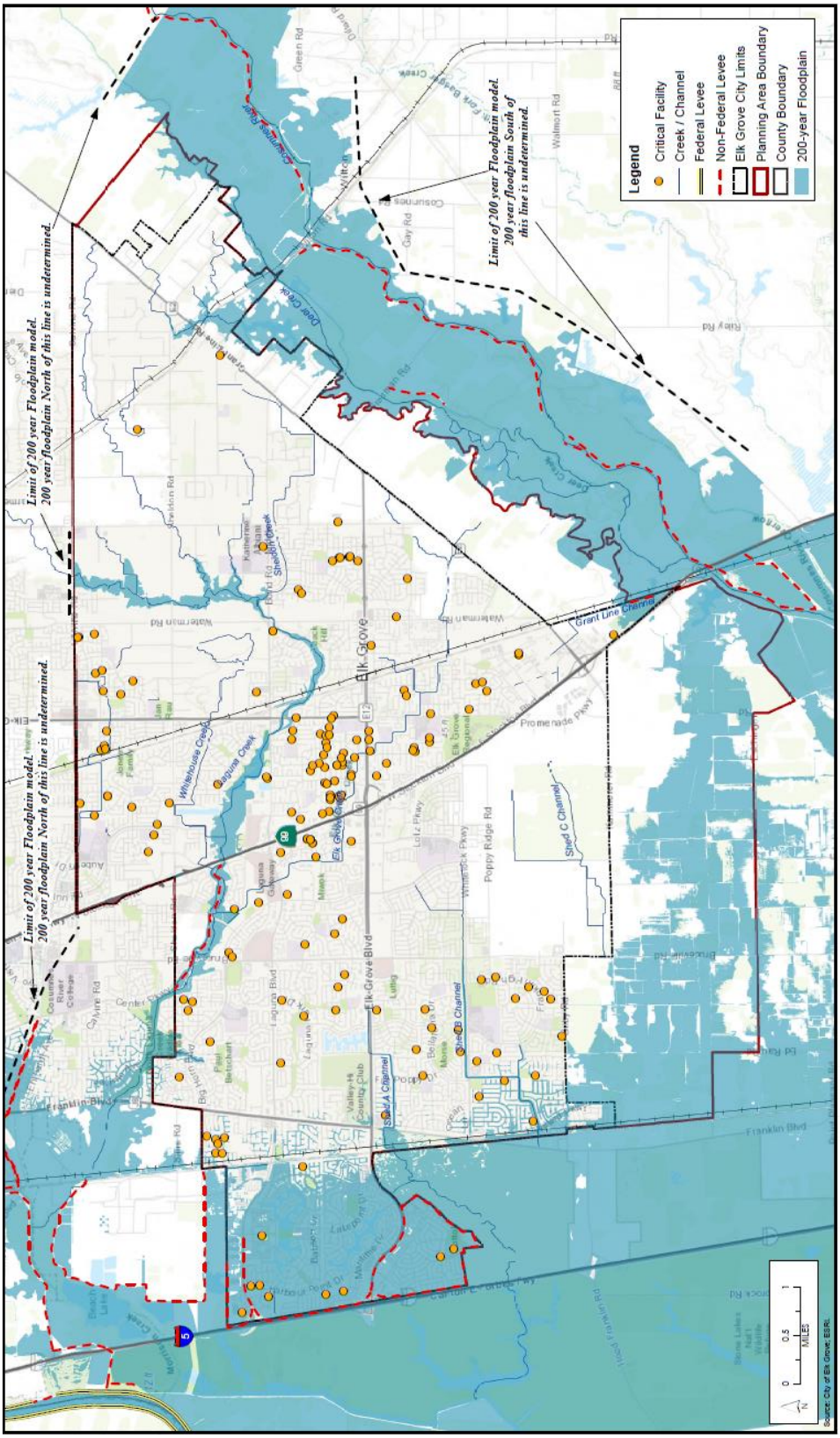
The City commissioned hydrologic modeling to supplement the DWR 200-year floodplain mapping of Laguna Creek to account for levee improvements completed or in process that were not included in the DWR mapping. The Sacramento Area Flood Control Agency (SAFCA) is in the process of implementing a levee improvement project to provide 200-year flood protection for the Sacramento River, and the US Army Corps of Engineers has completed improvements to the Folsom Dam spillway on the American River. These projects were not accounted for in the DWR mapping. Because of these improvements, the City's supplemental 200-year floodplain calculations use a scenario in which the levees and dams along the Sacramento and American Rivers do not fail.

The City's supplemental mapping also differs from DWR 200-year floodplain mapping by adding 200-year water surface elevations along Deer Creek. The DWR mapping did not assess Deer Creek since no State flood improvement projects are located in this watershed. Levees in this area have not been certified to provide 100-year protection and have failed in the past during large storm events. Therefore, modeling for this area considers the possibility of extensive levee failure, especially along the north bank of the Cosumnes River.

The area potentially affected by a 200-year flood event in the City is located along Deer Creek and the Cosumnes River. Much of this land is preserved for agricultural use and would be at limited risk of damage from flood hazard zones. However, a 200-year flood event caused by levee breaks along the Sacramento River could result in flooding in small portions of Laguna West, an existing residential neighborhood on the western side of the City. If, in the future, the City were to consider expanding beyond its existing Planning Area north or south along I-5, development in these areas would also be at risk in a 200-year flood event.

The City recognizes that flood risk conditions can change over time through natural processes or project improvements on the local or regional scale. Therefore, the 200-year flood map is considered the base case for establishing potential flood risk. The City will keep updated data on the 200-year floodplain through an annual review, accounting for the results of new technical studies and changes in flood protection infrastructure. This updated information will be referenced during the development review process for areas on the base case 200-year flood map, as shown in Figure B-16.

Figure B-16 City of Elk Grove – 0.5% (200-Year) Floodplain



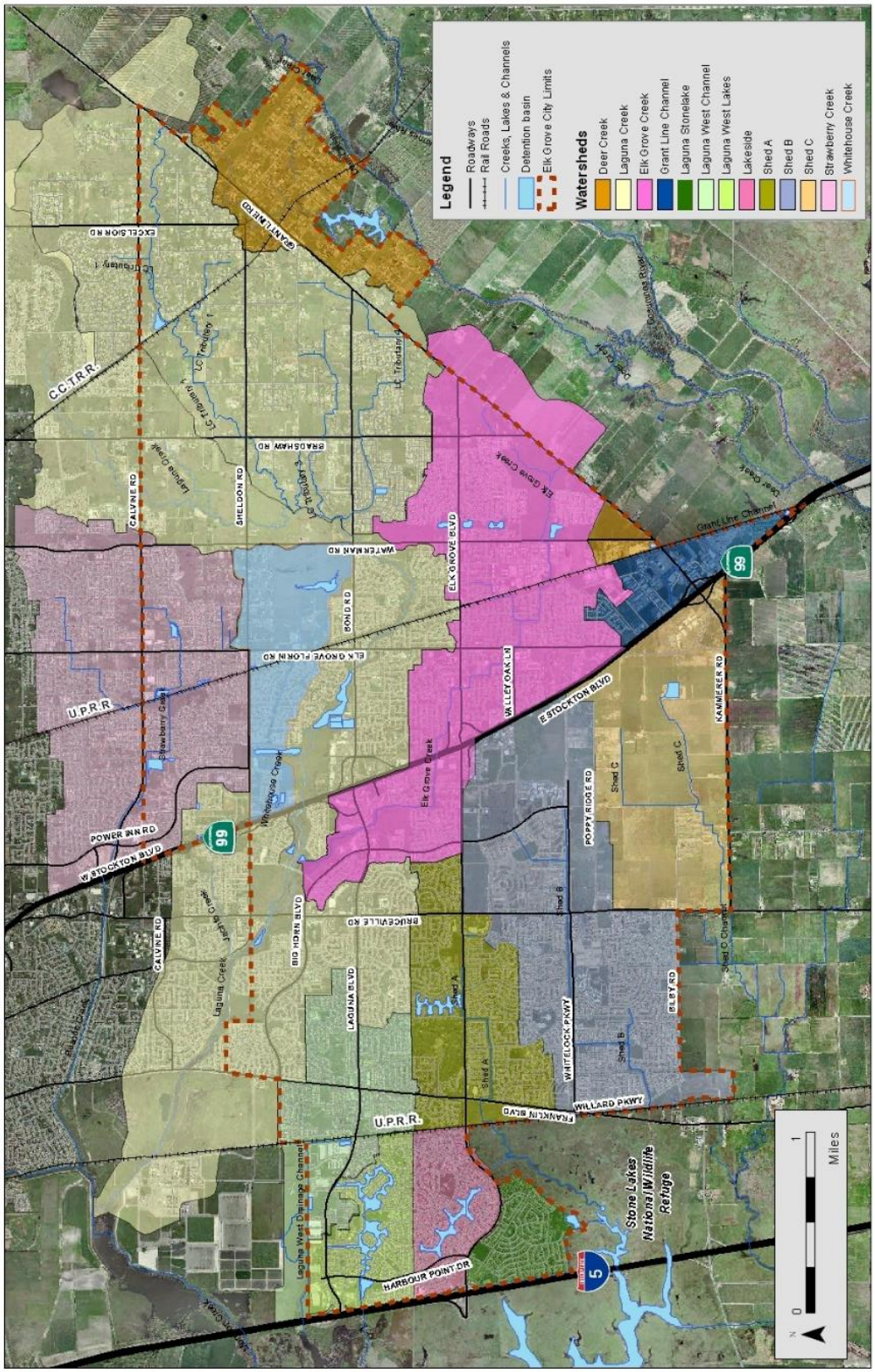
Source: City of Elk Grove General Plan 2018 Environmental Impact Report

Local Drainage and Flood Control

The City inherited a traditional storm drainage and flood control system from Sacramento County upon incorporation in 2000 and this storm drainage collection and conveyance system, which consists of channels, creeks, ditches, pipes, streets and detention basins provides the City with a dependable means of minimizing the opportunities of flooding which can cause damage to the City's residents and infrastructure. The City's storm drainage and flood control system is continually undergoing expansion to accommodate new development flows as well as making improvements to the existing infrastructure in order to encourage nonstructural environmentally friendly storm drainage and flood control practices.

The drainage within the City is conveyed through a storm drainage and flood control system consisting of about 400 miles of underground pipes; and 60 miles of natural and constructed channels. The City drains within thirteen watersheds as delineated in Figure B-17. Within the watersheds there are ten major natural creeks or open channels (Figure B-17) that convey runoff within the City including Elk Grove Creek, Laguna Creek, Strawberry Creek, Whitehouse Creek, Deer Creek, Ehrhardt Channel, Franklin Creek, Shed C Channel, Grant Line Channel, and the Laguna West Channel. Four of the creeks, Elk Grove Creek, Laguna Creek, Strawberry Creek, and Deer Creek convey runoff that originates outside the City limits. All of the watersheds and channels located within the City, ultimately drain into the Stone Lakes National Wildlife Refuge floodplain with the exception of the Deer Creek and Grant Line Channel watersheds, which drain to Deer Creek and ultimately to the Cosumnes and Mokelumne Rivers.

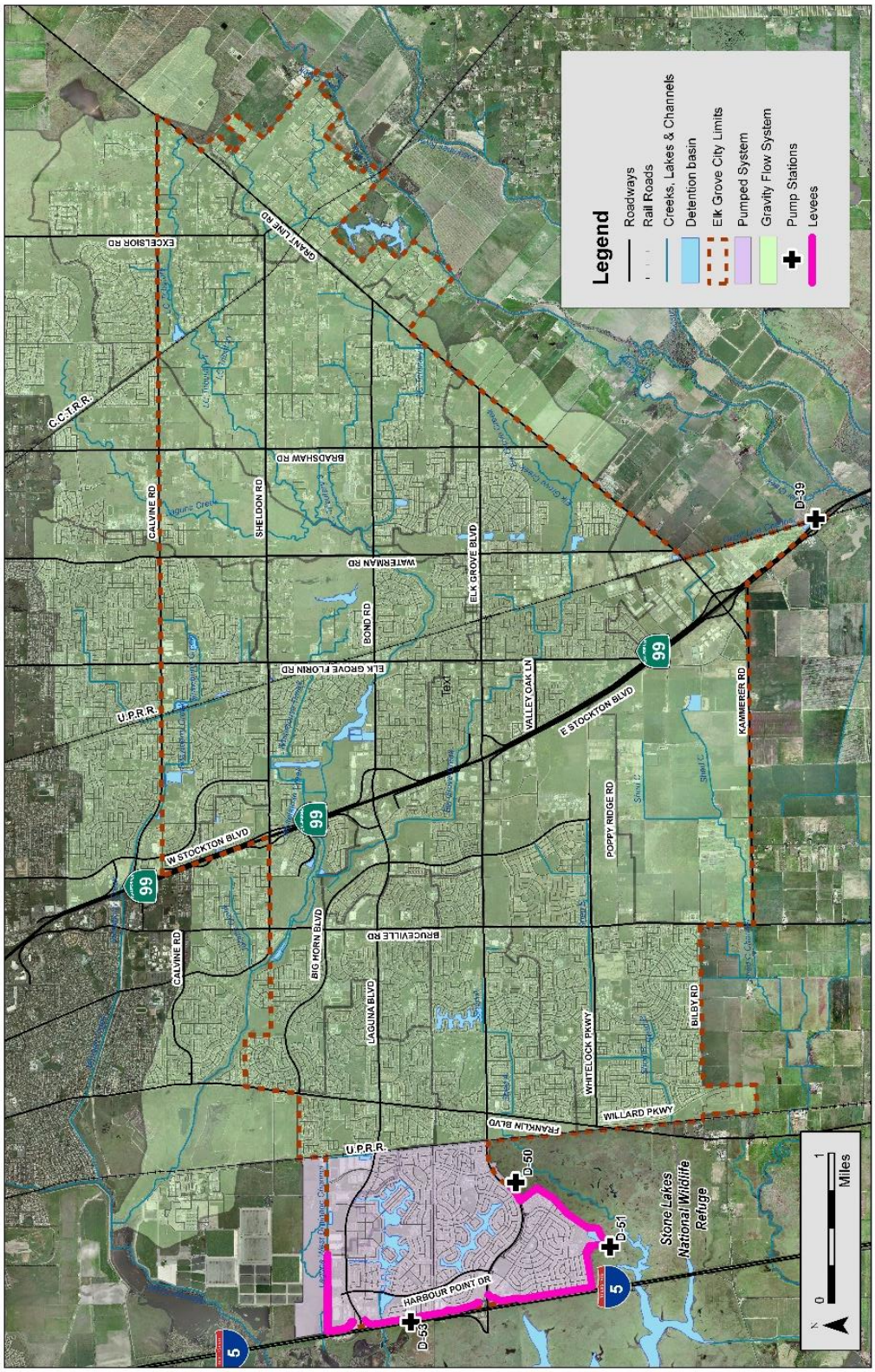
Figure B-17 City of Elk Grove Watershed Delineations, Creeks and Channels



Source: City of Elk Grove GIS

The City's storm drainage and flood control system can be characterized as a gravity flow system for the portion of the City east of the Union Pacific Railroad tracks and a pumped system west of the Union Pacific Railroad tracks for the area referred to as the Laguna West communities. The three pump stations for the Laguna West area are located in the Laguna West Channel, Lakeside and Laguna Stonelake watersheds. The Laguna West area is protected by a perimeter levee system which protects the communities from the backwater effects of the Cosumnes and Mokelumne Rivers. There is also a pump station located in the Grant Line Channel watershed. The City has nineteen detention basins that were primarily constructed in conjunction with commercial and residential development in order to mitigate project stormwater runoff flows to pre-project levels. Figure B-18 depicts the locations of the pump stations, levees, basins, and the gravity flow areas.

Figure B-18 City of Elk Grove Pump Stations, Levees, Detention Basins, and Gravity Flow Areas



Source: City of Elk Grove GIS

The majority of the City's storm drainage and flood control system facilities and channels are owned by the City, with some portions being privately owned. The City owns and operates the storm drainage and flood control facilities, which consist of pump stations, levees, detention basins and other flood control features.

Current land use of properties adjacent to storm drainage, flood control facilities and channels vary widely, and include all types of land uses present within the City, such as commercial, residential, industrial, recreational, open space, small scale agricultural, mixed-use and public facilities. Underground drainage pipes are typically located within or adjacent to public roadways. Natural and constructed channels are typically maintained as open space, with some recreational uses, such as bicycle trails, located along the channel corridor in some areas of the City.

The eastern portion of the City (primarily east of Waterman Road) is predominately rural with residences built on large lots where agricultural practices are common. A majority of the East Elk Grove area/rural region does not have an underground pipe system, curbs or gutters. Stormwater is collected and conveyed by roadside ditches that have very limited flow carrying capacity. This results in roads experiencing flooding and standing water at a few locations. In some areas the roads may overtop, which impacts driving, particularly at night.

Along the eastern and southern edges of the City, the Cosumnes River represents a major flood hazard. The Cosumnes River is the last river in California, which remains undammed along its entire length, so flooding caused by this river can be extensive.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table B-26. These events also likely affected the City to some degree.

Table B-26 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The flooding in 2017 caused localized flooding and downed trees in the City. Many of the localized street flooding issues were due to maintenance practices, which have subsequently been corrected. Highway 99, a major transportation corridor through the City, was flooded just south of the City boundary. This is a result of the highway being on low ground and is being corrected by Caltrans. The Emerald Oaks Golf Course, on the southern tip of the City and immediately east of Hwy 99, also flooded by design as it is a flood basin.

Vulnerability to and Impacts from Flood

Floods have been a part of the City's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County and City. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

One of the biggest concerns with major flooding is timely evacuation and access to vulnerable populations. The City is currently working on evacuation plans for hazardous events.

Assets at Risk

Based on the vulnerability of Elk Grove to the flood hazard, the sections that follow describes significant assets at risk in the City of Elk Grove. This section includes the values at risk, flooded acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Elk Grove. The methodology described in Section 4.3.12 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table B-27 is a summary table for the City of Elk Grove. Parcel counts, values, estimated contents, and total values in the City are shown for the 1% and 0.2% annual chance flood zones, as well as for those properties that fall outside of the mapped FEMA DFIRM flood zones. Table B-28 breaks down Table B-27 and shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in FEMA flood zones in the City.

The City noted that some of these parcels (that fall in Zone AE) were actually removed from the SFHA by a Letter of Map Revision from FEMA (the FEMA maps still show the areas in the SFHA since the maps have not been updated.

Table B-27 City of Elk Grove – Count and Value of Parcels at Risk in Summary DFIRM Flood Zones

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard	403	269	$61,274,181	$135,476,549	$92,047,967	$288,798,693
0.2% Annual Chance Flood Hazard	7,021	6,737	$785,686,811	$2,248,156,539	$1,315,971,218	$4,349,814,522
Other Areas	48,160	44,803	$5,415,550,301	$13,971,342,060	$8,031,991,292	$27,418,883,679
City of Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table B-28 City of Elk Grove – Count and Values of Parcels at Risk by Detailed Flood Zone and Property Use

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	26	0	$99	$0	$0	$99
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	3	0	$0	$0	$0	$0
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	6	0	$27	$0	$0	$27
Zone A Total	**35**	**0**	**$126**	**$0**	**$0**	**$126**

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Zone AE						
Agricultural	1	0	$9	$0	$0	$9
Care/Health	3	1	$2,943,280	$5,652,593	$5,652,593	$14,248,466
Church/Welfare	1	1	$268,289	$54,835	$54,835	$377,959
Industrial	3	2	$817,755	$1,317,876	$1,976,814	$4,112,445
Miscellaneous	54	0	$437,414	$0	$0	$437,414
Office	2	1	$403,259	$2,780,364	$2,780,364	$5,963,987
Public/Utilities	2	0	$2	$0	$0	$2
Recreational	1	1	$470,772	$1,524,986	$1,524,986	$3,520,744
Residential	257	254	$40,188,748	$88,175,049	$44,087,529	$172,451,322
Retail/ Commercial	10	9	$10,296,835	$35,970,846	$35,970,846	$82,238,527
Unknown	0	0	$0	$0	$0	$0
Vacant	34	0	$5,447,692	$0	$0	$5,447,692
Zone AE Total	**368**	**269**	**$61,274,055**	**$135,476,549**	**$92,047,967**	**$288,798,567**
1% Annual Chance Flood Hazard Total	**403**	**269**	**$61,274,181**	**$135,476,549**	**$92,047,967**	**$288,798,693**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	4	3	$7,669,150	$54,732,171	$54,732,171	$117,133,492
Church/Welfare	1	1	$333,286	$203,812	$203,812	$740,910
Industrial	9	9	$4,616,628	$12,397,077	$18,595,615	$35,609,321
Miscellaneous	128	0	$85,875	$0	$0	$85,875
Office	5	4	$2,829,252	$8,350,409	$8,350,409	$19,530,070
Public/Utilities	3	0	$9	$0	$0	$9
Recreational	4	4	$4,200,131	$16,354,956	$16,354,956	$36,910,043
Residential	4,038	4,033	$380,639,074	$1,044,687,963	$522,344,013	$1,947,671,034
Retail/ Commercial	30	30	$35,104,712	$85,390,336	$85,390,336	$205,885,384
Unknown	0	0	$0	$0	$0	$0
Vacant	35	1	$10,273,306	$4,123	$0	$10,277,429
0.2% Annual Chance Total	**4,257**	**4,085**	**$445,751,423**	**$1,222,120,847**	**$705,971,312**	**$2,373,843,567**
X Protected by Levee						
Agricultural	0	0	$0	$0	$0	$0

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Care/Health	1	1	$745,000	$1,735,000	$1,735,000	$4,215,000
Church/Welfare	4	4	$4,115,302	$15,770,564	$15,770,564	$35,656,430
Industrial	6	3	$9,383,367	$20,127,566	$30,191,348	$59,702,281
Miscellaneous	60	0	$584	$0	$0	$584
Office	51	44	$14,324,891	$93,962,948	$93,962,948	$202,250,787
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	1	1	$520,200	$1,500,000	$1,500,000	$3,520,200
Residential	2,584	2,567	$269,922,489	$852,199,179	$426,099,611	$1,548,221,248
Retail/ Commercial	34	32	$23,045,949	$40,740,435	$40,740,435	$104,526,819
Unknown	0	0	$0	$0	$0	$0
Vacant	23	0	$17,877,606	$0	$0	$17,877,606
X Protected by Levee Total	**2,764**	**2,652**	**$339,935,388**	**$1,026,035,692**	**$609,999,906**	**$1,975,970,955**
0.2% Annual Chance Flood Hazard Total	**7,021**	**6,737**	**$785,686,811**	**$2,248,156,539**	**$1,315,971,218**	**$4,349,814,522**
Other Areas						
Zone X						
Agricultural	18	7	$1,376,338	$1,239,312	$1,239,312	$3,854,962
Care/Health	28	22	$26,582,628	$90,844,343	$90,844,343	$208,271,314
Church/Welfare	45	41	$27,910,629	$115,055,115	$115,055,115	$258,020,859
Industrial	188	161	$85,608,395	$295,769,280	$443,653,914	$825,031,599
Miscellaneous	1,320	1	$841,892	$1,100	$1,100	$844,092
Office	268	247	$83,592,828	$426,140,488	$426,140,488	$935,873,804
Public/Utilities	67	0	$99	$0	$0	$99
Recreational	14	10	$8,630,215	$35,594,899	$35,594,899	$79,820,013
Residential	44,126	43,925	$4,421,924,222	$12,149,570,110	$6,074,785,117	$22,646,279,465
Retail/ Commercial	359	329	$320,907,843	$844,677,004	$844,677,004	$2,010,261,851
Unknown	1	1	$0	$127,600	$0	$127,600
Vacant	1,726	59	$438,175,212	$12,322,809	$0	$450,498,021
Zone X Total	**48,160**	**44,803**	**$5,415,550,301**	**$13,971,342,060**	**$8,031,991,292**	**$27,418,883,679**
Other Areas Total	**48,160**	**44,803**	**$5,415,550,301**	**$13,971,342,060**	**$8,031,991,292**	**$27,418,883,679**
Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data
*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone
**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table B-29 summarizes Table B-28 above and shows City of Elk Grove loss estimates and improved values at risk by FEMA 1% and 0.2% annual chance flood zones.

Table B-29 City of Elk Grove – Flood Loss Estimates

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood Hazard	403	269	$135,476,549	$92,047,967	$227,524,516	$45,504,903	0.03%
0.2% Annual Chance Flood Hazard	7,021	6,737	$2,248,156,539	$1,315,971,218	$3,564,127,757	$712,825,551	0.40%
Grand Total	**7,424**	**7,006**	**$2,383,633,088**	**$1,408,019,185**	**$3,791,652,273**	**$758,330,454**	**0.43%**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data
*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone
**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table B-28 and Table B-29, the City of Elk Grove has 269 parcels and $227.5 million of structure and contents values or values in the 1% annual chance flood zone, and 6,737 improved parcels and $3.56 billion of structure and contents values in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.11 of the Base Plan, there is a 1% chance in any given year of a flood event causing $45.4 million in damage and a 0.2% chance in any given year of a flood event causing $712.8 million in damage in the City of Elk Grove. The loss ratio of 0.03% and 0.40% indicates that flood losses for 1% and 0.2% annual chance flooding, respectively, would be somewhat minor relative to the total values of structures in the City.

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits. The same methodology, as discussed in Section 4.3.12 of the Base Plan, was used for the City of Elk Grove as well as for the County as a whole. Table B-30 represents a detailed and summary analysis of total acres for each FEMA DFIRM flood zone in the City.

Table B-30 City of Elk Grove – Flooded Acres by Flood Zone

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	0.0	0.00%	0.0	0.00%	0.0	0.00%
Care/Health	0.0	0.00%	0.0	0.00%	0.0	0.00%
Church/Welfare	0.0	0.00%	0.0	0.00%	0.0	0.00%
Industrial	0.0	0.00%	0.0	0.00%	0.0	0.00%
Miscellaneous	92.3	0.35%	0.0	0.00%	92.3	0.00%
Office	0.0	0.00%	0.0	0.00%	0.0	1.22%
Public/Utilities	2.6	0.01%	0.0	0.00%	2.6	0.00%
Recreational	0.0	0.00%	0.0	0.00%	0.0	0.03%
Residential	32.2	0.12%	11.8	0.06%	20.5	0.00%
Retail/ Commercial	0.0	0.00%	0.0	0.00%	0.0	0.27%
Unknown	0.0	0.00%	0	0.00%	0.0	0.00%
Vacant	48.8	0.18%	0	0.00%	48.8	0.00%
Zone A Total	**176.0**	**0.66%**	**11.8**	**0.06%**	**164.2**	**0.65%**
Zone AE						
Agricultural	25.8	0.10%	0.0	0.00%	25.8	0.34%
Care/Health	97.3	0.37%	52.3	0.28%	45.1	0.60%
Church/Welfare	6.0	0.02%	6.0	0.03%	0	0.00%
Industrial	11.8	0.04%	11.3	0.06%	0.5	0.01%
Miscellaneous	282.1	1.06%	0.0	0.00%	282.1	3.73%
Office	17.7	0.07%	0.6	0.00%	17.1	0.23%
Public/Utilities	16.8	0.06%	0.0	0.00%	16.8	0.22%
Recreational	4.4	0.02%	4.4	0.02%	0.0	0.00%
Residential	378.2	1.42%	369.8	1.95%	8.4	0.11%
Retail/ Commercial	16.4	0.06%	15.3	0.08%	1.1	0.01%
Unknown	0.0	0.00%	0.0	0.00%	0.0	0.00%
Vacant	227.8	0.86%	0.0	0.00%	227.8	3.01%
Zone AE Total	**1,084.3**	**4.08%**	**459.6**	**2.42%**	**624.7**	**8.26%**
Zone AH						
Agricultural	0.0	0.00%	0.0	0.00%	0.0	0.00%
Care/Health	0.0	0.00%	0.0	0.00%	0.0	0.00%
Church/Welfare	5.7	0.02%	5.7	0.03%	0.0	0.00%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Industrial	0.0	0.00%	0.0	0.00%	0.0	0.00%
Miscellaneous	0.2	0.00%	0.0	0.00%	0.2	0.00%
Office	0.0	0.00%	0.0	0.00%	0.0	0.00%
Public/Utilities	0.0	0.00%	0.0	0.00%	0.0	0.00%
Recreational	0.0	0.00%	0.0	0.00%	0.0	0.00%
Residential	0.0	0.00%	0.0	0.00%	0.0	0.00%
Retail/ Commercial	0.0	0.00%	0.0	0.00%	0.0	0.00%
Unknown	0.0	0.00%	0.0	0.00%	0.0	0.00%
Vacant	0.0	0.00%	0.0	0.00%	0.0	0.00%
Zone AH Total	**5.9**	0.02%	**5.7**	0.03%	**0.2**	**0.00%**
Zone AO						
Agricultural	0.0	0.00%	0.0	0.00%	0.0	0.00%
Care/Health	0.0	0.00%	0.0	0.00%	0.0	0.00%
Church/Welfare	0.0	0.00%	0.0	0.00%	0.0	0.00%
Industrial	0.0	0.00%	0.0	0.00%	0.0	0.00%
Miscellaneous	0.0	0.00%	0.0	0.00%	0.0	0.00%
Office	0.0	0.00%	0.0	0.00%	0.0	0.00%
Public/Utilities	0.0	0.00%	0.0	0.00%	0.0	0.00%
Recreational	0.0	0.00%	0.0	0.00%	0.0	0.00%
Residential	0.3	0.00%	0.3	0.00%	0.0	0.00%
Retail/ Commercial	0.0	0.00%	0.0	0.00%	0.0	0.00%
Unknown	0.0	0.00%	0.0	0.00%	0.0	0.00%
Vacant	0.0	0.00%	0.0	0.00%	0.0	0.00%
Zone AO Total	**0.3**	**0.00%**	**0.3**	**0.00%**	**0.0**	**0.00%**
1% Annual Chance Flood Hazard Total	**1,266.4**	**4.77%**	**477.4**	**2.51%**	**789.0**	**10.44%**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	2.0	0.01%	0.0	0.00%	2.0	0.03%
Care/Health	27.4	0.10%	21.2	0.11%	6.2	0.08%
Church/Welfare	10.5	0.04%	10.5	0.06%	0.0	0.00%
Industrial	19.7	0.07%	19.4	0.10%	0.3	0.00%
Miscellaneous	126.2	0.48%	0.0	0.00%	126.2	1.67%
Office	8.0	0.03%	3.8	0.02%	4.2	0.06%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Public/Utilities	36.2	0.14%	0.0	0.00%	36.2	0.48%
Recreational	6.6	0.02%	6.6	0.03%	0.0	0.00%
Residential	718.5	2.71%	716.5	3.77%	2.0	0.03%
Retail/ Commercial	54.6	0.21%	54.2	0.29%	0.3	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	200.3	0.75%	1.0	0.01%	199.3	2.64%
0.2% Annual Chance Total	**1,210.0**	**4.56%**	**833.2**	**4.39%**	**376.8**	**4.98%**
X Protected by Levee						
Agricultural	0.0	0.00%	0.0	0.00%	0.0	0.00%
Care/Health	1.4	0.01%	1.4	0.01%	0.0	0.00%
Church/Welfare	15.2	0.06%	15.2	0.08%	0.0	0.00%
Industrial	25.5	0.10%	21.9	0.12%	3.7	0.05%
Miscellaneous	83.8	0.32%	0.0	0.00%	83.8	1.11%
Office	60.2	0.23%	49.8	0.26%	10.4	0.14%
Public/Utilities	0.1	0.00%	0.0	0.00%	0.1	0.00%
Recreational	1.0	0.00%	1.0	0.01%	0.0	0.00%
Residential	1,672.3	6.30%	1,646.2	8.67%	26.0	0.34%
Retail/ Commercial	46.5	0.18%	38.4	0.20%	8.1	0.11%
Unknown	0.0	0.00%	0.0	0.00%	0.0	0.00%
Vacant	59.7	0.22%	0.0	0.00%	59.7	0.79%
X Protected by Levee Total	**1,965.7**	7.40%	**1,773.9**	9.34%	**191.8**	2.54%
0.2% Annual Chance Flood Hazard Total	**3,175.7**	**11.96%**	**2,607.1**	**13.72%**	**568.6**	**7.52%**
Other Areas						
Zone X						
Agricultural	489.0	1.84%	331.2	1.74%	157.8	2.09%
Care/Health	82.1	0.31%	57.0	0.30%	25.1	0.33%
Church/Welfare	177.8	0.67%	157.0	0.83%	20.9	0.28%
Industrial	521.6	1.96%	441.5	2.32%	80.1	1.06%
Miscellaneous	1,497.6	5.64%	0.0	0.00%	1,497.6	19.81%
Office	592.1	2.23%	523.1	2.75%	69.0	0.91%
Public/Utilities	506.6	1.91%	0	0.00%	506.6	6.70%
Recreational	255.3	0.96%	206.7	1.09%	48.6	0.64%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Residential	13,308.0	50.11%	13,092.1	68.92%	215.8	2.86%
Retail/ Commercial	667.8	2.51%	636.3	3.35%	31.5	0.42%
Unknown	0.1	0.00%	0.1	0.00%	0	
Vacant	4,015.9	15.12%	466.7	2.46%	3,549.1	46.95%
Agricultural	22,113.8	83.27%	15,911.5	83.76%	6,202.2	82.04%
Other Areas Total	**22,113.8**	**83.27%**	**15,911.5**	**83.76%**	**6,202.2**	**82.04%**
Elk Grove Total	**26,555.9**	**100.0%**	**18,996.0**	**100.0%**	**7,559.9**	**100.0%**

Source: FEMA 11/2/2018 DFIRM

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Elk Grove – 3.20. According to this analysis, there is a total population of 813 and 12,906 residents of the City at risk to flooding in the 1% and 0.2% annual chance floodplains, respectively. This is shown in Table B-31.

Table B-31 City of Elk Grove – Count of Improved Residential Parcels and Population by Flood Zone

Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Elk Grove	254	813	4,033	12,906

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Elk Grove in identified DFIRM flood zones. GIS was used to determine whether the critical facility locations intersect a DFIRM flood zones and if so, which zone it intersects. Details of critical facilities in mapped dam inundation areas in the City of Elk Groves are shown in Figure B-19 and detailed in Table B-32. Details of critical facility definition, type, name and address and jurisdiction by DFIRM flood zones are listed in Appendix F.

Figure B-19 City of Elk Grove – Critical Facilities and DFIRM Flood Zones

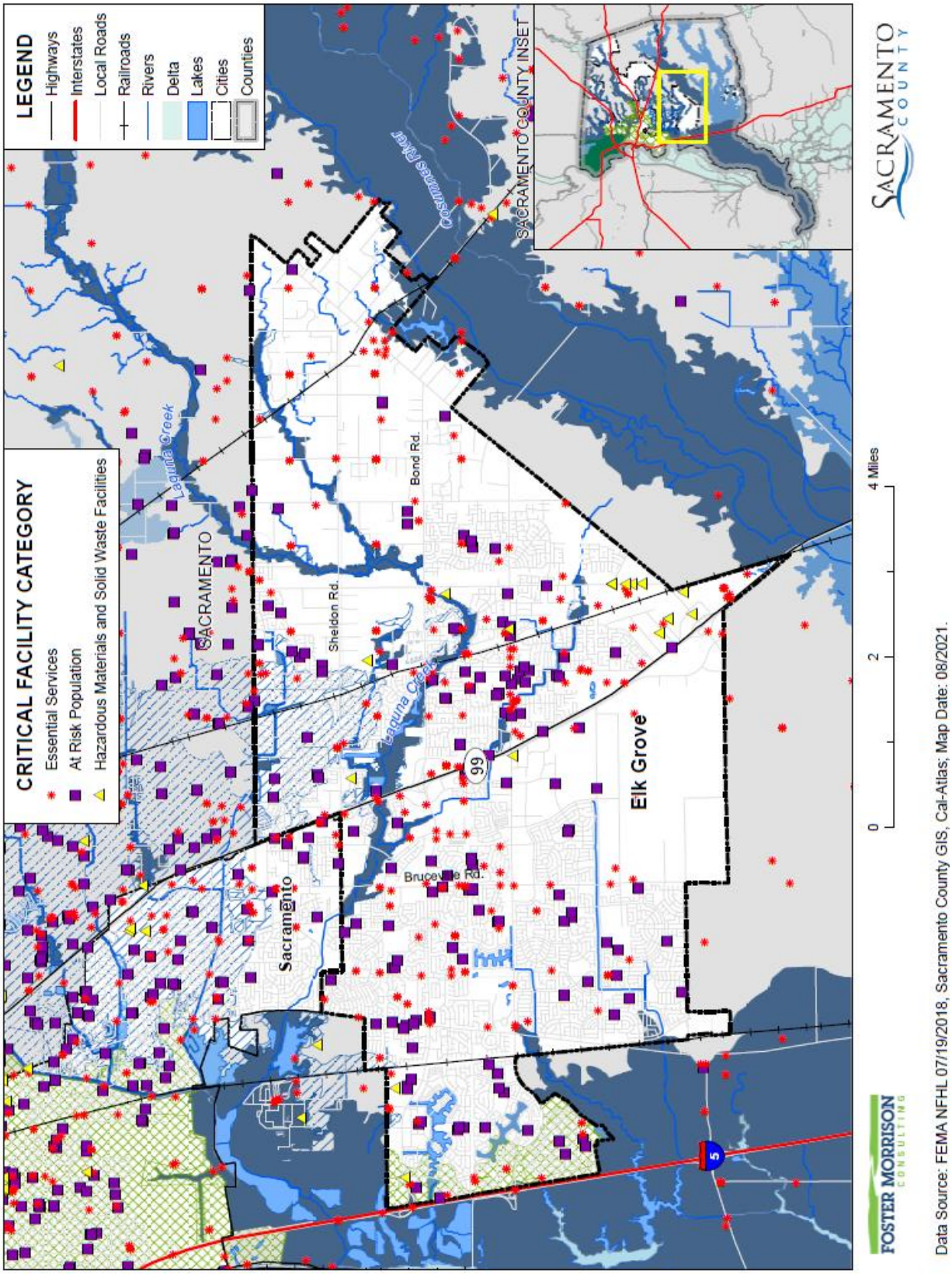


Table B-32 City of Elk Grove – Critical Facilities in FEMA DFIRM Flood Zones by Category and Type

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
1% Annual Chance Flood Hazard		
Essential Services Facilities	FDIC Insured Banks	1
	Water Well	2
	Total	**3**
At Risk Population Facilities	Places of Worship	1
	Total	**1**
1% Annual Chance Flood Hazard Total		**4**
0.2% Annual Chance Flood Hazard		
Essential Services Facilities	Emergency Evacuation Center	1
	EMS Stations	1
	FDIC Insured Banks	5
	Fire Station	1
	Microwave Service Towers	17
	Water Well	13
	Total	**38**
At Risk Population Facilities	Day Care Center	4
	Places of Worship	6
	School	5
	Total	**15**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	1
	Total	**1**
0.2% Annual Chance Flood Hazard Total		**54**
Other Areas		
Essential Services Facilities	Cellular Tower	2
	Emergency Evacuation Center	7
	EMS Stations	6
	FDIC Insured Banks	20
	Fire Station	5
	Hospital or Urgent Care	1
	Law Enforcement	2
	Microwave Service Towers	90
	Sewage Treatment Plant	1
	Water Well	143
	Total	**277**
At Risk Population Facilities	Day Care Center	32

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
	Mobile Home Parks	1
	Places of Worship	82
	School	40
	Total	**155**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	6
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	3
	Solid Waste Facility	4
	Waste Transfer Station	1
	Total	**17**
Other Areas Total		**449**
Elk Grove Total		**507**

Source: City of Elk Grove, FEMA 7/19/2018 DFIRM

Insurance Coverage, Claims Paid, and Repetitive Losses

Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures located within a 100-year floodplain – a requirement that affects nearly all mortgages financed through commercial lending institutions. Flood insurance is also recommended for all structures protected by levees, even if not mapped within a floodplain.

The City of Elk Grove joined the National Flood Insurance Program (NFIP) on October 15, 2001. The City does not participate in CRS program. NFIP data indicates that as of March 24, 2020, there were 1,002 flood insurance policies in force in the City with $337,426,500 of coverage. Of the 1,002 policies, 986 were residential (single-family homes) and 16 were non-residential. Of the 1,002 policies, 33 were in the A zones, while 979 in B, C, and X zones. There have been 5 historical claims for flood losses totaling $103,021.75. NFIP data further indicates that there are no repetitive loss (RL) or severe repetitive loss (SRL) buildings in Elk Grove. There have been no substantial damage claims.

Based on this analysis of insurance coverage, the City has values at risk to the 1% annual chance and greater floods. Of the 269 improved parcels within the 1% annual chance flood zone, only 33 (or 12.3 percent) of those parcels maintain flood insurance. This can be seen on Table B-33.

Table B-33 City of Elk Grove – Percentage of Policy Holders to Improved Parcels in the 1% Annual Chance Floodplain

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Elk Grove	269	33	12.3%

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data

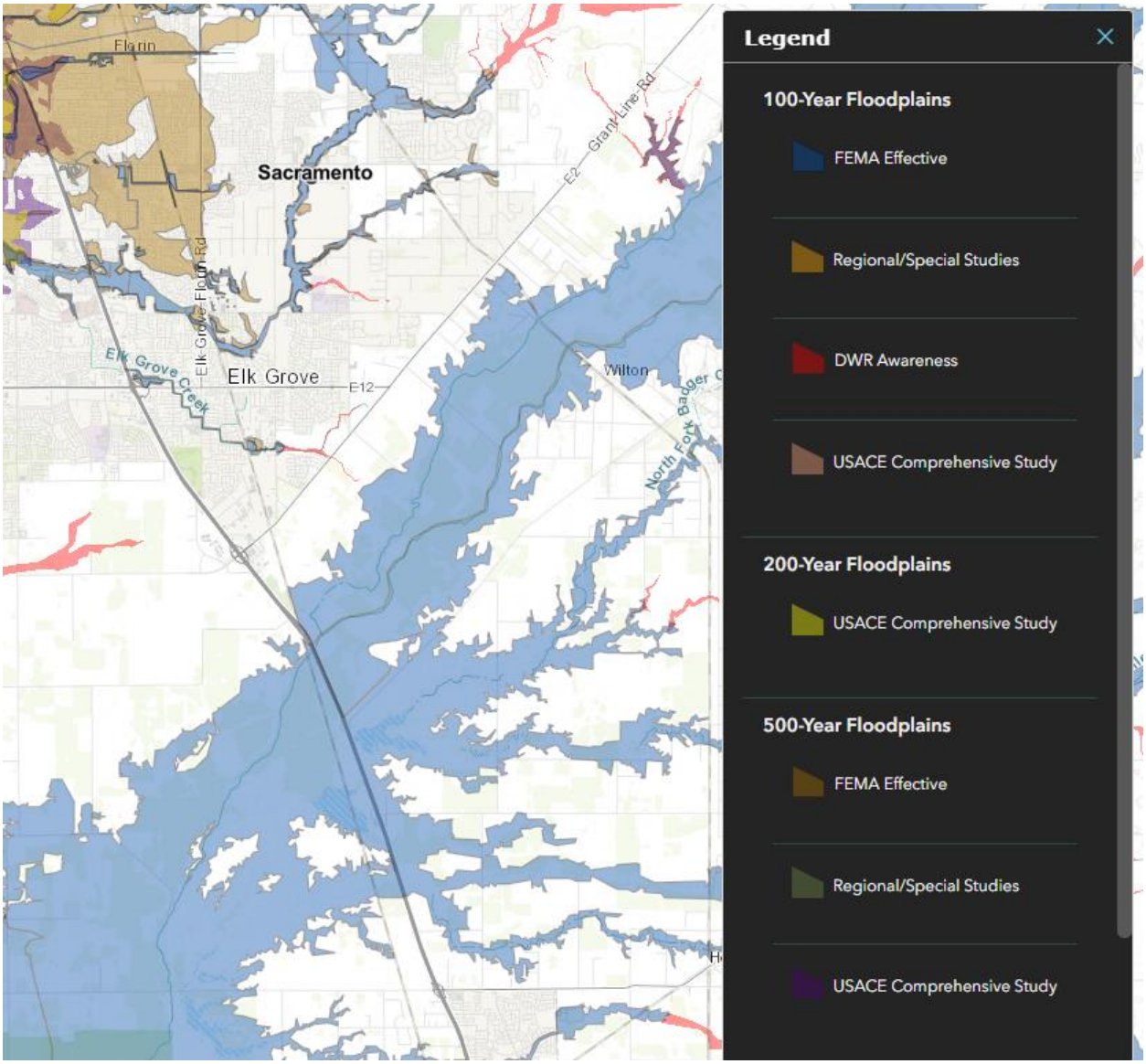
California Department of Water Resources Best Available Maps (BAM)

The FEMA regulatory maps provide just one perspective on flood risks in Sacramento County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Nevada-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-(as applicable), and 500-year event risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the City than that provided in the FEMA DFIRMs. The BAM map for Elk Grove is shown in Figure B-20.

Figure B-20 City of Elk Grove – Best Available Map



Source: California DWR

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1%r (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2% (2002 Sac and San Joaquin River Basins Comp Study).

Future Development

The potential for flooding may increase as floodwaters are channeled due to land development. Such changes can exacerbate flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning should be based on build out property use to ensure that all new development remains safe from future flooding. While local floodplain

management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the overall floodplain.

The City enforces Chapter 16.50 of the Elk Grove Municipal Code (EGMC) - Flood Damage Prevention. If development is to occur in the floodplain, it is required to conform to the elevation and other standards of the EGMC. While the use of fill to create buildable area is strongly discouraged by City policy, should it be allowed, there shall be no net increase to the water surface elevation adjacent to, downstream, and upstream of the development, as determined by the City. Other improvements may be required as part of the proposed project. A Conditional Letter of Map Revision (CLOMR) issued by FEMA shall be required prior to grading permit issuance, unless only a Letter of Map Revision (LOMR) is required. A LOMR issued by FEMA shall be required prior to issuance of the first building permit.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure B-21 shows the locations of future development areas the City is planning to develop on the DFIRM flood zones. Table B-34 shows the parcels and acreages of each future development area in the City in the DFIRM flood zones.

Figure B-21 City of Elk Grove – DFIRM Flood Zones and Future Development

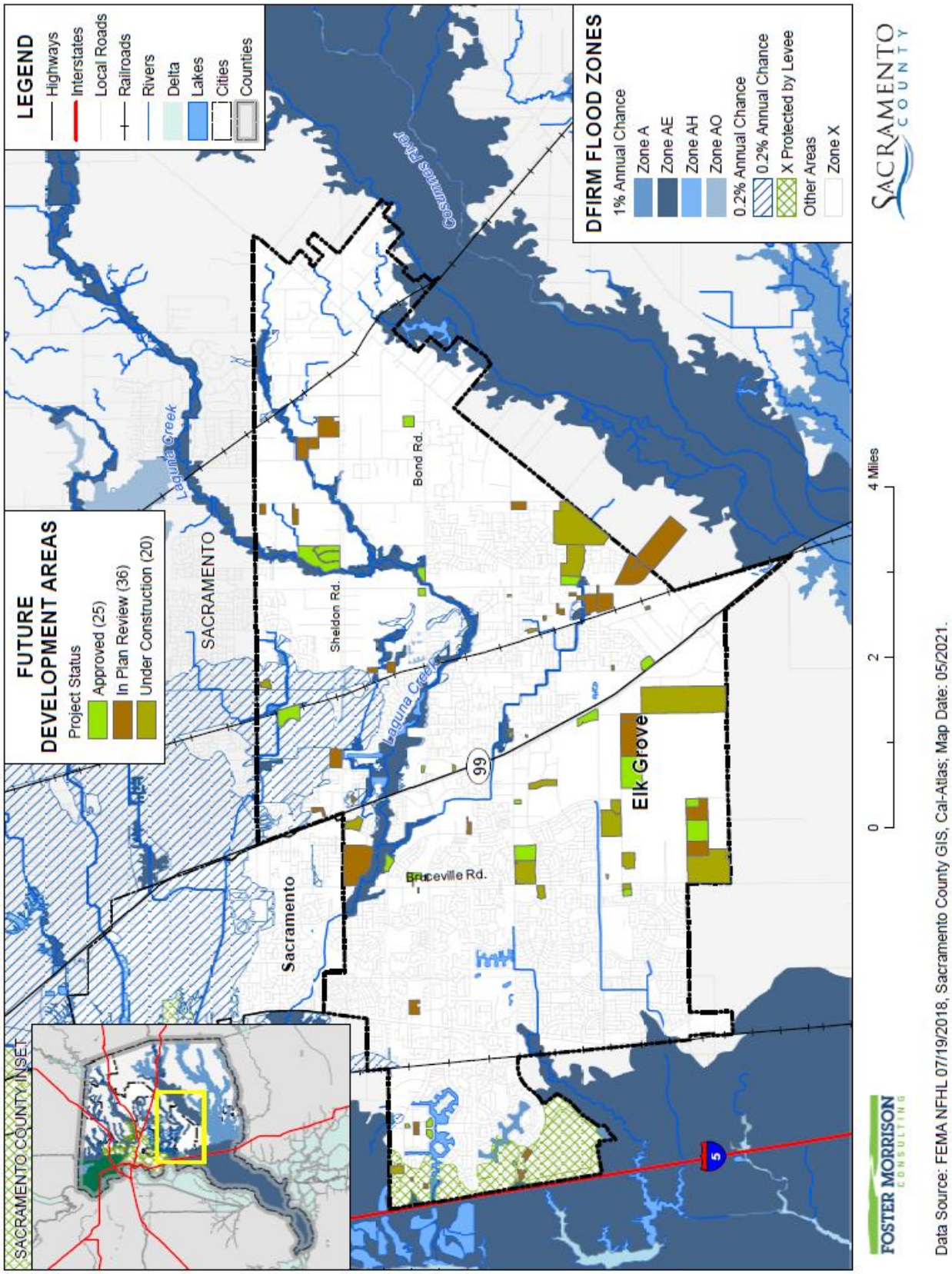


Table B-34 City of Elk Grove – DFIRM Flood Zones and Future Development Areas

Flood Zone / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
1% Annual Chance Flood Hazard			
Zone AE			
Approved			
Sheldon Park Estates North Gated Community	5	0	10.4
Shell Gas Station	1	0	1.0
Approved Total	***6***	***0***	***11.4***
In Plan Review			
8633 Bader Road Map	1	1	20.3
Elk Grove Muslim Center	1	1	2.4
In Plan Review Total	***2***	***2***	***22.6***
Zone AE Total	**8**	**2**	**34.1**
1% Annual Chance Flood Hazard Total	**8**	**2**	**34.1**
0.2% Annual Chance Flood Hazard			
0.2% Annual Chance			
Approved			
Sheldon Park Estates North Gated Community	1	0	18.7
T-Mobile Jones Family Park	1	0	26.7
Approved Total	***2***	***0***	***45.3***
In Plan Review			
Hotel at Sheldon Place	1	0	2.3
Sheldon Grove Subdivision	1	0	19.8
In Plan Review Total	***2***	***0***	***22.0***
Under Construction			
Calvine Pointe	1	0	7.1
Under Construction Total	***1***	***0***	***7.1***
0.2% Annual Chance Total	**5**	**0**	**74.5**
X Protected by Levee			
Approved			
Arco AM/PM Car Wash Expansion	1	1	1.2
Approved Total	***1***	***1***	***1.2***
In Plan Review			
California Northstate University Medical Center	6	5	5.3
Candlewood Hotel	1	0	1.9
Elk Grove Independent Senior Housing	2	0	5.2
Wendy's Remodel	1	1	0.8

Flood Zone / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
In Plan Review Total	***10***	***6***	***13.1***
Under Construction			
Cafeteria Expansion	1	1	9.2
Under Construction Total	***1***	***1***	***9.2***
X Protected by Levee Total	**12**	**8**	**23.5**
0.2% Annual Chance Flood Hazard Total	**17**	**8**	**98.0**
Other Areas			
Zone X			
Approved			
AAA Services Building	1	0	0.7
Bond Road Rezone and Tentative Map	2	2	10.1
Buffalo Wild Wings	1	0	1.0
Creekside Estates	1	0	7.0
Crooked Creek Industrial Park	2	1	14.2
Dignity Health Medical Campus	7	1	28.0
Elk Grove Masonic Lodge	1	0	0.7
GreenSpace Self Storage Facility	1	0	3.0
Laguna West Plaza Pads 1 & 2	2	0	1.6
New Faze Skilled Nursing	1	0	15.1
Poppy Keys Southwest	3	0	60.2
Quail Run II	1	0	4.8
Raising Cane's Restaurant	1	1	1.7
Seasons at Stonebrook Master Home Plan	3	0	79.5
Sheldon Park Estates North Gated Community	22	9	42.8
Shell with 7-Eleven & Storage Facility	4	0	4.5
Target Exterior Remodel	1	1	10.1
T-Mobile Evergreen Springs	1	1	2.3
Toscano Apartments	2	0	7.9
Trojan Storage II	1	0	8.9
U-Haul	4	0	10.2
Vineyard at Madeira Pad E	1	0	0.7
Approved Total	***63***	***16***	***315.2***
In Plan Review			
10069 Elk Grove Florin Road TPM	1	1	1.1
10075 Sheldon Road Tentative Parcel Map	1	1	35.3
8580 Bradshaw Road	1	0	8.3

Flood Zone / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
8651 Bader Road TPM and Rezone	1	1	10.0
9730 Kent Street Addition	1	0	1.3
Bartholomew Vineyard Amendment	1	1	10.3
Bow Stockton Apartments	2	1	5.6
Burger King Remodel	1	1	0.7
Eden Gardens Banquet Hall	1	1	5.2
Elk Grove Food Bank	1	1	2.0
Elk Grove Muslim Center	1	0	4.6
Grant Line Construction Aggregate Production and Recycling Facility	1	0	24.8
In-N-Out Burger - The Ridge Pad 14	1	0	0.9
Kubota Tractor Corporation	1	1	101.6
Laguna Main Street Apartments	4	0	5.8
Laguna Springs Corporate Center - Building A	1	0	4.9
Life Storage Expansion	1	0	4.6
Mendes Villages 2 & 3	1	0	30.6
Mountain Elk Villas	1	0	12.1
Poppy Keys Southeast	4	0	66.5
S&J Storage	1	0	4.3
Sheldon Farms MHP	2	0	80.9
Tegan Estates	3	3	11.9
Telos Greens TSM and Rezone	1	0	26.4
Tractor Supply Company	1	0	67.4
Triangle Point TSM Phase 2	1	0	67.4
Warda Warehouse 3	1	0	1.5
Waterman Brinkman Logistics Center	3	1	21.6
In Plan Review Total	**40**	**13**	**617.7**
Under Construction			
Bruceville Meadows Residential	253	0	96.5
Bruceville Point	2	1	8.3
Fieldstone North and South	514	234	113.6
Fortune School	2	0	40.0
Madeira South (Poppy Lane)	221	92	35.1
Madeira South Lot A Master House Plans	1	0	10.6
McGeary Ranch	84	3	13.3
Mendes Subdivision	1	0	39.5
Milestone	126	29	45.5

Flood Zone / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Railroad Street	4	1	3.2
Sheldon Farms North	1	0	43.8
Sheldon Terrace	204	74	14.3
Sterling Meadows	623	444	172.2
The Gardens at Quail Run	1	0	4.4
The Park Senior Housing	3	0	15.1
The Ridge Shopping Center	20	8	39.6
Towneplace Suites	1	1	1.7
Wienerschnitzel	1	0	0.4
Under Construction Total	***2,062***	***887***	***697.2***
Zone X Total	**2,165**	**916**	**1,630.1**
Other Areas Total	**2,165**	**916**	**1,630.1**
Grand Total	**2,190**	**926**	**1,762.1**

Source: City of Elk Grove GIS, FEMA 7/19/2018 DFIRM

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the City during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration. This may produce localized street flooding due to high water in the waterway/creek systems. The previous discussion in the Flood: 1%/0.2% Annual Chance section included detailed information of the City's drainage and localized creek systems that during these heavy rains can be overwhelmed and cause flooding.

Location and Extent

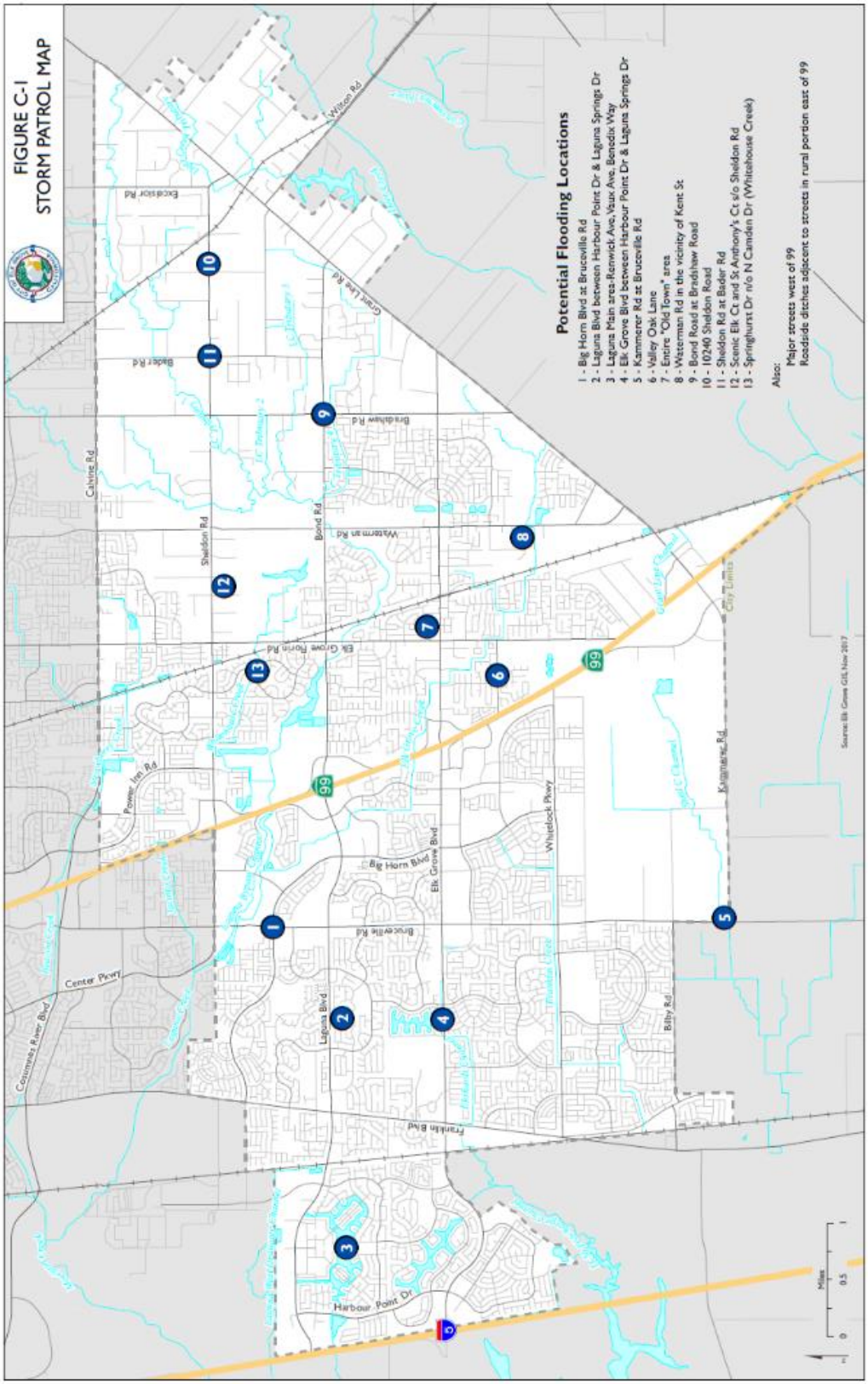
The City of Elk Grove is subject to localized flooding throughout the City. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the City vary by location. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the City tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

The East Elk Grove area and rural area has localized flooding which is widespread but generally minor. These areas of potential concern are included in Figure B-22 and Table B-35. In portions of this area, roadside ditches and culverts lack volume capacity and are prone to blockages from debris. Streets of primary concern that are monitored during rain events in this area are Sheldon Road, Bradshaw Road, Grant Line Road, Waterman Road, Bader Road, Bond Road, and Elk Grove Boulevard.

During heavy rainfall, the major streets west of Highway 99 experience localized flooding due to inlets being blocked with leaves resulting in standing water on one or more lanes in the roadway. Major streets of primary concern that are monitored during rain events in this area are Big Horn Boulevard, Laguna Boulevard, Bruceville Road, Elk Grove Boulevard, and Franklin Boulevard.

Figure B-22 and Table B-35 identifies known and past occurrences of such areas and the associated problems encountered. This list is an initial inventory of key problem areas and is not intended to be a complete inventory of all problems and locations associated with severe weather events and localized flooding in the City.

Figure B-22 Potential Localized Flooding Locations



Source: City of Elk Grove GIS.

Table B-35 City of Elk Grove's Road List of Localized Flooding Problem Areas

Road Name	Flooding	Pavement Deterioration	Washout	High Water	Landslide/ Mudslide	Debris	Downed Trees
Big Horn Blvd. at Bruceville Rd.	X					X	
Laguna Blvd. between Harbour Point Dr. and Laguna Springs Dr.	X			X		X	X
Laguna Main areas – Renwick Ave., Vaux Ave., Benedix Way	X					X	X
Elk Grove Blvd. between Harbour Point Dr. and Laguna Springs Dr.	X			X		X	X
Kammerer Rd. at Bruceville Rd.	X	X		X		X	
Valley Oak Ln.	X					X	X
Entire "Old Town" Area	X					X	X
Waterman Rd. in the vicinity of Kent St.	X			X		X	
Bond Rd. at Bradshaw Rd.	X					X	
Sheldon Rd.	X					X	
Sheldon Rd. at Bader Rd.	X					X	X
Scenic Elk Ct. and St. Anthony's Ct. s/o Sheldon Rd.	X					X	
Springhurst Dr. north of N. Camden Dr.	X					X	
Major Roads west of Hwy. 99	X					X	X
Roadside Ditches East Elk Grove Area/ Rural area	X					X	X

Source: City of Elk Grove

Past Occurrences

The City noted that localized flooding is an annual occurrence and affects those areas described above.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the City and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

The City has not experienced any large flooding events since incorporation, although smaller localized flooding events occur annually. Localized flooding occurs primarily during the winter and spring months, with areas of concern largely near waterways and creek systems that swell during heavy rainfall events. Roadway flooding has also occurred in specific locations during heavy rainfall events due to inadequate drainage or blockages of the drainage system. With expected increases in average annual precipitation as a result of climate change, the City is expecting to see increased rainfall during larger storm events. This could place increased stress on stormwater drainage systems.

Future Development

Future development in the City will use Low Impact Development (LID) techniques and infiltration best management practices (BMPs) such as infiltration trenches, infiltration basins, bio retention planters, porous pavement, dry wells and green streets. The City will need to be proactive to ensure that increased development has proper siting and drainage for stormwater. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized flooding. Mitigating the causes of the localized stormwater flooding will reduce future risks of losses.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main channel of a stream. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the City are not known. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. The HMPC noted that when northern California reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees.

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the City vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the City tends to have a shorter speed of onset, due to the amount of water that flows through the City.

The Elk Grove area is protected by a number of project levees that are part of federally authorized flood projects and are considered part of the State Plan of Flood Control. There are no project levees in Elk Grove, but several project levees located outside of the City affect flooding in the City along the Sacramento River. A number of non-project levees also provide flood protection to the community. These non-project levees were generally constructed prior to project levees and without federal or State assistance. They are not part of the State Plan of Flood Control. Non-project levees are located along the eastern side of Interstate 5 and along Morrison Creek, Laguna Creek, and the Cosumnes River. Figure B-23 shows the FEMA DFIRM X Protected by Levee areas in the City. Geographical levee failure flood extent for the City from the FEMA DFIRMs is shown in Table B-36.

Figure B-23 City of Elk Grove – DFIRM X Protected by Levee Areas

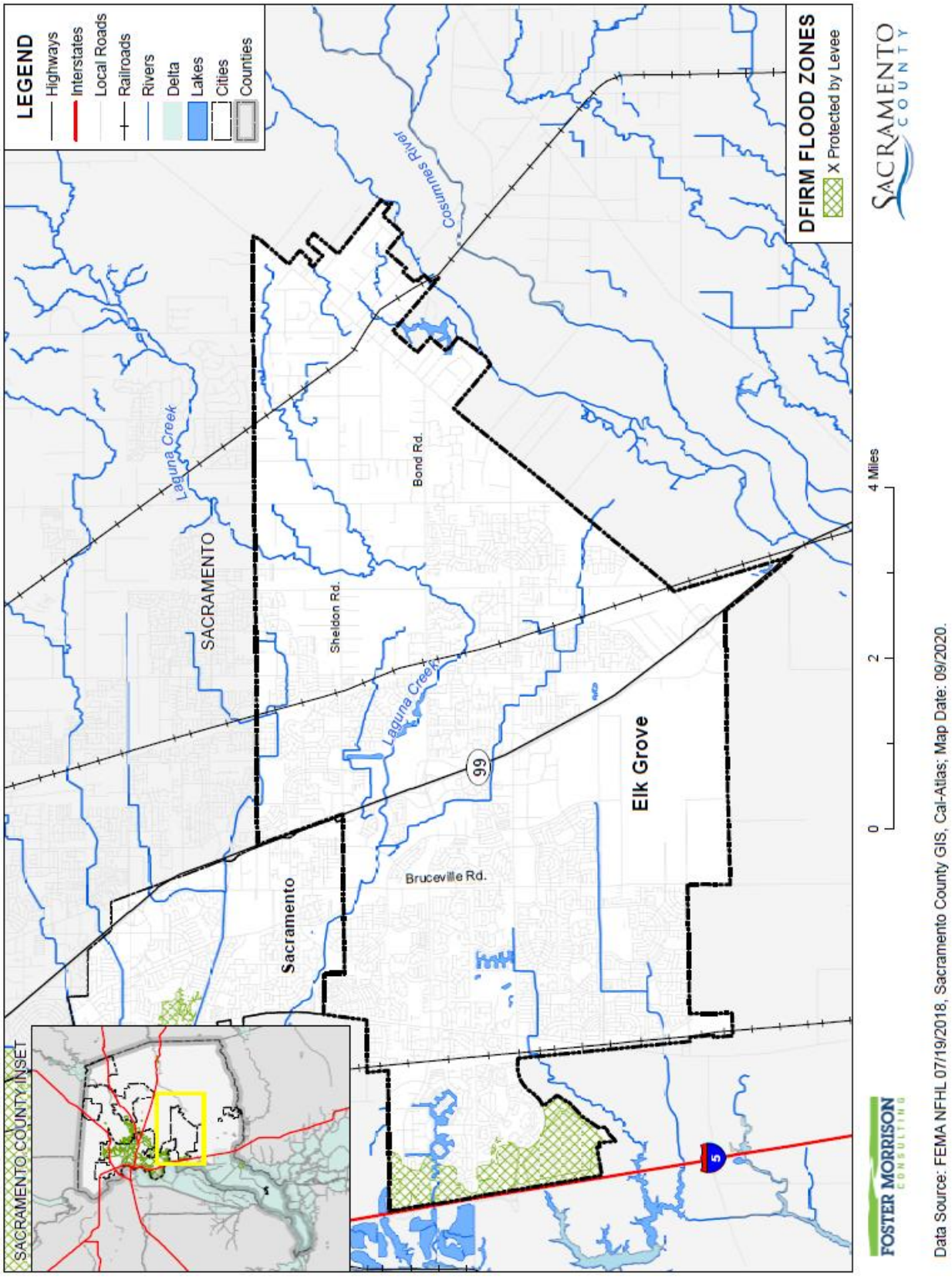


Table B-36 City of Elk Grove – Geographical Levee Failure Extents

X Protected by Levee/ Jurisdiction	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
Elk Grove	1,966	5.64%	1,774	6.81%	192	2.18%

Source: FEMA DFIRM 7/19/2018

*Percentage of total acres is the percent of total acres of the entire County Planning Area, not the total acres of the jurisdiction

Past Occurrences

There have been two state and two federal disaster declaration from levee failure. This can be seen in Table B-37.

Table B-37 Sacramento County – State and Federal Levee Failure Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Levee Break	2	1972, 1980	2	1972, 1980

Source: Cal OES, FEMA

There have been no past occurrences of levee failure in the City.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach. Generally, levees fail due to overtopping or collapse. A catastrophic levee failure resulting from collapse can occur very quickly with relatively little warning. Such a failure could occur where a levee is saturated and the high hydrostatic water pressure on the river side, coupled with erosion of the levee from high water flows or an inherent defect in the levee, causes an almost instant collapse of a portion of the levee. Under such circumstances, structures located relatively near the break will suffer immediate and extensive damage. Several hundred yards away from the break the energy of the flood waters will be dispersed sufficiently to reduce, but not eliminate, flooding damage to structures in its path. The flood water will flow in a relatively shallow path toward any low point in the affected area. Flood water will collect in these low areas and the levels will rise as the flow continues. When the rivers are high, it is not possible to close or repair a levee break until the water surface in the river and the flooded area equalize.

The City of Elk Grove 2019 General Plan noted that the existing levee system in areas surrounding Elk Grove was initially constructed by hand labor, and later by dredging to hold back river floods and tidal influences, to obtain additional lands for grazing and crop growing. Constant maintenance is necessary to hold these levees against the river floods that threaten surrounding areas. Because levees are vulnerable to peat oxidation as well as sand, silt, and peat erosion, new material is continually added to maintain them. Subsiding farmlands adjacent to levees may increase water pressure against the levees, adding to the

potential for levee failure. In addition, many levees, known as non-project levees, are not maintained to any specified standard, which can increase the likelihood of failure and inundation.

The City's levee system is designed to protect the Laguna West communities from the backwater effects of the Cosumnes and Mokelumne Rivers. These levees have never experienced flood waters on the water side of the levees. If a 100-year flood event should occur, backwater effects from the Cosumnes and Mokelumne Rivers are expected to last for only one (1) to two (2) days as the Cosumnes River is an uncontrolled watershed and the peak flows from the river will last for a short period of time.

A major overtopping of a levee may result in severe erosion of the levee crowns on the landward side and cause levee failure over a period of minutes to several hours. A severe levee overtopping can, therefore, be considered as a levee break for the purpose of determining the extent of flooding that any area will suffer. Generally, overtopping can be predicted based on river stages and the warning given depending on the source of the flood waters. On the Sacramento River system, depending on which dams are releasing the flows, advance warning of river stages may be as much as 24 hours.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Assets at Risk

Based on the vulnerability of Elk Grove to the levee failure hazard, the sections that follow describes significant assets at risk in the City of Elk Grove. This section includes the values at risk, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of levee failure flooding within the City of Elk Grove. The methodology described in Section 4.3.14 of the Base Plan was followed in determining structures and values at risk to the levee failure flooding. Table B-38 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in FEMA X Protected by Levee flood zones in the City.

Table B-38 City of Elk Grove – Count and Values of Parcels at Risk in X Protected by Levee Flood Zone and Property Use

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
X Protected by Levee						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	1	1	$745,000	$1,735,000	$1,735,000	$4,215,000

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Church/Welfare	4	4	$4,115,302	$15,770,564	$15,770,564	$35,656,430
Industrial	6	3	$9,383,367	$20,127,566	$30,191,348	$59,702,281
Miscellaneous	60	0	$584	$0	$0	$584
Office	51	44	$14,324,891	$93,962,948	$93,962,948	$202,250,787
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	1	1	$520,200	$1,500,000	$1,500,000	$3,520,200
Residential	2,584	2,567	$269,922,489	$852,199,179	$426,099,611	$1,548,221,248
Retail/ Commercial	34	32	$23,045,949	$40,740,435	$40,740,435	$104,526,819
Unknown	0	0	$0	$0	$0	$0
Vacant	23	0	$17,877,606	$0	$0	$17,877,606
X Protected by Levee Total	**2,764**	**2,652**	**$339,935,388**	**$1,026,035,692**	**$609,999,906**	**$1,975,970,955**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table B-39 shows City of Elk Grove levee failure flood loss estimates and improved values at risk by FEMA X Protected by Levee flood zones.

Table B-39 City of Elk Grove – X Protected by Levee Flood Loss Estimates

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
X Protected by Levee	4,257	4,085	$1,222,120,847	$705,971,312	$1,928,092,159	$385,618,432	0.21%

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table B-39, the City of Elk Grove has 4,085 parcels and $1.93 billion of structure and contents values or values in the X Protected by Levee flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.11 of the Base Plan, two feet of flooding would cause $385 million in flood damages in the City.

Structures protected by levees that fail are often total losses. The analysis above assumes all levees in the City break at one time, which is unlikely. The extent and depth of actual flooding and associated damage will vary depending on the location, nature, depth, and extent of any levee break.

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the levee failure flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Elk Grove – 3.20. According to this analysis, there is a total population of 813 residents of the City at risk to levee failure flooding. This is shown in Table B-31.

Table B-40 City of Elk Grove – Count of Improved Residential Parcels and Population by Flood Zone

Jurisdiction	X Protected by Levee	
	Improved Residential Parcels	Population at Risk
Elk Grove	2,567	8,214

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Elk Grove in identified DFIRM X Protected by Levee flood zones. GIS was used to determine whether the critical facility locations intersect a DFIRM flood zones and if so, which zone it intersects. Details of critical facilities in mapped dam inundation areas in the City of Elk Groves are shown in Figure B-24 and detailed in Table B-41. Details of critical facility definition, type, name and address and jurisdiction by DFIRM X Protected by Levee flood zones are listed in Appendix F.

Figure B-24 City of Elk Grove – Critical Facilities in X Protected by Levee Flood Zones

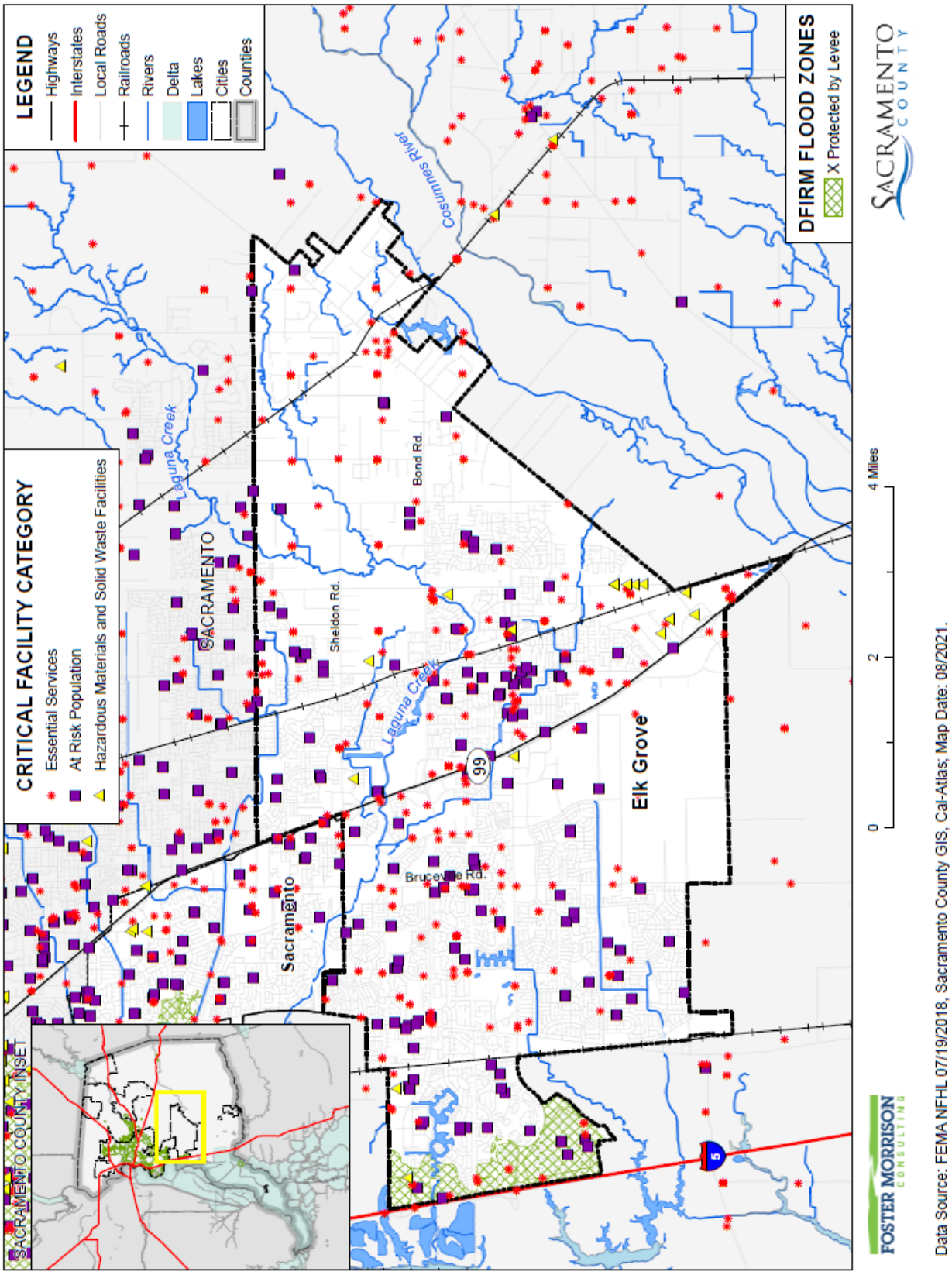


Table B-41 City of Elk Grove – Critical Facilities in DFIRM X Protected by Levee Flood Zones by Category and Type

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
0.2% Annual Chance Flood Hazard – X Protected by Levee		
Essential Services Facilities	Emergency Evacuation Center	1
	EMS Stations	1
	FDIC Insured Banks	5
	Fire Station	1
	Microwave Service Towers	7
	Water Well	12
	Total	**27**
At Risk Population Facilities	Day Care Center	3
	Places of Worship	1
	School	4
	Total	**8**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
X Protected by Levee Flood Hazard Total		**35**

Source: City of Elk Grove, FEMA 7/19/2018 DFIRM

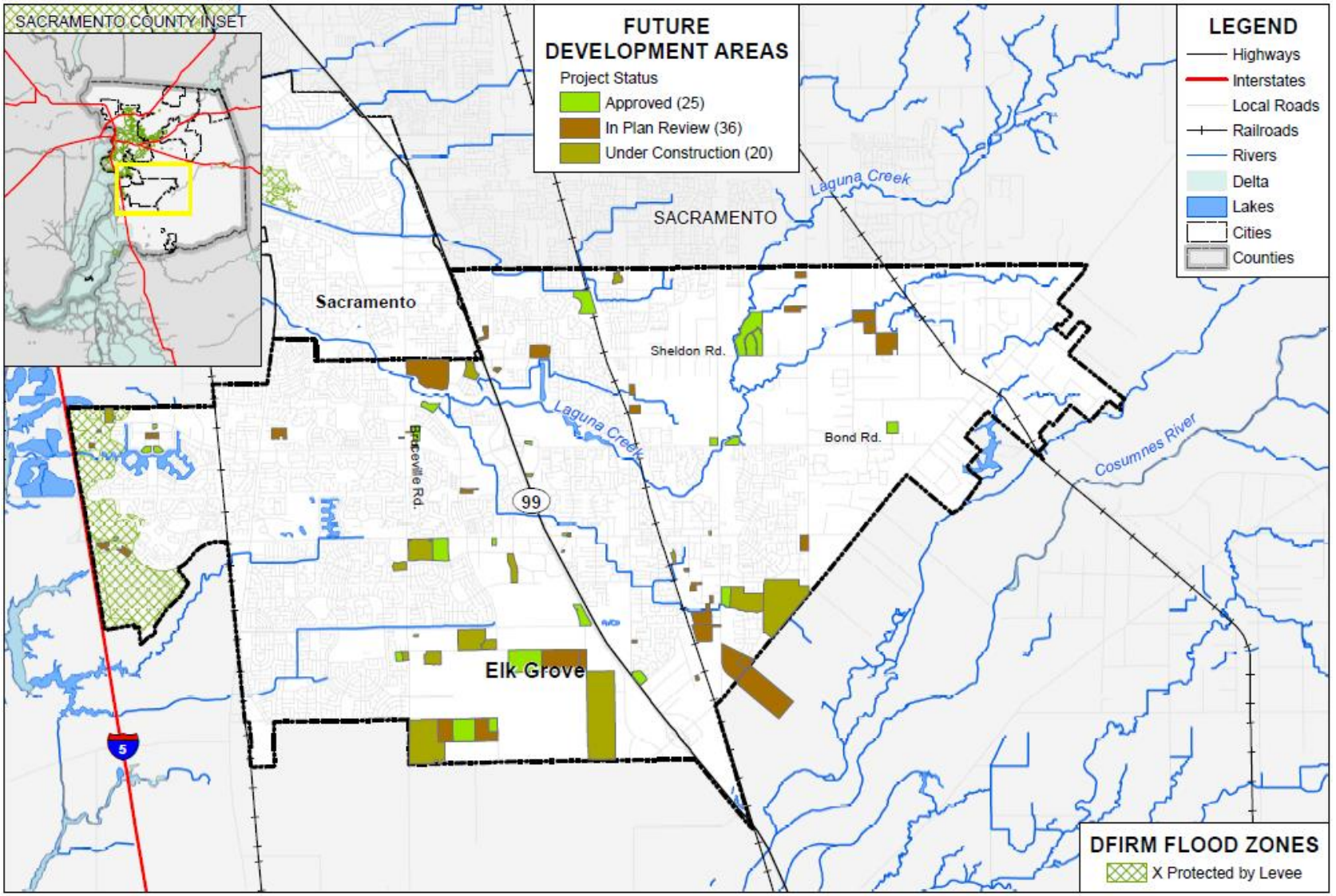
Future Development

The City's levee system is located in the Laguna West/Stonelake communities. These communities are built-out and only infill projects are anticipated to occur in these areas. Any future development will be required to meet the City's development standards, policies and ordinances.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure B-25 shows the locations of future development areas the City is planning to develop on the DFIRM X Protected by Levee layer. Table B-42 shows the parcels and acreages of each future development area in the City in the X Protected by Levee areas.

Figure B-25 City of Elk Grove – DFIRM X Protected by Levee Zones and Future Development



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 05/2021.

Table B-42 City of Elk Grove – DFIRM X Protected by Levee Flood Zones and Future Development Areas

Flood Zone / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
X Protected by Levee			
Approved			
Arco AM/PM Car Wash Expansion	1	1	1.2
Approved Total	**1**	**1**	**1.2**
In Plan Review			
California Northstate University Medical Center	6	5	5.3
Candlewood Hotel	1	0	1.9
Elk Grove Independent Senior Housing	2	0	5.2
Wendy's Remodel	1	1	0.8
In Plan Review Total	**10**	**6**	**13.1**
Under Construction			
Cafeteria Expansion	1	1	9.2
Under Construction Total	**1**	**1**	**9.2**
X Protected by Levee Total	**12**	**8**	**23.5**

Source: City of Elk Grove GIS, FEMA 7/19/2018 DFIRM

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the City, County, and surrounding region is at risk, as pandemic is a regional, national, and international event. The speed of onset of pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no

scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table B-43.

Table B-43 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic flu.

- The **1918-1919 Influenza Pandemic (H1N1)**
- The **February 1957-1958 Influenza Pandemic (H2N2)**
- The **1968 Influenza Pandemic (H3N2)**

To date, the 21st century has seen two acknowledged pandemics.

- **2009 Swine Flu (H1N1**)
- **2019/2020 COVID 19**

With the COVID-19 pandemic, the city saw major shutdowns as a result of the State stay-at-home order and County public health orders. Non-essential businesses were closed for various periods or were required to operate at limited capacity. Many businesses implemented employee COVID-19 testing measures. The unemployment rate for the City went from 4.0% before the pandemic to 12.7% in June 2020. The hospitality industry was particularly impacted by the pandemic. Occupancy rates declined by as much as 60% from the previous year in April 2020, with the negative rates lasting through March 2021. The overall occupancy rate for 2020 was down by 15% from the previous year. In addition, local schools were closed or on distance learning only operations from on March 7, 2020, to March 30, 2021.

Vulnerability to and Impacts from Pandemic

Pandemic has and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. A pandemic does not affect the buildings, critical facilities, and infrastructure in the City. A pandemic can have varying levels of impact to the citizens of the City and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently) an unemployment rose significantly. Supply chains for food can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

There were numerous impacts to the City from the COVID-19 pandemic, including related to City finances and transit services.

City finances were significantly impacted. In March 2020, to help mitigate the impacts of the anticipated $7 million revenue decrease in projected General Fund revenues for fiscal year 2020-21, staff made efforts to implement reductions to the fiscal year 2020-21 budget. This included adding no new staff positions for proposed fiscal year 2020-21. Also not included in the fiscal year 2020-21 budget was an advance prepayment of the City's PERS unfunded accrued liabilities (UAL) in the amount of $915 thousand. Sales tax assumptions and forecasts a $4.7 million decline in sales for fiscal year 2020-2021 resulting from the pandemic.

In terms of transit services, following Sacramento County's stay-at-home order that was issued in mid-March 2020 the City's fixed-route transit service (e-tran) and Americans with Disabilities Act (ADA) paratransit service (e-van) immediately experienced a significant loss in transit demand and ridership. Additionally, the pandemic negatively impacted the staff personnel available to operate the City's transit services. Both of these factors led the City to temporarily reduce the daily scheduled e-tran commuter route trips by 50%. The e-tran local route services were not reduced in order to continue providing the necessary coverage within the City's jurisdictional boundaries and immediate service area for essential employment and lifeline service needs. The e-van service, which provides on demand, saw lower ridership and demand during the pandemic.

Future Development

Future development is not expected to be significantly impacted by this hazard, though population growth in the City could increase exposure to a pandemic, and increase the ability of each disease to be transmitted among the population of the City. If the median age of City residents continues to increase, vulnerability to pandemic diseases may increase, due to the fact that these diseases are often more deadly to senior citizens.

Severe Weather: Extreme Cold and Freeze

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the National Weather Service), extreme cold often accompanies a winter storm or is left in its wake. Freezing temperatures can also occur without the accompanying winter storm.

Location and Extent

Extreme cold and freeze are regional issues, meaning the entire City is at risk to cold weather and freeze events. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of extreme cold and freeze, temperature data from the County from the WRCC indicates minimum temperatures fall below 32°F on 8.3 days with no days falling below 0°F. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days to weeks at a time.

Past Occurrences

There has been no federal or state disaster declarations in the County for extreme cold and freeze. The City noted that cold and freeze is a regional phenomenon; events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

Vulnerability to and Impacts from Severe Weather: Extreme Cold and Freeze

The City experiences temperatures below 32 degrees during the winter months. The temperature moves to the teens in rather extreme situations. Freeze can cause injury or in extreme situations, loss of life to residents of the City. While it is rare for buildings to be affected directly by freeze, damages to pipes that feed building can be damaged during periods of extreme cold.

Extreme cold and freeze can affect critical facilities and infrastructure, down trees, break pipes, and can be a life safety issue. When extreme cold is coupled with high winds or ice storms, power lines may be downed, resulting in an interruption of utilities and critical services. Transportation networks, communications, and utilities infrastructure are the most vulnerable physical assets in the City. The elderly and young population is most vulnerable to temperature extremes. The residents of nursing homes and elder care facilities, as well as transient and homeless populations are especially vulnerable to extreme cold events.

Future Development

Future development built to code should be able to withstand issues associated with extreme cold and freeze events. Pipes at risk of freezing should be buried or insulated from freeze as new facilities are improved or added. Vulnerability to extreme cold will increase as the average age of the population in the County shifts and homelessness becomes more of an issue.

Ultra-efficient homes are being incorporated into the community with state-of-the-art energy-efficient construction, appliances, and lighting with commercially available renewable energy systems, such as solar water heating and solar electricity. Energy saving and water-wise drought tolerant landscapes are also being incorporated into future landscape development.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and lasts for several weeks. Heat kills by taxing the human body beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature." Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the City, there are risks to the built environment from extreme heat. While extreme heat on its own does not usually affect structures, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat can lead to power outages and when combined with high winds, to Public Safety Power Shutdown (PSPS) events, creating significant issues in the City. However, PSPS events in the City have been declining with PG&E's refined system for shutting power off in high wildfire risk areas.

Location and Extent

Heat is a regional phenomenon and affects the whole of the City. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat event determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

The City Planning Team noted that since extreme heat is a regional phenomenon, events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

There have been no previous reported heat-related damages, injuries or deaths.

Vulnerability to and Impacts from Extreme Heat

The City experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-115°F in rather extreme situations. During these times, drought conditions may worsen and the City may see an increase in dry fuels. Also, power outages and PSPS events may occur during these times as well. Health issues are the primary concern with this hazard, although economic impacts can also be an issue.

The elderly and individuals below the poverty level are the most vulnerable to extreme temperatures. Nursing homes and elder care facilities are especially vulnerable to extreme heat events if power outages occur and air conditioning is not available. In addition, individuals below the poverty level may be at increased risk to extreme heat if use of air conditioning is not affordable. This is especially true of homeless people and the transient population.

Days of extreme heat have been known to result in medical emergencies, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts. Extreme heat can also dry out vegetations, making it more vulnerable to wildfire ignitions.

The City opens "Cooling centers" during the occasional periods of extreme heat. In the past, the cooling centers were opened an average of 5 times per year and have had very low attendance. Churches and schools can be opened in the event there is a need to expand the cooling centers throughout the City. If long term or widespread heat conditions continue, County Emergency Operation Services would declare a local emergency or the possibility of a state emergency would be activated. Those being served at the City cooling centers could be transferred to larger Red Cross centers opened within the County.

Expected increases in extreme heat, with average annual temperatures increasing in addition to the duration and frequency of heat wave events, are a concern for the City. These conditions are intensified due to urban heat island effects. Of paramount concern is resident health and wellbeing during heat related events, particularly vulnerable populations. In addition, impacts on infrastructure due to extreme heat is also a concern.

Future Development

Future development of new buildings in the City will likely not be affected by extreme heat. Extreme heat is more likely to affect vulnerable populations. Vulnerability to extreme heat will increase as the average age of the population in each City shifts. It is encouraged that nursing homes and elder care facilities have emergency plans or backup power to address power failure during times of extreme heat and in the event of a PSPS. Low income residents and homeless populations are also vulnerable. Cooling centers for these populations should be utilized when necessary.

Ultra-efficient homes are being incorporated into the community with state-of-the-art energy-efficient construction, appliances, and lighting with commercially available renewable energy systems, such as solar water heating and solar electricity. Energy saving and water-wise drought tolerant landscapes are also being incorporated into future landscape development.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the City occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the City falls mainly in the fall, winter, and spring months. Wind often accompanies these storms; hail and lightning are rare in the City.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the City. All portions of the City are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Hail and lightning are rare in the City and Sacramento County. Duration of severe storms in California, Sacramento County, and the City can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the City. This is the cause of many of the federal disaster declarations related to flooding. Heavy rains and storms occur during the winter and spring months causing occasional localized street flooding. The flooding section above includes information on impacts from past events.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are an annual occurrence in the City. These events can cause significant and localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the City, but also can cause damage, with lightning occasionally igniting wildfires.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Power outages may also occur. Heavy rains and storms often result in flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

There have been heavy rain or storm events effecting the City within the past few years, usually resulting in localized flooding. These have occurred primarily during the winter and spring months, with areas of concern largely near waterways and creek systems that swell during heavy rainfall events. Roadway flooding has also occurred in specific locations during heavy rainfall events due to inadequate drainage or blockages of the drainage system. With climate change, the City is expected to see increased average annual precipitation which is largely anticipated to happen during heavy rainfall events. This could place increased stress on stormwater drainage systems.

Future Development

The City has a Storm Drainage Master Plan, which identifies improvements necessary as part of new development to address storm and flood risk. Additionally, the City has adopted General Plan policy discouraging fill in floodplains and has adopted new flood damage prevention regulations in its Municipal Code. Future development in the City is subject to these requirements. New critical facilities should be built to withstand hail damage, lightning, and heavy rains.

Wildfire

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the City of Elk Grove. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. These high winds can result in red flag days, and can result in PSPS events in the City. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

Wildfire can affect all areas of the City. CAL FIRE has estimated that the risk varies across the City and has created maps showing risk variance. Following the methodology described in Section 4.3.19 of the Base Plan, wildfire maps for the City of Elk Grove were created. Figure B-26 shows the CAL FIRE Hazard Severity Zones (FHSZs) in the City. As shown on the maps, FHSZs within the City range from urban unzoned to moderate. Figure B-27 shows the CAL FIRE Threat Areas in the City. As shown on the maps, fire threat within the City ranges from low to moderate.

Figure B-26 City of Elk Grove – Fire Hazard Severity Zones

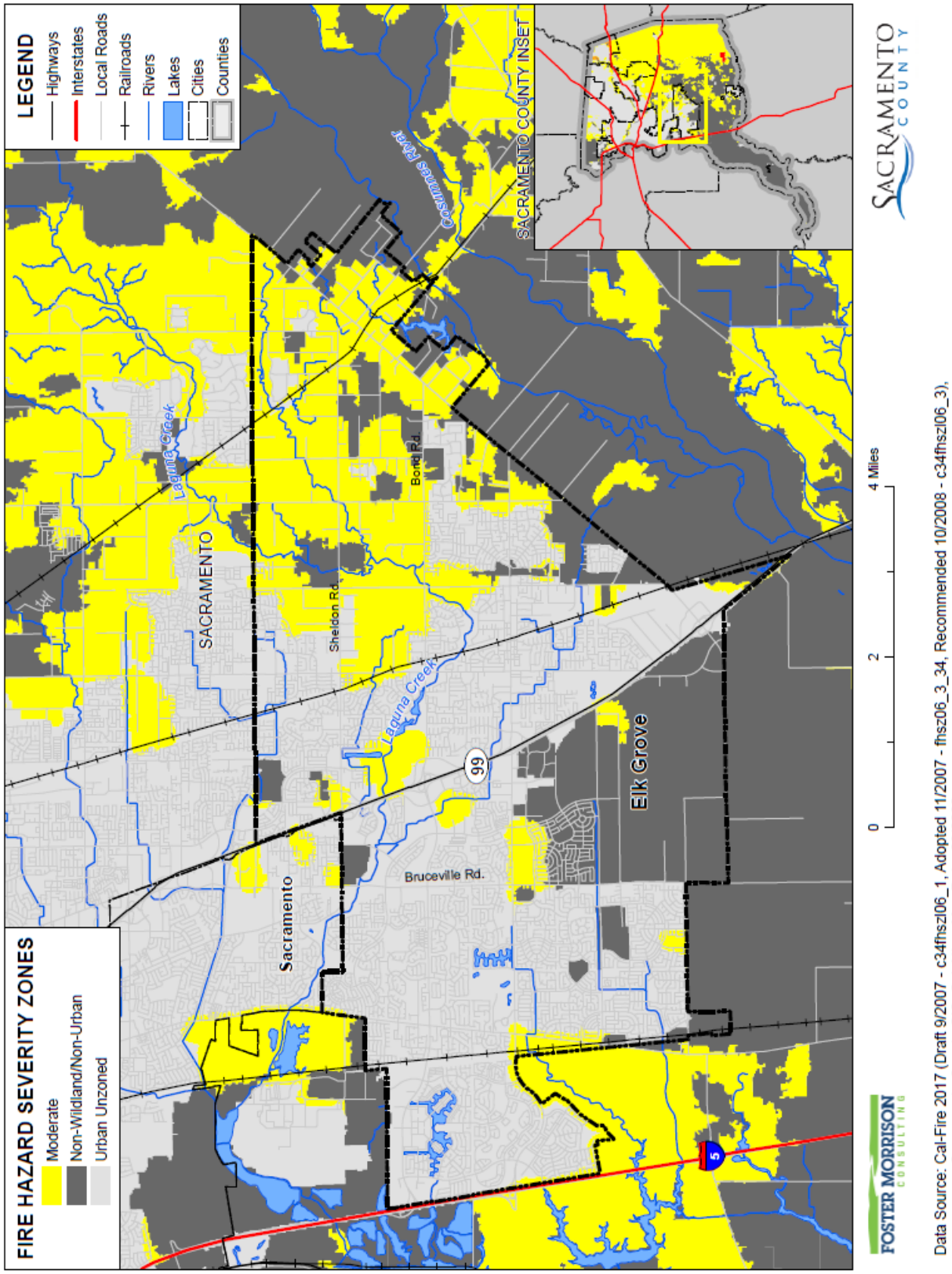
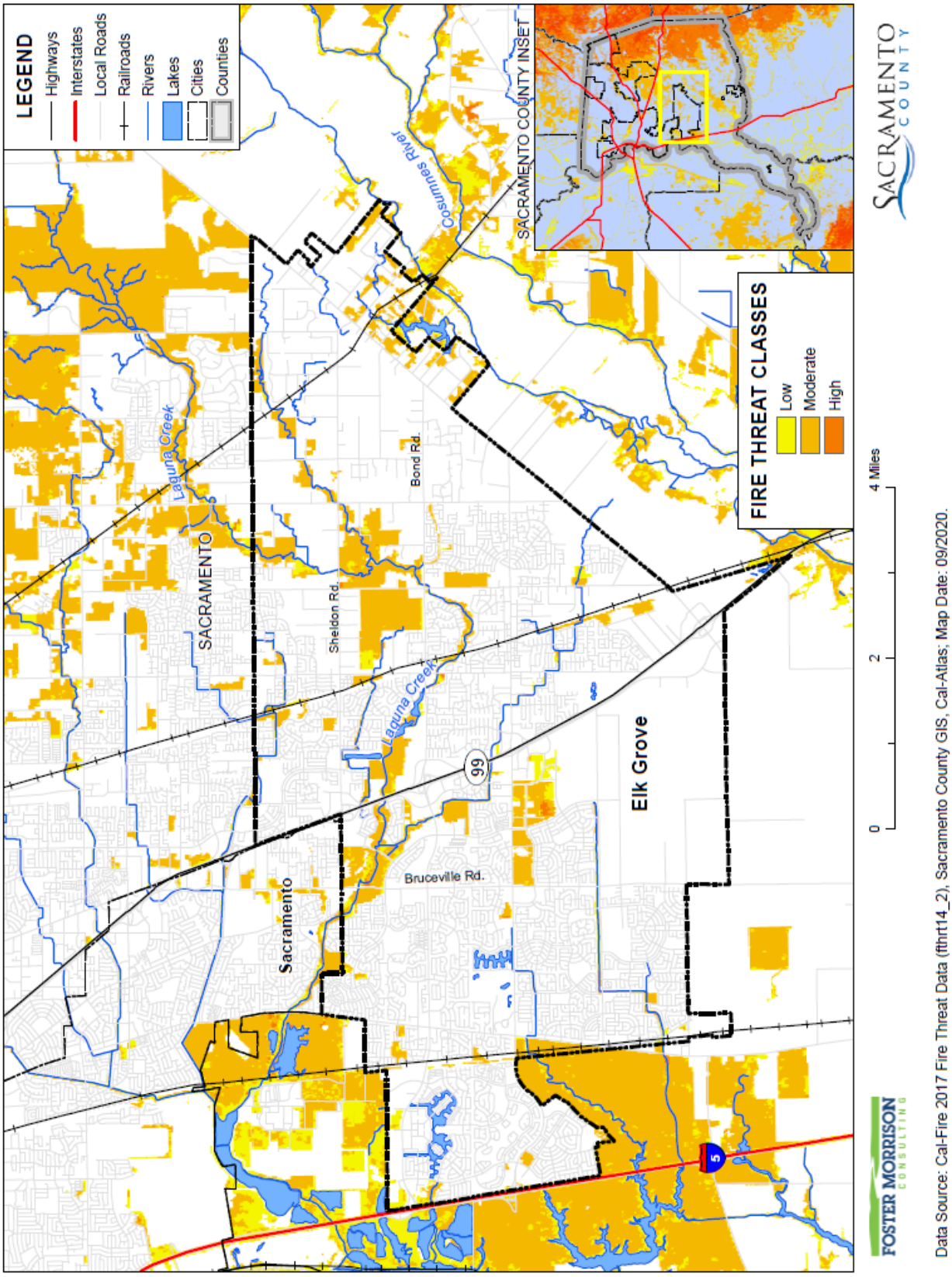


Figure B-27 City of Elk Grove – Fire Threat Areas



Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more. Geographical FHSZ extent from CAL FIRE is shown in Table B-44. Geographical Fire Threat Area extents from CAL FIRE are shown on Table B-45.

Table B-44 City of Elk Grove – Geographical FHSZ Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
Very High	0	0.00%	0	0.00%	0	0.00%
High	0	0.00%	0	0.00%	0	0.00%
Moderate	6,421.2	24.18%	4,424.6	23.29%	1,996.6	26.41%
Non-Wildland/non-Urban	5,208.0	19.61%	2,532.8	13.33%	2,675.2	35.39%
Urban Unzoned	14,926.6	56.21%	12,038.6	63.37%	2,888.1	38.20%
Total	**26,555.9**	**100.00%**	**18,996.0**	**100.00%**	**7,559.9**	**100.00%**

Source: CAL FIRE

Table B-45 City of Elk Grove – Geographical Fire Threat Area Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	18.3	0.07%	1.3	0.01%	17.0	0.23%
Moderate	2,201.0	8.29%	574.9	3.03%	1,626.0	21.51%
Low	408.8	1.54%	126.7	0.67%	282.1	3.73%
No Threat	23,927.8	90.10%	18,293.1	96.30%	5,634.7	74.53%
Total	**26,555.9**	**100.00%**	**18,996.0**	**100.00%**	**7,559.9**	**100.00%**

Source: CAL FIRE

Past Occurrences

There has been no state and one federal disaster declaration due to fire, as shown in Table B-46. It should be noted that this fire disaster was from an explosion in Roseville, and not from an actual wildfire.

Table B-46 Sacramento County – State and Federal Wildfire Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

The City Planning Team noted that occasionally, open field brush fires have occurred in the City:

- A 25-acre fire that occurred on June 9 of 2015. A grass fire that started about 1:30 p.m. at Bond and Waterman roads was driven by high, shifting winds. It quickly spread toward homes that border the field to the east and south. The fire damaged one Elk Grove home and prompted evacuation of several other residences before it was contained.
- On June 6, 2016, a small grass fire broke out in an Elk Grove residential area. The fire was first reported near Sundance Lane and Auberry Drive in an empty grass field. Though no injuries were reported, the half-acre blaze did damage a backyard fence and some gardening equipment.
- On July 12, 2016, a grass fire burned 10 acres at a vacant lot that bordered a neighborhood, a shopping center, and an elementary school. No injuries, deaths, or building damages were reported. This fire occurred around 12:45 p.m. near Dandelion Drive in north Elk Grove.

No major fires have occurred since the City was incorporated. The police department provided mutual aid resources for several large fires in California from 2016 to present. The Cosumnes Fire Department also provided staff through strike team deployments during this period. These events included:

- Cascade Fire, Yuba County (CA), October 2017. Elk Grove Police Department sent police officers to assist with evacuation area security as mutual aid.
- Tubbs Fire, Sonoma County (CA), October 2017. Elk Grove Police Department sent police officers for evacuations and evacuation area security, tactical dispatchers for field deployments, and tactical dispatchers who provided Public Safety Answering Point mutual aid.
- Atlas Fire, Napa and Solano Counties (CA), November 2017. Elk Grove Police Department sent public safety dispatchers who provided Public Safety Answering Point mutual aid.
- Camp Fire, Butte County (CA), November 2018. Elk Grove Police Department sent police officers for evacuations and evacuation area security, tactical dispatchers for immediate field command post setup and incident command consulting, animal control officers for field deployments, and provided logistical assistance in coordinating Public Safety Dispatcher mutual aid for several months.
- Kincade Fire, Sonoma County (CA), November 2019. Elk Grove Police Department sent police officers for evacuations and evacuation area security, and tactical dispatchers for Public Safety Answering Point mutual aid.
- Moccasin Fire, Tuolumne County (CA), August 2020. Elk Grove Police Department sent police officers for evacuation area security as mutual aid.
- Lake Napa Unit (LNU) Lightning Complex Fires, Lake and Napa Counties (CA), August 2020. Elk Grove Police Department sent police officers for evacuations and evacuation area security as mutual aid.
- North Complex Fire, Plumas and Butte Counties (CA), September 2020. Elk Grove Police Department sent police officers for evacuation area security as mutual aid.
- Thomas Fire, Santa Barbara (CA), 2017, Cosumnes Fire Department sent firefighters to assist with the extinguishment of the fire as mutual aid.
- Carr Fire, Shasta County (CA), 2018, Cosumnes Fire Department sent firefighters to assist with the extinguishment of the fire as mutual aid.
- Mendocino Fire, Colusa County, (CA), 2018, Cosumnes Fire Department sent firefighters to assist with extinguishment of the fire as mutual aid.
- Glass Fire, Santa Clara (CA), 2020, Cosumnes Fire Department sent firefighters to assist with the extinguishment of the fire as mutual aid.
- Creek Fire, Fresno County, (CA), 2020, Cosumnes Fire Department sent firefighters to assist with the extinguishment of the fire as mutual aid.

The eight Police Department mutual aid events listed above resulted in a total cost of $262,567.86 to the City of Elk Grove, with $178,886.98 being reimbursed. The Cosumnes Fire Department (CFD) receives almost 100% reimbursement from the state for strike team deployments, of which there were five during the period. The impact to CFD staff during the summer months due to these deployments are largely physical and mental fatigue. Throughout Camp Fire, Kincade Fire, and LNU Lightning Complex Fire, air quality was affected by smoke within the City and Police Department buildings, including within the 9-1-1 dispatch center. Over multiple weeks during these events the general public was instructed to remain indoors due to poor air quality.

Vulnerability to and Impacts from Wildfire

Fuel loads in the County and Cities, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. The more urbanized areas within the County are not immune from fire. The dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and City, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Elk Grove is not immune to numerous types of grass and brush fires and any one of them may accelerate into an urban interface wildfire. Such a situation could lead to evacuation of large portions of the population and the potential for significant loss of personal property, structures, and rangeland. The natural fuels available in or near the City vary greatly in the rate and intensity of burning. Fires in heavy brush and stands of trees burn with great intensity but more slowly than in dry grass and leaves. Dense fuels will propagate fire better than sparse fuels. There are several eucalyptus groves that exist in the Wilton area, at the south-east boundary with the City, that could pose a significant fire threat.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and timber; and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the City. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the City by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the City; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate a PSPS which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic

wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

The largest impact from fires in the City would be poor air quality.

Assets at Risk

Based on the vulnerability of Elk Grove to the wildfire hazard, the sections that follow describes significant assets at risk in the City of Elk Grove. This section includes the values at risk, population at risk, and critical facilities at risk.

Values at Risk in Fire Hazard Severity Zones

GIS was used to determine the possible impacts of wildfire within the City of Elk Grove. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire hazard severity zones. Summary analysis results for Elk Grove are shown in Table B-47, which summarizes total parcel counts, improved parcel counts and their structure values by fire hazard severity zone. Table B-48 breaks out the Table B-47 by adding the property use details by fire hazard severity zone for the City.

Table B-47 City of Elk Grove – Count and Value of Parcels by Fire Hazard Severity Zone

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate	4,626	4,096	$706,051,086	$1,660,424,981	$1,009,598,054	$3,376,074,109
Non-Wildland/Non-Urban	5,579	4,199	$824,296,197	$1,706,112,600	$931,174,201	$3,461,583,045
Urban Unzoned	45,379	43,514	$4,732,164,010	$12,988,437,567	$7,499,238,222	$25,219,839,740
Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table B-48 City of Elk Grove – Count and Value of Parcels by Fire Hazard Severity Zone and Property Use

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate						
Agricultural	4	2	$342,002	$81,932	$81,932	$505,866
Care/Health	7	3	$5,907,909	$10,620,008	$10,620,008	$27,147,925
Church/Welfare	13	12	$8,633,553	$46,514,661	$46,514,661	$101,662,875
Industrial	8	6	$5,440,287	$1,802,168	$2,703,253	$9,945,707
Miscellaneous	191	0	$462,407	$0	$0	$462,407

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Office	20	17	$15,499,494	$131,196,332	$131,196,332	$277,892,158
Public/Utilities	17	0	$54	$0	$0	$54
Recreational	2	2	$3,479,933	$13,940,482	$13,940,482	$31,360,897
Residential	4,041	3,991	$516,222,244	$1,298,636,452	$649,318,235	$2,464,176,920
Retail / Commercial	64	48	$62,108,660	$155,223,151	$155,223,151	$372,554,962
Unknown	0	0	$0	$0	$0	$0
Vacant	259	15	$87,954,543	$2,409,795	$0	$90,364,338
Moderate Total	**4,626**	**4,096**	**$706,051,086**	**$1,660,424,981**	**$1,009,598,054**	**$3,376,074,109**
Non-Wildland/Non-Urban						
Agricultural	14	5	$1,034,336	$1,157,380	$1,157,380	$3,349,096
Care/Health	1	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	1	0	$10	$0	$0	$10
Miscellaneous	251	0	$323,953	$0	$0	$323,953
Office	1	1	$2,767,116	$27,162,130	$27,162,130	$57,091,376
Public/Utilities	7	0	$9	$0	$0	$9
Recreational	3	0	$27	$0	$0	$27
Residential	4,181	4,144	$490,808,073	$1,537,341,350	$768,670,663	$2,796,820,133
Retail / Commercial	26	25	$56,502,262	$134,184,028	$134,184,028	$324,870,318
Unknown	0	0	$0	$0	$0	$0
Vacant	1,094	24	$272,860,411	$6,267,712	$0	$279,128,123
Non-Wildland/Non-Urban Total	**5,579**	**4,199**	**$824,296,197**	**$1,706,112,600**	**$931,174,201**	**$3,461,583,045**
Urban Unzoned						
Agricultural	1	0	$9	$0	$0	$9
Care/Health	28	24	$32,032,149	$142,344,099	$142,344,099	$316,720,347
Church/Welfare	38	35	$23,993,953	$84,569,665	$84,569,665	$193,133,283
Industrial	197	169	$94,985,848	$327,809,631	$491,714,438	$914,509,929
Miscellaneous	1,146	1	$579,504	$1,100	$1,100	$581,704
Office	305	278	$82,883,620	$372,875,747	$372,875,747	$828,635,114
Public/Utilities	48	0	$47	$0	$0	$47
Recreational	15	14	$10,341,358	$41,034,359	$41,034,359	$92,410,076
Residential	42,786	42,644	$4,105,644,216	$11,298,654,499	$5,649,327,372	$21,053,626,016

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Retail / Commercial	343	327	$270,744,417	$717,371,442	$717,371,442	$1,705,487,301
Unknown	1	1	$0	$127,600	$0	$127,600
Vacant	471	21	$110,958,889	$3,649,425	$0	$114,608,314
Urban Unzoned Total	**45,379**	**43,514**	**$4,732,164,010**	**$12,988,437,567**	**$7,499,238,222**	**$25,219,839,740**
Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Values at Risk in Fire Threat Areas

GIS was used to determine the possible impacts of wildfire within the City of Elk Grove. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire threat areas. Summary analysis results for Elk Grove are shown in Table B-49, which summarizes total parcel counts, improved parcel counts and their structure values by fire threat area. Table B-50 breaks out the Table B-49 by adding the property use details by threats areas for the City.

Table B-49 City of Elk Grove – Count and Value of Parcels by Fire Threat Area

Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	0	0	$0	$0	$0	$0
High	3	1	$64,995	$154,762	$77,381	$297,138
Moderate	552	275	$164,149,216	$255,300,118	$194,070,862	$613,520,201
Low	192	113	$38,024,306	$74,113,140	$55,684,179	$167,821,621
No Threat	54,837	51,420	$6,060,272,776	$16,025,407,128	$9,190,178,055	$31,275,857,934
Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table B-50 City of Elk Grove – Count and Value of Parcels by Fire Threat Area and Property Use

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
High						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Miscellaneous	2	0	$10	$0	$0	$10
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	1	1	$64,985	$154,762	$77,381	$297,128
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	0	0	$0	$0	$0	$0
High Total	**3**	**1**	**$64,995**	**$154,762**	**$77,381**	**$297,138**
Moderate						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	6	1	$10,587,857	$19,884,890	$19,884,890	$50,357,637
Church/Welfare	1	0	$29	$0	$0	$29
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	105	0	$152,914	$0	$0	$152,914
Office	4	4	$1,849,968	$81,946,711	$81,946,711	$165,743,390
Public/Utilities	7	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	271	260	$40,081,105	$121,758,517	$60,879,261	$222,718,888
Retail/ Commercial	23	9	$25,752,605	$31,360,000	$31,360,000	$88,472,605
Unknown	0	0	$0	$0	$0	$0
Vacant	135	1	$85,724,738	$350,000	$0	$86,074,738
Moderate Total	**552**	**275**	**$164,149,216**	**$255,300,118**	**$194,070,862**	**$613,520,201**
Low						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	1	1	$2,863,080	$5,652,593	$5,652,593	$14,168,266
Church/Welfare	1	1	$568,160	$4,054,589	$4,054,589	$8,677,338
Industrial	2	2	$496,453	$471,525	$707,288	$1,675,266
Miscellaneous	44	0	$388	$0	$0	$388
Office	5	4	$2,672,416	$8,994,543	$8,994,543	$20,661,502
Public/Utilities	2	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	99	99	$12,691,537	$36,043,454	$18,021,730	$66,756,717
Retail/ Commercial	4	4	$3,233,690	$18,253,436	$18,253,436	$39,740,562

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unknown	0	0	$0	$0	$0	$0
Vacant	34	2	$15,498,582	$643,000	$0	$16,141,582
Low Total	**192**	**113**	**$38,024,306**	**$74,113,140**	**$55,684,179**	**$167,821,621**
No Threat						
Agricultural	19	7	$1,376,347	$1,239,312	$1,239,312	$3,854,971
Care/Health	29	25	$24,489,121	$127,426,624	$127,426,624	$279,342,369
Church/Welfare	49	46	$32,059,317	$127,029,737	$127,029,737	$286,118,791
Industrial	204	173	$99,929,692	$329,140,274	$493,710,403	$922,780,380
Miscellaneous	1,437	1	$1,212,552	$1,100	$1,100	$1,214,752
Office	317	288	$96,627,846	$440,292,955	$440,292,955	$977,213,756
Public/Utilities	63	0	$110	$0	$0	$110
Recreational	20	16	$13,821,318	$54,974,841	$54,974,841	$123,771,000
Residential	50,637	50,419	$5,059,836,906	$13,976,675,568	$6,988,337,898	$26,024,850,336
Retail/ Commercial	406	387	$360,369,044	$957,165,185	$957,165,185	$2,274,699,414
Unknown	1	1	$0	$127,600	$0	$127,600
Vacant	1,655	57	$370,550,523	$11,333,932	$0	$381,884,455
No Threat Total	**54,837**	**51,420**	**$6,060,272,776**	**$16,025,407,128**	**$9,190,178,055**	**$31,275,857,934**
Elk Grove Total	**55,584**	**51,809**	**$6,262,511,293**	**$16,354,975,148**	**$9,440,010,477**	**$32,057,496,894**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Population at Risk

The FHSZ and Fire Threat dataset was overlayed on the parcel layer. Those residential parcel centroids that intersect the FHSZs and Fire Threat Areas were counted and multiplied by the 2010 Census Bureau average household factors for the City of Elk Grove – 3.20. According to this analysis, there is a total population of 12,771 residents of Elk Grove at risk to moderate or higher FHSZs, while there is a total of 833 in the moderate or higher fire threat areas. This is shown in Table B-51 and Table B-52, respectively.

Table B-51 City of Elk Grove – Count of Improved Residential Parcels and Population by Fire Hazard Severity Zone

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Elk Grove	0	0	0	0	3,991	12,771

Source: CAL FIRE, US Census Bureau Average Household Sizes: Citrus Heights (2.54); Sacramento City (2.66); Elk Grove (3.20); Folsom (2.63), Galt (3.16); Isleton (2.7), Rancho Cordova (2.14): and unincorporated Sacramento County (2.76)

Table B-52 City of Elk Grove – Count of Improved Residential Parcels and Population by Fire Threat Area

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Elk Grove	0	0	1	3	260	832

Source: CAL FIRE, US Census Bureau Average Household Sizes

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Elk Grove in identified FHSZs. Critical facilities in a FHSZ in the City of Elk Grove are shown in Figure B-28 and detailed in Table B-53. Critical facilities in a fire threat area in the City of Elk Grove are shown in Figure B-29 and detailed in Table B-54. Details of critical facility definition, type, name and address and jurisdiction by fire hazard severity zone are listed in Appendix F.

Figure B-28 City of Elk Grove – Critical Facilities in Fire Hazard Severity Zones

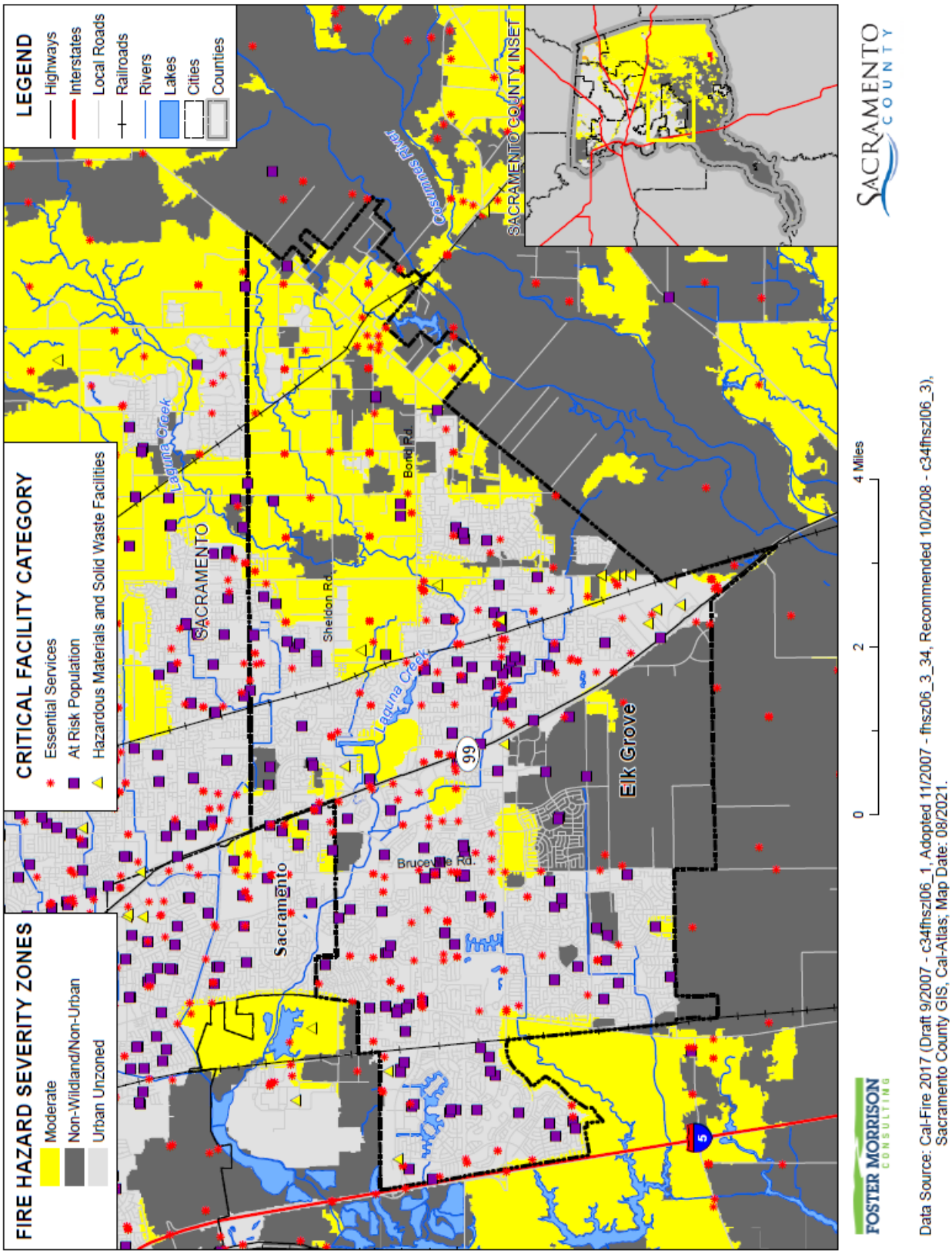


Table B-53 City of Elk Grove – Critical Facilities in Fire Hazard Severity Zones by Category and Type

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
Moderate		
Essential Services Facilities	Cellular Tower	2
	EMS Stations	1
	FDIC Insured Banks	4
	Fire Station	1
	Microwave Service Towers	13
	Water Well	61
	Total	**82**
At Risk Population Facilities	Day Care Center	2
	Places of Worship	1
	School	5
	Total	**8**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	2
	EPA ER TSCA Facility	2
	Solid Waste Facility	2
	Total	**6**
Moderate Total		**96**
Non-Wildland/Non-Urban		
Essential Services Facilities	Water Well	17
	Total	**17**
At Risk Population Facilities	Day Care Center	4
	Places of Worship	2
	School	9
	Total	**15**
Non-Wildland/Non-Urban Total		**32**
Urban Unzoned		
Essential Services Facilities	Emergency Evacuation Center	8
	EMS Stations	6
	FDIC Insured Banks	22
	Fire Station	5
	Hospital or Urgent Care	1
	Law Enforcement	2
	Microwave Service Towers	94
	Sewage Treatment Plant	1

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
	Water Well	80
	Total	**219**
At Risk Population Facilities	Day Care Center	30
	Mobile Home Parks	1
	Places of Worship	86
	School	31
	Total	**148**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	4
	EPA ER TSCA Facility	1
	Leaky Underground Storage Tank	4
	Solid Waste Facility	2
	Waste Transfer Station	1
	Total	12
Urban Unzoned Total		**379**
Elk Grove Total		**507**

Source: CAL FIRE, Sacramento County

Figure B-29 City of Elk Grove – Critical Facilities in Fire Threat Areas

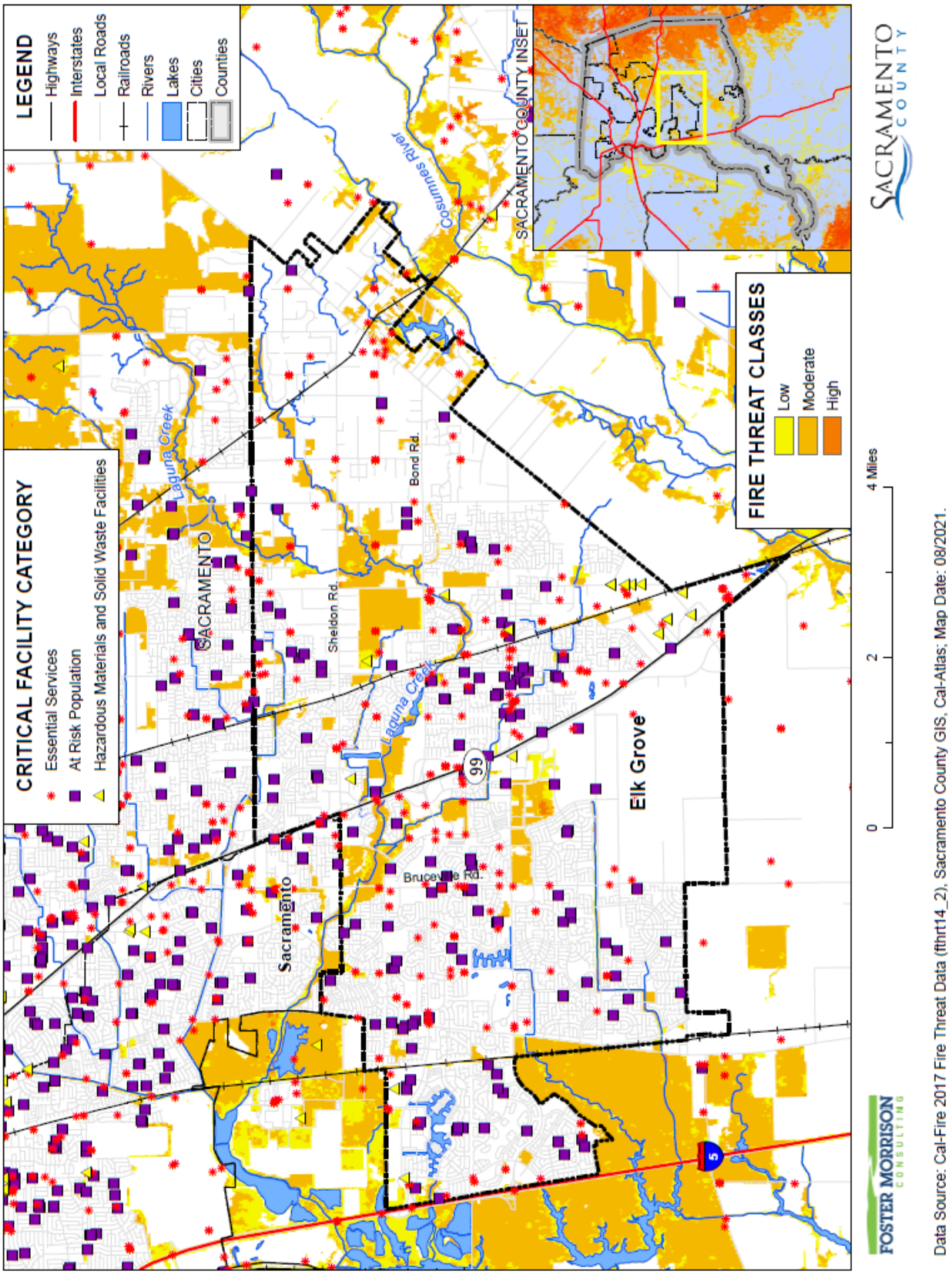


Table B-54 City of Elk Grove – Critical Facilities in Fire Threat Areas by Category and Type

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
Low		
Essential Services Facilities	Microwave Service Towers	2
	Water Well	1
	Total	**3**
Hazardous Materials and Solid Waste Facilities	Solid Waste Facility	1
	Total	**1**
Low Total		**4**
Moderate		
Essential Services Facilities	Water Well	24
	Total	**24**
At Risk Population Facilities	School	1
	Total	**1**
Moderate Total		**25**
No Threat		
Essential Services Facilities	Cellular Tower	2
	Emergency Evacuation Center	8
	EMS Stations	7
	FDIC Insured Banks	26
	Fire Station	6
	Hospital or Urgent Care	1
	Law Enforcement	2
	Microwave Service Towers	105
	Sewage Treatment Plant	1
	Water Well	133
	Total	**291**
At Risk Population Facilities	Day Care Center	36
	Mobile Home Parks	1
	Places of Worship	89
	School	44
	Total	**170**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	6
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	4
	Solid Waste Facility	3
	Waste Transfer Station	1
	Total	**17**

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
No Threat Total		**478**
Elk Grove Total		**507**

Source: CAL FIRE, Sacramento County

Future Development

Additional growth and development within moderate or higher fire hazard severity zones in the City would place additional values at risk to wildfire. City building codes are in effect and should continue to be updated as appropriate to reduce this risk. While there is additional growth and development within the City, none of this is in a moderate or high fire zone

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure B-30 shows the locations of future development areas the City is planning to develop on the FHSZs. Table B-55 shows the parcels and acreages of each future development area in the City in each FHSZ. Figure B-31 shows the locations of future development areas the City is planning to develop on the Fire Threat Area. Table B-56 shows the parcels and acreages of each future development area in the City in each Fire Threat Area.

Figure B-30 City of Elk Grove – FHSZs and Future Development Areas

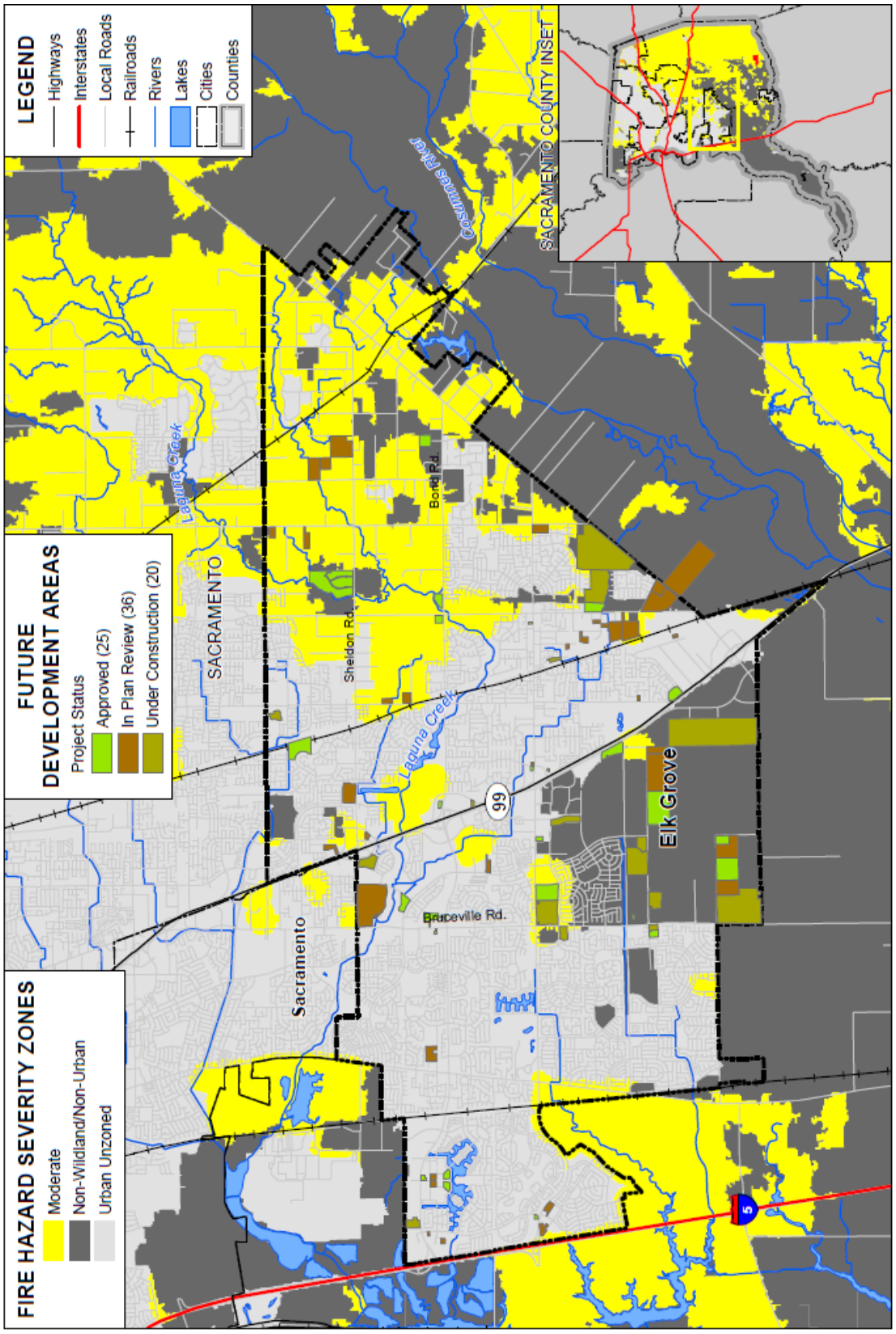


Table B-55 City of Elk Grove – FHSZs and Future Development Areas

Fire Hazard Severity Zone / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Moderate			
Approved			
Buffalo Wild Wings	1	0	1.0
Creekside Estates	1	0	7.0
Dignity Health Medical Campus	7	1	28.0
Sheldon Park Estates North Gated Community	1	1	1.8
Shell with 7-Eleven & Storage Facility	4	0	4.5
Approved Total	**14**	**2**	**42.4**
In Plan Review			
10075 Sheldon Road Tentative Parcel Map	1	1	35.3
8580 Bradshaw Road	1	0	8.3
8633 Bader Road Map	1	1	20.3
8651 Bader Road TPM and Rezone	1	1	10.0
Eden Gardens Banquet Hall	1	1	5.2
Elk Grove Muslim Center	2	1	6.9
In-N-Out Burger - The Ridge Pad 14	1	0	0.9
S&J Storage	1	0	4.3
In Plan Review Total	**9**	**5**	**91.3**
Under Construction			
Bruceville Point	1	1	4.8
Fieldstone North and South	1	0	0.2
The Ridge Shopping Center	20	8	39.6
Under Construction Total	22	9	44.7
Moderate Total	**45**	**16**	**178.4**
Non-Wildland/Non-Urban			
Approved			
Bond Road Rezone and Tentative Map	2	2	10.1
Crooked Creek Industrial Park	2	1	14.2
New Faze Skilled Nursing	1	0	15.1
Poppy Keys Southwest	3	0	60.2
Seasons at Stonebrook Master Home Plan	3	0	79.5
Sheldon Park Estates North Gated Community	27	8	70.0
Vineyard at Madeira Pad E	1	0	0.7
Approved Total	**39**	**11**	**250.0**
In Plan Review			

Fire Hazard Severity Zone / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Grant Line Construction Aggregate Production and Recycling Facility	1	0	24.8
Kubota Tractor Corporation	1	1	101.6
Mendes Villages 2 & 3	1	0	30.6
Mountain Elk Villas	1	0	12.1
Poppy Keys Southeast	4	0	66.5
Sheldon Farms MHP	2	0	80.9
Telos Greens TSM and Rezone	1	0	26.4
Tractor Supply Company	1	0	67.4
Triangle Point TSM Phase 2	1	0	67.4
In Plan Review Total	**13**	**1**	**477.8**
Under Construction			
Bruceville Meadows Residential	253	0	96.5
Fieldstone North and South	513	234	113.4
Fortune School	2	0	40.0
Madeira South (Poppy Lane)	221	92	35.1
Madeira South Lot A Master House Plans	1	0	10.6
McGeary Ranch	84	3	13.3
Mendes Subdivision	1	0	39.5
Milestone	126	29	45.5
Sheldon Farms North	1	0	43.8
Sterling Meadows	623	444	172.2
Under Construction Total	**1,825**	**802**	**609.8**
Non-Wildland/Non-Urban Total	**1,877**	**814**	**1,337.5**
Urban Unzoned			
Approved			
AAA Services Building	1	0	0.7
Arco AM/PM Car Wash Expansion	1	1	1.2
Elk Grove Masonic Lodge	1	0	0.7
GreenSpace Self Storage Facility	1	0	3.0
Laguna West Plaza Pads 1 & 2	2	0	1.6
Quail Run II	1	0	4.8
Raising Cane's Restaurant	1	1	1.7
Shell Gas Station	1	0	1.0
Target Exterior Remodel	1	1	10.1
T-Mobile Evergreen Springs	1	1	2.3
T-Mobile Jones Family Park	1	0	26.7

Fire Hazard Severity Zone / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Toscano Apartments	2	0	7.9
Trojan Storage II	1	0	8.9
U-Haul	4	0	10.2
Approved Total	**19**	**4**	**80.8**
In Plan Review			
10069 Elk Grove Florin Road TPM	1	1	1.1
9730 Kent Street Addition	1	0	1.3
Bartholomew Vineyard Amendment	1	1	10.3
Bow Stockton Apartments	2	1	5.6
Burger King Remodel	1	1	0.7
California Northstate University Medical Center	6	5	5.3
Candlewood Hotel	1	0	1.9
Elk Grove Food Bank	1	1	2.0
Elk Grove Independent Senior Housing	2	0	5.2
Hotel at Sheldon Place	1	0	2.3
Laguna Main Street Apartments	4	0	5.8
Laguna Springs Corporate Center - Building A	1	0	4.9
Life Storage Expansion	1	0	4.6
Sheldon Grove Subdivision	1	0	19.8
Tegan Estates	3	3	11.9
Warda Warehouse 3	1	0	1.5
Waterman Brinkman Logistics Center	3	1	21.6
Wendy's Remodel	1	1	0.8
In Plan Review Total	32	15	106.4
Under Construction			
Bruceville Point	1	0	3.5
Cafeteria Expansion	1	1	9.2
Calvine Pointe	1	0	7.1
Railroad Street	4	1	3.2
Sheldon Terrace	204	74	14.3
The Gardens at Quail Run	1	0	4.4
The Park Senior Housing	3	0	15.1
Towneplace Suites	1	1	1.7
Wienerschnitzel	1	0	0.4
Under Construction Total	**217**	**77**	**59.0**
Urban Unzoned Total	**268**	**96**	**246.2**

Fire Hazard Severity Zone / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Grand Total	**2,190**	**926**	**1,762.1**

Source: City of Elk Grove GIS, CAL FIRE

Figure B-31 City of Elk Grove – Fire Threat Areas and Future Development Areas

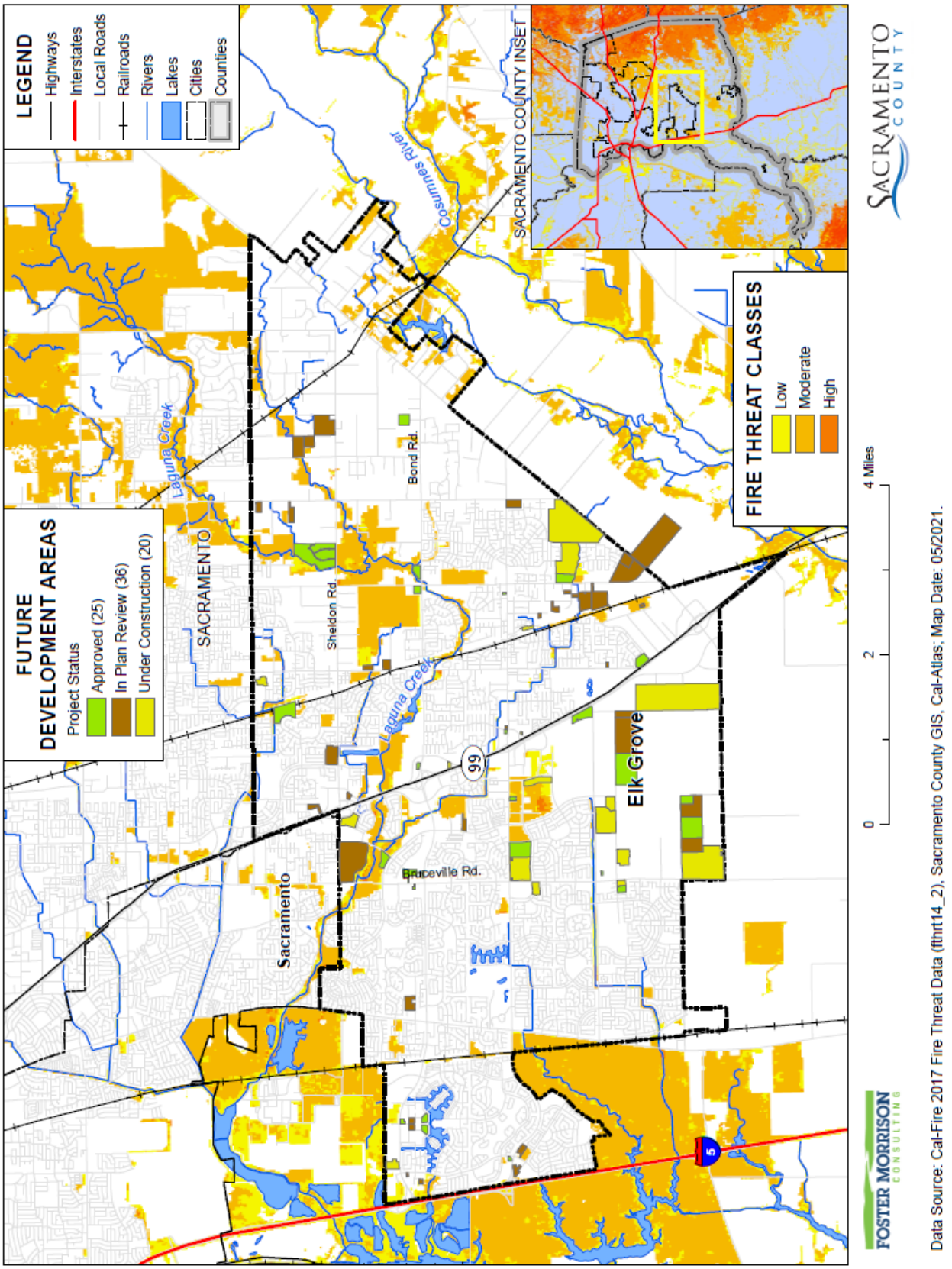


Table B-56 City of Elk Grove – Fire Threat Areas and Future Development Areas

Fire Threat / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Moderate			
Approved			
Buffalo Wild Wings	1	0	1.0
Creekside Estates	1	0	7.0
Dignity Health Medical Campus	3	0	21.5
T-Mobile Jones Family Park	1	0	26.7
Trojan Storage II	1	0	8.9
Approved Total	**7**	**0**	**65.1**
In Plan Review			
8651 Bader Road TPM and Rezone	1	1	10.0
Candlewood Hotel	1	0	1.9
Elk Grove Independent Senior Housing	2	0	5.2
In-N-Out Burger - The Ridge Pad 14	1	0	0.9
Laguna Springs Corporate Center - Building A	1	0	4.9
Sheldon Farms MHP	2	0	80.9
Warda Warehouse 3	1	0	1.5
In Plan Review Total	**9**	**1**	**105.3**
Under Construction			
Milestone	1	0	4.5
Sheldon Farms North	1	0	43.8
The Park Senior Housing	2	0	11.4
The Ridge Shopping Center	20	8	39.6
Under Construction Total	**24**	**8**	**99.3**
Moderate Total	**40**	**9**	**269.6**
Low			
Under Construction			
Milestone	7	1	2.7
The Park Senior Housing	1	0	3.8
Under Construction Total	**8**	**1**	**6.5**
Low Total	**8**	**1**	**6.5**
No Threat			
Approved			
AAA Services Building	1	0	0.7
Arco AM/PM Car Wash Expansion	1	1	1.2
Bond Road Rezone and Tentative Map	2	2	10.1

Fire Threat / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Crooked Creek Industrial Park	2	1	14.2
Dignity Health Medical Campus	4	1	6.5
Elk Grove Masonic Lodge	1	0	0.7
GreenSpace Self Storage Facility	1	0	3.0
Laguna West Plaza Pads 1 & 2	2	0	1.6
New Faze Skilled Nursing	1	0	15.1
Poppy Keys Southwest	3	0	60.2
Quail Run II	1	0	4.8
Raising Cane's Restaurant	1	1	1.7
Seasons at Stonebrook Master Home Plan	3	0	79.5
Sheldon Park Estates North Gated Community	28	9	71.9
Shell Gas Station	1	0	1.0
Shell with 7-Eleven & Storage Facility	4	0	4.5
Target Exterior Remodel	1	1	10.1
T-Mobile Evergreen Springs	1	1	2.3
Toscano Apartments	2	0	7.9
U-Haul	4	0	10.2
Vineyard at Madeira Pad E	1		0.7
Approved Total	**65**	**17**	**308.1**
In Plan Review			
10069 Elk Grove Florin Road TPM	1	1	1.1
10075 Sheldon Road Tentative Parcel Map	1	1	35.3
8580 Bradshaw Road	1	0	8.3
8633 Bader Road Map	1	1	20.3
9730 Kent Street Addition	1	0	1.3
Bartholomew Vineyard Amendment	1	1	10.3
Bow Stockton Apartments	2	1	5.6
Burger King Remodel	1	1	0.7
California Northstate University Medical Center	6	5	5.3
Eden Gardens Banquet Hall	1	1	5.2
Elk Grove Food Bank	1	1	2.0
Elk Grove Muslim Center	2	1	6.9
Grant Line Construction Aggregate Production and Recycling Facility	1	0	24.8
Hotel at Sheldon Place	1	0	2.3
Kubota Tractor Corporation	1	1	101.6
Laguna Main Street Apartments	4	0	5.8

Fire Threat / Future Development Status / Title	Total Parcel Count	Improved Parcel Count	Total Acres
Life Storage Expansion	1	0	4.6
Mendes Villages 2 & 3	1	0	30.6
Mountain Elk Villas	1	0	12.1
Poppy Keys Southeast	4	0	66.5
S&J Storage	1	0	4.3
Sheldon Grove Subdivision	1	0	19.8
Tegan Estates	3	3	11.9
Telos Greens TSM and Rezone	1	0	26.4
Tractor Supply Company	1	0	67.4
Triangle Point TSM Phase 2	1	0	67.4
Waterman Brinkman Logistics Center	3	1	21.6
Wendy's Remodel	1	1	0.8
In Plan Review Total	**45**	**20**	**570.2**
Under Construction			
Bruceville Meadows Residential	253	0	96.5
Bruceville Point	2	1	8.3
Cafeteria Expansion	1	1	9.2
Calvine Pointe	1	0	7.1
Fieldstone North and South	514	234	113.6
Fortune School	2	0	40.0
Madeira South (Poppy Lane)	221	92	35.1
Madeira South Lot A Master House Plans	1	0	10.6
McGeary Ranch	84	3	13.3
Mendes Subdivision	1	0	39.5
Milestone	118	28	38.3
Railroad Street	4	1	3.2
Sheldon Terrace	204	74	14.3
Sterling Meadows	623	444	172.2
The Gardens at Quail Run	1	0	4.4
Towneplace Suites	1	1	1.7
Wienerschnitzel	1	0	0.4
Under Construction Total	**2,032**	**879**	**607.7**
No Threat Total	**2,142**	**916**	**1,486.0**
Grand Total	**2,190**	**926**	**1,762.1**

Source: City of Elk Grove GIS, CAL FIRE

B.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

B.6.1. Regulatory Mitigation Capabilities

Table B-57 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Elk Grove.

Table B-57 City of Elk Grove Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y	General Plan The City's General Plan was first adopted in 2003 and was most recently updated in 2019. The Plan as currently adopted identifies a number of safety issues and concerns for the community and includes policies for addressing these issues. Implementation of the policies is deferred to subsequent plans. Storm Drainage Master Plan The City also has a Storm Drainage Master Plan, adopted in 2011 with a minor update completed in 2019, which identifies candidate stormwater drainage projects to address the existing deficiencies and future growth impacts on area drainage. These projects implement the mitigation strategy identified in this LHMP.
Capital Improvements Plan	Y	Capital Improvement Program The Capital Improvement Program is adopted annually by the City Council and identifies capital construction projects to be completed by the City over the coming five years. Many of the projects identified in the plan address potential hazards, such as flooding, heat, and air pollution. The Plan is an excellent approach to implementing mitigation actions. Title 21 Plans/Capital Improvement Program
Economic Development Plan	N	The City Council reviewed the Economic Development Work Plan at its regular meeting on June 22, 2016. Annually, an Economic Development report is presented to City Council. The Work Plan and the annual reports do not address hazards and are not an appropriate location to address mitigation actions.

Local Emergency Operations Plan	Y	The Emergency Operations Plan adopted in 2018 contains a hazard analysis summary and capability assessment. Six products from the capability assessment emerged which were: Participation in County Evacuation Planning, Investment in the Disaster Information Management System (WebEOC), Training and Exercises for Staff, Emergency Operations Center Annex, Recovery Guidance, and Debris removal. The first priority listed in the operational goals section of this plan is to mitigate hazards.
Continuity of Operations Plan	Y	The Emergency Operations Plan adopted in 2018 contains section 2.4 (Continuity of Government (COG) Operations, and 2.5 (Continuity of Operations (COOP). Both sections contain comprehensive information related to COG and COOP to ensure operations are continued during and after a disaster.
Transportation Plan	Y	The City's transportation plan is comprised of the maps and policies in the General Plan, along with other planning documents in the Bicycle, Pedestrian, and Trails, Master Plan, the ADA Transition Plan, and services plans for the City's transit service, e-Tran. Most of these plans do not address hazards as they are focused on the delivery of transportation infrastructure for the movement of goods, services, and people around and through the City. However, as this infrastructure is designed, best planning and engineering practices are applied to ensure that the improvements do not impact drainage ways, increase fire severity, or otherwise create a hazard to persons and property.
Stormwater Management Plan/Program	Y	The City's Storm Drainage Master Plan explains the City's Stormwater Management program, stormwater regulations and it includes flood mitigation projects Chapter 15.12 Stormwater Management and Discharge Control Storm Drainage Master Plan
Engineering Studies for Streams	Y	See Stormwater Management Plan/Program
Community Wildfire Protection Plan	N	The City is not in a wildfire hazard area; therefore no plan is required.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y 2013	The City adopted the most recent Climate Action Plan in 2019 to identify steps the City will take to address climate change. In addition, the City adopted a Community Mobility Resilience Plan in 2021 to provide a comprehensive set of strategies to mitigate and adapt to the impacts of climate change on our transportation network.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	2016/2019 Yes, codes are enforced by the City's Building Division.
Building Code Effectiveness Grading Schedule (BCEGS) Score	Y	Score: 2
Fire department ISO rating:	Y	Rating: 3/9 (urban/rural)

Site plan review requirements	Y	Since 2005 the City has had a discretional design review requirement for all new non-residential and multifamily construction over 1,000 square feet. Master home plans (track subdivisions) are also subject to design review.
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y 2006	The City's Zoning regulations are included in Title 23 of the Municipal Code. A comprehensive update was completed in 2006. The code is regularly reviewed and updated. Title 23 Zoning
Subdivision ordinance	Y	Title 22 Land Development The City recently adopted Flood Damage Prevention regulations as part of its Municipal Code. The regulations are modeled after the State's model ordinance for non-coastal communities. The regulation will implement policies in the General Plan relative to limiting development in the floodplain.
Floodplain ordinance	Y	The City adopted Chapter 16.50 - Flood Damage Prevention regulations as part of its Municipal Code. The regulations are modeled after the State's model ordinance for non-coastal communities. The regulation implements policies in the General Plan relative to limiting development in the floodplain.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	Chapter 15.12 Stormwater Management and Discharge Control Chapter 16.44 Land Grading and Erosion Control Chapter 16.50 Flood Damage Prevention Title 23 Zoning – Division III-Chapter 23.42
Flood insurance rate maps	Y	FEMA, recorded parcel maps and the City's GIS data.
Elevation Certificates	Y	Various sites throughout the City. During review of improvement plans, the Development Engineering team review and approve.
Acquisition of land for open space and public recreation uses	Y	General Plan EGMC 22.40 Bicycle, Pedestrian, and Trail Master Plan Storm Drainage Master Plan Laguna Ridge Specific Plan Southeast Policy Area
Erosion or sediment control program	Y	Chapter 16.44 Land Grading and Erosion Control
Other	Y	Chapter 17.04 Uniform Fire Code was adopted in 2019 which in turn adopts the California Fire Code.
How can these capabilities be expanded and improved to reduce risk?		
Continue to implement programs and update/enforce regulations.		

Source: City of Elk Grove

City of Elk Grove General Plan (2019)

The City of Elk Grove General Plan Program serves as the blueprint for future growth and development and provides comprehensive planning for the future. It encompasses what the City is now, and what it

intends to be, and provides the overall framework of how to achieve this future condition (see the discussion in Section 4.3.1 Growth and Development Trends).

The General Plan includes a Safety Element that focuses on safety issues to be considered in planning for the present and future development of the City Planning Area. Identified hazards include wildfire, geologic/seismic, flooding, and other natural and man-made hazards (such as hazardous materials).

The Services, Health, and Safety chapter contains goals and policies addressing the nine topics listed below, which are each assigned a one-, two-, or three-letter acronym. Within each topic, the following goals further the Community Vision and Supporting Principles. Mitigation-related goals are as follows:

- Disaster and Emergency Management (EM)
  - ✓ GOAL EM-1: Coordinated Disaster and Emergency Management3
- Disaster and Emergency Risk Reduction (ER)
  - ✓ GOAL ER-1: Minimal Risk from Accidental Release of Hazardous Materials
  - ✓ GOAL ER-2: Minimal Damage from Flooding and Drainage
  - ✓ GOAL ER-3: Minimal Risk from Geologic and Seismic Hazards
  - ✓ GOAL ER-4: Minimal Risk from Fire Hazards
  - ✓ GOAL ER-5: Safe Crossings and Goods Movement on Railroads
  - ✓ GOAL ER-6: An Adaptable and Resilient Community
- Disaster and Emergency Response and Public Safety (SAF)
  - ✓ GOAL SAF-1: A Safe Community
- Urban Infrastructure (INF)
  - ✓ GOAL INF-1: An Efficient Water Delivery and Storage System
  - ✓ GOAL INF-2: An Efficient Wastewater Collection and Treatment System
- Community Infrastructure and Facilities (CIF)
  - ✓ GOAL CIF-1: Minimal Solid Waste Generation
  - ✓ GOAL CIF-2: Coordinated Utility Infrastructure and Improvements
  - ✓ GOAL CIF-3: Elk Grove is a Leader in Innovative Technology Infrastructure
  - ✓ GOAL CIF-4: Schools Are an Integral Part of the Community
  - ✓ GOAL CIF-5: Community Facilities that Serve the Needs of the Community
- Infrastructure Financing and Phasing (IFP)
  - ✓ GOAL IFP-1: Infrastructure Improvement Costs Are Secured Prior to Development
- Community Health (HTH)
  - ✓ GOAL HTH-1: Healthy Living Options for Residents
- Community Services (CS)
  - ✓ GOAL CS-1: A Library System That Empowers Public Learning for Residents
  - ✓ GOAL CS-2: Services and Programs Support and Are Accessible to Children, Youth, and Seniors
- Noise (N)

- ✓ GOAL N-1: Sensitive Uses Are Protected from Noise Intrusion
- ✓ GOAL N-2: Community Noise Exposure is Minimized

Elk Grove Climate Action Plan (2019)

In December 2009, the City was awarded an Energy Efficiency and Conservation Block Grant (EECBG) from the United States Department of Energy. The City dedicated a portion of its EECBG funds to prepare the City's first CAP which was adopted by the City Council on March 27, 2013.

This document serves as the first update to the City's CAP and will support the current CAP implementation work being done at the City while providing new information and strategies to reduce the City's GHG emissions.

The purpose of the CAP is to identify how the City will achieve State-recommended targets of reducing GHG emissions to 1990 levels by 2020 and 40 percent below 1990 levels by 2030 pursuant to Assembly Bill (AB) 32 and Senate Bill (SB) 32. The CAP also demonstrates initial progress towards meeting the State's long-term 2050 goal of reducing emissions to 80 percent below 1990 levels as stated in Executive Order S-03-05. The CAP provides goals and associated measures, also referred to as GHG reduction strategies, in the sectors of energy use, transportation, land use, and solid waste.

City of Elk Grove Storm Drainage Master Plan

The City has developed a comprehensive Storm Drainage Master Plan (SDMP) to provide a variety of drainage concepts for upgrading the existing storm drainage and flood control collection system. The SDMP identifies and analyzes the existing drainage deficiencies throughout the City to provide a range of drainage concepts for the construction of future facilities required to serve the City at buildout of the General Plan; to establish criteria for selecting and prioritizing projects; and to utilize the SDMP for the potential development of a capital drainage financing program. The SDMP combines the demands of flood-risk reduction with ecosystem enhancements while incorporating urban development and rural residential land uses to provide an effective plan that will meet both the City's and community's vision. The SDMP was recently updated in 2019.

City of Elk Grove Capital Improvement Program

The Capital Improvement Program (CIP) includes all active projects and those expected to be undertaken during the coming five fiscal years. Specific projects and their scheduled completions were selected based on:

- Implementation of the City's General Plan;
- Existing traffic patterns and associated improvement needs;
- Projected traffic patterns, based on assumptions regarding the quantity and location of expected development;
- The need to establish a coherent roadway network, with strategic connections that distribute traffic flows efficiently;
- Minimizing disruptions associated with construction activity;
- Availability of funding; and
- City Council direction.

City of Elk Grove Emergency Operations Plan

The City's Emergency Operations Plan (EOP) establishes an Emergency Management Organization (EMO) and assigns functions and tasks consistent with California's Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS). It provides for the integration and coordination of planning efforts of multiple jurisdictions. This Plan was reviewed and approved by representatives from each City department, local special districts with emergency services responsibilities in the City, and the Sacramento Operational Area Office of Emergency Services. The content is based upon guidance approved and provided by the State of California, the Federal Emergency Management Agency and the federal Department of Homeland Security (DHS). The intent of the EOP is to provide direction on how to respond to an emergency from the initial onset, through an extended response, and into the recovery process.

City of Elk Grove Bicycle, Pedestrian and Trail Master Plan

The Bicycle, Pedestrian and Trails Master Plan (BPTMP or Master Plan) is intended to guide and influence pedestrian, bicycle, and trail policies, programs, and development standards to make biking and walking in the City of Elk Grove (City) more safe, comfortable, convenient, and enjoyable for all community members. The ultimate goal of the BPTMP is to increase the number of persons who walk and bicycle for transportation to work, school, and errands, and for recreation. The City seeks to have exemplary bicycle, pedestrian, and trail facilities that provide connectivity throughout the City and the wider Sacramento region in order to offer recreational opportunities and an alternative method for transportation for City residents.

B.6.2. Administrative/Technical Mitigation Capabilities

Table B-58 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Elk Grove.

Table B-58 City of Elk Grove's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	There are maintenance programs in place to reduce risks.
Mutual aid agreements	Y	California Master Mutual Aid Agreement, Law Enforcement Mutual Aid Agreement, Fire and Rescue Mutual Aid Agreement (via Cosumnes Fire District), Public Works Mutual Aid Agreement, County of Sacramento Operational Area Council, U.S. Army Corps of Engineers Rehabilitation Inspection PL84-99 Program, NFIP, County of Sacramento OES, County of Sacramento EMD
Other		Flood training, January 2016

Staff	Y/N FT/PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
Floodplain Administrator	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
Emergency Manager	Y PT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
Community Planner	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
Civil Engineer	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
GIS Coordinator	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Reverse 911, pump station alarms, Local Hazard Mitigation Plan, Debris Management Plan
Hazard data and information	Y	FEMA Floodplain maps, localized flooding maps
Grant writing	Y	Various departments provide grant writing efforts.
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The City's Public Works Department is converting eight positions, currently filled by consultants, to full-time City employees in the Engineering Services Division. This includes positions in the Traffic and Drainage Engineering Sections. Conversion to full-time City employees will ensure consistency and improved institutional knowledge for understanding and mitigating potential flooding and traffic hazards.		

Source: City of Elk Grove

B.6.3. Fiscal Mitigation Capabilities

Table B-59 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table B-59 City of Elk Grove's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	There are funding resources that have been used in the past and can be used in the future.
Authority to levy taxes for specific purposes	Y	There are funding resources that have been used in the past and can be used in the future.
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	There are funding resources that have been used in the past and can be used in the future.
Storm water utility fee	Y	There are funding resources that have been used in the past and can be used in the future.
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	N	
Community Development Block Grant	Y	There are funding resources that have been used in the past and can be used in the future.
Other federal funding programs	Y	FEMA, U.S. Army Corps of Engineers Rehabilitation Inspection PL84-99 Program
State funding programs	Y	Stormwater grant
Other		
How can these capabilities be expanded and improved to reduce risk?		
Continue to train staff, implement programs and enforce regulations.		

Source: City of Elk Grove

B.6.4. Mitigation Education, Outreach, and Partnerships

Table B-60 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table B-60 City of Elk Grove's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	Emergency preparedness and disaster education information provided at local neighborhood meetings and via social media
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Public meetings to address emergency preparedness and flood control operations. Information is also provided at local outreach events and via social media.

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Natural disaster or safety related school programs	Y	Earthquake and fire drills.
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	Y	Frequent training with regional partners such as SMUD, PG&E, County of Operational Emergency Services, Sacramento County Water Agency, CSD Fire and Department of Homeland Security
Other		
How can these capabilities be expanded and improved to reduce risk?		
Continue to train staff, implement programs and enforce regulations.		

Source: City of Elk Grove

B.6.5. Other Mitigation Efforts

The City has many other completed or ongoing mitigation projects/efforts that include the following:

- The City has participated in FEMA's Map Modernization Project and the requirements of Title 44 of the Federal Code of Regulations (CFR), Section 65.10 of the National Flood Insurance Program (NFIP) regulations to certify the Laguna West levee system. The Laguna West levee system meets the design, operation and maintenance criteria set forth 44 CFR Section 65.10. The City also participates in the U.S. Army Corps of Engineers Rehabilitation Inspection PL84-99 Program for non-federal levees and non-project levees.
- The City implements levee operation and maintenance activities, which provide maintenance recommendations and requirements for specific levee inspections and maintenance operations. Levee inspections and maintenance activities include vegetation control, rutting/depressions, erosion control, slope stability, cracking, rodent control, encroachments/excavation, riprap revetments/banks, closure structures, underseepage relief wells/toe drainage system, seepage/sandboils, debris removal, roadway crown, utilities, minor structures, and mosquito abatement.
- Certified the Laguna West levees to participate in the Map Moderation Program and to be in compliance with FEMA's 44 CFR Section 65.10 of the National Flood Insurance Program so that the federally subsidized flood insurance is available to the residents of the City;
- Adoption of resolution (#2007-189) that includes the City as an active member of the Sacramento Operational Area Council;
- Adoption of resolution (#25-2010) for compliance with SEMS/NIMS and certifies us as an "Accredited Disaster Council" to comply with the requirements of Cal OES;
- Mutual Aid Agreements with the following:
  - ✓ California Master Mutual Aid Agreement
  - ✓ Law Enforcement Mutual Aid Agreement
  - ✓ Fire and Rescue Mutual Aid Agreement (via Cosumnes Fire District)
  - ✓ Public Works Mutual Aid Agreement
  - ✓ Sacramento Operational Plan
- Social Media updates to inform the public of dangers and preventative steps to consider to mitigate any threats to their safety;

- Activated cooling and warming centers during extreme weather, as necessary;
- The Police Department's Problem Oriented Police Unit provides disaster education through neighborhood meetings or the Citizens Academy;
- Police Officers receive annual training on emergency response, including responses to local hazards or naturally created hazards;
- Disaster responses from the Police Department to Suburban Propane or the Sacramento Wastewater Treatment Plant;
- Development of a Disaster Debris Management Plan;
- Levee inspections through the U.S. Army Corps of Engineers Rehabilitation Inspection PL84-99 Program to ensure the City's levees are being properly maintained;
- Floodplain studies and LOMRs for new development projects and existing properties to be removed from the FEMA 100-year floodplain;
- Replacement of pump and electrical equipment for pump stations D50, D51, and D53 to protect public safety;
- Inspect and clean storm drainpipe on an annual basis to ensure system is operating in an efficient manner;
- Annual update of Storm Response and Flood Fighting Operation Plan to provide emergency information and support to City staff responding to both forecasted and actual storm events, and emergency information;
- Beaver Management Program to effectively address the challenges presented by beaver activity within the City's network of creeks, channels and storm drainage infrastructure to help prevent flooding;
- Requests and inquiries from the City's residents, businesses and insurance agents for flood zone information;
- Maintaining asset data in GIS to assist the City with planning, design, operation and maintenance efforts;
- Sandbag distribution during severe events to assist residents to protect their properties from flooding
- Drainage and floodplain easement information maintained in a GIS to assist the City with planning, design, operation and maintenance efforts;
- Public outreach efforts and education on emergency preparedness;
- Development of a comprehensive Storm Drainage Master Plan to provide a variety of drainage concepts for upgrading the existing storm drainage and flood control collection system to accommodate future development to serve the City at buildout of the General Plan; updated the SDMP in 2019.
- Identification of new and existing programs and activities that lay out a program level approach to holistically address vital function and values of drainage conveyance, flood control, aquatic resources and water quality that benefit public health and safety, minimize property damage and protect the environment; and
- The following flood mitigation projects were completed:
  - ✓ Emerald Vista Drive Storm Drain Improvements
  - ✓ Bradshaw/Sheldon Road Intersection Improvements
  - ✓ Blakemore Court and Hartwell Court Drainage Improvements
  - ✓ Storm Drain Pump Station Improvement Project
  - ✓ North Camden Drive Storm Drain Improvements
  - ✓ Sleepy Hollow Detention Basin Retrofit Project

B.7 Mitigation Strategy

B.7.1. Mitigation Goals and Objectives

The City of Elk Grove adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

B.7.2. NFIP Mitigation Strategy

The City of Elk Grove joined the National Flood Insurance Program (NFIP) on October 15, 2001. As a participant of the NFIP, the City of Elk Grove has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the City. The City of Elk Grove will continue to comply with the requirements of the NFIP in the future.

In addition, the City of Elk Grove actively participates with Sacramento County to address local NFIP issues through a regional approach. Many of the program activities are the same for the City of Elk Grove as for Sacramento County since participation at the County level includes all local jurisdictions.

The City of Elk Grove Public Works Department provides public outreach activities, which include map information services, public awareness, public hazard disclosure, and flood protection information. This information is readily available to the public and consists of current flood mapping. In addition, the Public Works Department provides information about the stormwater management program and up-to-date information related to the maintenance of the City's drainage system.

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS which are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The City of Elk Grove is not a current participant in the CRS program.

More information about the floodplain administration in the City of Elk Grove can be found in Table B-61.

Table B-61 City of Elk Grove Compliance with NFIP

NFIP Topic	Comments
Insurance Summary	
How many NFIP policies are in the community? What is the total premium and coverage?	1,002 policies $426,259 in premiums $337,426,500 in coverage
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	5 claims $103,027.75 in claims paid 0 substantial damage claims
How many structures are exposed to flood risk within the community?	269 in 1% annual chance 6,737 in 0.2% annual chance

NFIP Topic	Comments
Repetitive Loss (RL) and Severe Repetitive Loss Properties (SRL)	0 RL properties 0 SRL properties
Describe any areas of flood risk with limited NFIP policy coverage	No known areas.
Staff Resources	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	Yes, CFM certification has been attained
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	New development applications are routed to drainage staff for review. Staff reviews plans and also confirms that proposed developments are not located within SFHAs. FEMA floodplain information has been incorporated into the City's GIS database in addition to floodplain easement information. The City manages the flood control and flood preparedness webpages, which include a variety of flood related information. In addition, outreach information is provided at various events in the City.
What are the barriers to running an effective NFIP program in the community, if any?	There are minimal barriers to running an effective NFIP program. The community is fairly informed and educated regarding flooding concerns and the City has conducted various neighborhood workshops in the past. Education is key and the City will continue to educate the community regarding existing and potential flooding concerns.
Compliance History	
Is the community in good standing with the NFIP?	Y
Are there any outstanding compliance issues (i.e., current violations)?	N
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	CAV 7/27/2010
Is a CAV or CAC scheduled or needed?	Not scheduled
Regulation	
When did the community enter the NFIP?	10/15/2001
Are the FIRMs digital or paper?	Digital
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Yes, the regulations are modeled after the State's model ordinance for non-coastal communities. The regulation implements policies in the General Plan relative to limiting development in the floodplain. In addition, habitable structures are not allowed to be constructed in the SFHA.

NFIP Topic	Comments
Provide an explanation of the permitting process.	New development applications are submitted to the Development Services Division and applications are then routed to various Divisions in the City, including Public Works. PW staff reviews plans, confirms that proposed developments are not located within SFHAs and provides comments as necessary. Staff also tracks these reviews.
Community Rating System	
Does the community participate in CRS?	N
What is the community's CRS Class Ranking?	N/A
What categories and activities provide CRS points and how can the class be improved?	N/A
Does the plan include CRS planning requirements?	N/A

B.7.3. Mitigation Actions

The planning team for the City of Elk Grove identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Wildfire

After a review of capabilities and mitigation action alternatives, the following hazards were move to a low priority significance for mitigation action purposes:

- Earthquake
- Severe Weather: Extreme Cold and Freeze

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts

are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140). Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Safety Element of General Plan

Responsible Office: City of Elk Grove Planning Department

Priority (H, M, L): High

Cost Estimate: Jurisdictional board/staff time

Potential Funding: Local budgets

Benefits (avoided Losses): Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

Schedule: As soon as possible

Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Pandemic, Severe Weather: Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City and County play a key role in public outreach/education efforts to communicate the potential risk and vulnerability of their community to the effects of natural hazards. A comprehensive multi-hazard public education program will better inform the community of natural hazards of concern and actions the public can take to be better prepared for the next natural disaster event.

Project Description: A comprehensive multi-hazard outreach program will ascertain both broad and targeted educational needs throughout the community. The City will work with the County and other agencies as appropriate to develop timely and consistent annual outreach messages in order to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will leverage and build upon existing mechanisms.

Other Alternatives: Continue public information activities currently in place.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing County outreach programs will be reviewed for effectiveness and leveraged and expanded upon to reach the broader region.

Responsible Office: City of Elk Grove in partnership with the County

Participating Jurisdictions: County and all cities.

Priority (H, M, L): High

Cost Estimate: Annual costs to be determined, and will depend on the scope and frequency of activities and events as well as volunteer participation

Benefits (Losses Avoided): Increase residents' knowledge of potential hazards and activities required to mitigate hazards and be better prepared. Protect lives and reduce damages, relatively low cost to implement.

Potential Funding: Local budgets, grant funds

Timeline: Ongoing/Annual public awareness campaign

Action 3. Elk Grove Green Street Project: Repurposing Urban Runoff with Green Instructure Technologies

Hazards Addressed: Flood protection, Severe Weather: Heavy Rains and Storms, drainage deficiencies, water quality, habitat protection, education and outreach, and awareness and stewardship

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background:

- Reduce pollutant loads entering Elk Grove Creek and ultimately discharging into Stone Lakes National Wildlife Refuge and the Sacramento River - San Joaquin River Delta.
- Use pre-treated urban runoff for groundwater recharge.
- Protect riparian areas from further degradation.
- Reduce the risk of flooding by reducing runoff volumes and peak flows.

Project Description: The City prioritized a ½ mile section of major roadway for retrofit to repurpose stormwater as groundwater and provide other high-quality benefits in an impaired urbanized watershed. The Project will replace an outdated drainage system and impervious pavement with pervious materials and linear biofiltration planters connected to dry wells along the street frontage. The proposed green infrastructure will: 1) reduce pollutant loads entering Elk Grove Creek, which outfalls into the Stone Lakes National Wildlife Refuge and the Delta, 2) use pretreated urban runoff for groundwater recharge, and 3) provide flood protection. Assuming an average annual rainfall of 18", the 5.56 acre watershed will generate 6.84 acre-feet of stormwater for capture and infiltration. The Project, located on a major arterial that connects elementary, middle, and high schools will provide safer, enhanced pedestrian and bicycle access, traffic calming measures, and will enhance the City's Safe Routes to Schools Program

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The Green Street Project was identified in the Storm Drainage Master Plan.

Responsible Agency/ Department/Partners: City of Elk Grove, Public Works Department - Drainage

Cost Estimate: $5 million

Benefits (Losses Avoided): Reduce pollutant loads, impacts on groundwater supplies, riparian areas degradation, and reduce peak flows.

Potential Funding: Storm Drainage Utility Fee (Drainage Fund) and Grants

Timeline: Unknown

Project Priority (H, M, L): M

Action 4. Mutual Aid Agreements

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Pandemic, Severe Weather: Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Mutual aid agreements are necessary to be in place if a disaster occurs to provide integration and coordination of planning efforts for multiple jurisdictions. The intent of these agreements is to provide direction on how to respond to an emergency from the initial onset, through to extended response, and into the recovery process. Disasters know no boundaries and other emergency agencies are needed to help with emergency response.

Project Description: Ensure that Mutual Aid Agreements are in place such as: California Master Mutual Aid Agreement, Law Enforcement Mutual Aid Agreement, Fire and Rescue Mutual Aid Agreement (via Cosumnes Fire District), Public Works Mutual Aid Agreement, County of Sacramento Operational Area Council, U.S. Army Corps of Engineers Rehabilitation Inspection PL84-99 Program, NFIP, County of Sacramento OES, and County of Sacramento EMD.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: General Plan (Safety Element), Emergency Operation Plan, Storm Drainage Master Plan

Responsible Agency/ Department/Partners: City of Elk Grove, Public Works Department - Drainage; City of Elk Grove Police Department

Cost Estimate: Unknown

Benefits (Losses Avoided): Assistance with emergency response from other agencies.

Potential Funding: No funding is necessary to establish Mutual Aid Agreements. However, funding sources related to mutual aid responses, associated with Mutual Aid Agreements typically come from the requesting agency or from funds at the State or Federal level.

Timeline: On-going

Project Priority (H, M, L): High

Action 5. City of Elk Grove's Storm Drainage Master Plan (SDMP)

Hazards Addressed: Drought and Water Shortage, Flood protection, Severe Weather: Heavy Rains and Storms, drainage deficiencies, water quality, habitat protection, education and outreach, and awareness and stewardship

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background:

- Protect the value and function of the public storm drainage and flood control systems infrastructure and extend its useful life.
- Improve the storm drainage and flood control systems by incorporating features that promote water quality, groundwater recharge, and habitat protection, whenever feasible.
- Foster awareness and stewardship of water quality and aquatic ecosystems.
- Comply with applicable local, state and federal laws and regulations.

Project Description: The SDMP was developed to provide a variety of drainage concepts for upgrading the existing storm drainage and flood control collection system (Drainage System). The SDMP identifies and analyzes the existing drainage deficiencies throughout the City; provides a range of drainage concepts for the construction of future facilities required to serve the City at buildout of the General Plan; and establishes criteria for selecting and prioritizing projects. Furthermore, the SDMP may be utilized for the development of a capital drainage financing program. The SDMP combines the demands of flood-risk reduction with ecosystem enhancements while incorporating urban development and rural residential land uses to provide an effective plan that will meet both the City's and community's vision. A Minor Update to the SDMP was completed in 2019; the main purpose of the update was to provide a summary of projects completed since 2011, provide details regarding remaining projects, including implementation costs and schedules (if available), and provide information regarding new regulatory requirements related to stormwater management and flood control.

Other Alternatives:

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implement the programs and projects identified in the SDMP

Responsible Agency/ Department/Partners: City of Elk Grove, Public Works Department - Drainage

Cost Estimate: Unknown

Benefits (Losses Avoided): Avoids flooding, degradation of water quality, and impacts on groundwater supplies.

Potential Funding: Storm Drainage Utility Fee (Drainage Fund), Sacramento County Zone 11A fee (Drainage Impact Fee Program), and Grants

Timeline: None

Project Priority (H, M, L): H

Action 6. Create a Climate-Smart Stormwater Management System

Hazards Addressed: Climate Change, Flood protection, drainage deficiencies, water quality, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background:

- Increase stormwater infrastructure capacity
- Climate change is likely to result in changes in precipitation patterns, with increases in the intensity of large storm events
- Atmospheric river phenomenon, and other events that bring significant fractions of annual average precipitation over a brief period of time, are likely to increase
- Current infrastructure standards are not updated with modeling to take into consideration these more intense storm events

Project Description: This work would include several items. 1) Work with Sacramento County to conduct appropriate analysis and begin the process to update the intensity, duration, and frequency curves used in stormwater infrastructure standards used for managing localized runoff and precipitation events. Incorporate updated modeling in standards for new development in the City, including capital improvement projects and the City's Storm Drainage Master Plan. 2) Develop a comprehensive list of existing stormwater and drainage facilities that are at increased risk from failure or loss of performance from increases in the intensity of storm events. 3) Explore opportunities to add redundancy to the City's existing stormwater and flood management systems (e.g., additional detention basins) to mitigate impacts from increased storm intensities as needed. 4) Explore and identify feasible strategies (e.g., riprap, hardening) to mitigate scour for bridges. Identify critical bridges (e.g., high-volume roadways) and prioritize improvements to these bridges to prevent scour and asset failure.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Storm Drainage Master Plan, City Construction Specifications and Improvement Standards, Sacramento County Hydrology Standards

Responsible Agency/ Department/Partners: City of Elk Grove, Development Services and Public Works Departments

Cost Estimate: $300,000 (for the study)

Benefits (Losses Avoided): Increase preparedness for large flood events

Potential Funding: Storm Drainage Utility Fee (Drainage Fund), Sacramento County Zone 11A fee (Drainage Impact Fee Program), and Grants

Timeline: None

Project Priority (H, M, L): M

Action 7. Implement a Comprehensive and Climate-Smart Green Infrastructure Strategy

Hazards Addressed: Climate Change, Drought and Water Shortage, Extreme heat, Flooding, Drainage, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background:

- Climate change is likely to result in changes in precipitation patterns and increases in extreme heat events.
- Current infrastructure standards are not sufficient to mitigate the impacts of climate change and need to be updated to adapt to the realities of climate change.
- Climate-smart green infrastructure will improve the City's ability to reduce the impact of climate change (extreme heat and flooding) and recover following hazard events.

Project Description: Implement a climate-smart green infrastructure to mitigate and adapt to the impacts of climate change. This project would include several actions, including: 1) updating City Standards to require larger land development projects to incorporate principles of green infrastructure (e.g., bioswales, permeable pavements, rain gardens, linear parks, green roofs), which help mitigate the UHI effect in the City; 2) increase tree planting with a focus on carbon sequestration and environmental justice; and 3) update the City's Municipal Code and other design guidelines to incorporate strategies to mitigate future increases in temperature and extreme heat events and mitigate the UHI effect in new development.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Municipal Code, Design Standards and Protocols

Responsible Agency/ Department/Partners: City of Elk Grove, Development Services and City Managers Departments

Cost Estimate: $7.4 million

Benefits (Losses Avoided): Increase evapotranspiration and reduce heat-absorbing surfaces

Potential Funding: General Funds, Measure A Transportation sales tax and mitigation fee and Grants

Timeline: None

Project Priority (H, M, L): M

Action 8. Upgrade the City's Laguna West Levee System to Mitigate Climate-Related Flood Impacts

Hazards Addressed: Climate Change, Flood, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background:

- California requires the 200-year floodplain to be considered in zoning and development regulations.

- The current Laguna West levee system can meet the FEMA 100-year floodplain but would need upgrades to provide full protection for the 200-year floodplain.
- Comply with applicable local, state, and federal laws and regulations.

Project Description: This project would work to develop policies to finance, plan, and construct infrastructure improvements to the Laguna West levee system to increase the City's resilience to large-scale flooding events. The Laguna West levee system is accredited by FEMA as meeting 100-year storm event standards and provides protection to the Laguna West and Lakeside areas. However, the system would need to be raised an average of 3.5 feet to comply with the State 200-year flood protection standard and relieve new development of addition development obligations.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Responsible Agency/ Department/Partners: City of Elk Grove, Public Works Department

Cost Estimate: $30.8 million

Benefits (Losses Avoided): Increase preparedness for large flood events

Potential Funding: Storm Drainage Utility Fee (Drainage Fund), Sacramento County Zone 11A fee (Drainage Impact Fee Program), and Grants

Timeline: None

Project Priority (H, M, L): H

Action 9. Establish a Resilient Pedestrian and Bicycle Infrastructure Network

Hazards Addressed: Climate Change, Extreme heat

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background:

- Climate change is likely to result in changes in precipitation patterns and increases in extreme heat events.
- The current infrastructure network for pedestrians and cyclists is not sufficient to mitigate the impacts of climate change, in particular for extreme heat.
- Pedestrians and cyclists are particularly vulnerable during extreme heat and providing a network that is able to adapt to extreme heat would allow the network to continue to be utilized during heat events.
- The pedestrian and bicycle network could be used to assist in mitigating the impact of extreme heat through increasing tree canopy and high-albedo surfaces throughout the network.

Project Description: Incorporate projections of future extreme heat impacts into the design and development of pedestrian and bicycle infrastructure in the City. Identify opportunities to upgrade existing

bicycle and pedestrian infrastructure to mitigate future extreme heat impacts and ensure comfort for users (e.g., tree canopy, high-albedo surfaces).

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Bicycle, Pedestrian, and Trails Master Plan: Design Standards and Protocols

Responsible Agency/ Department/Partners: City of Elk Grove, Development Services and Public Works Departments

Cost Estimate: $9.4 million

Benefits (Losses Avoided): Increase resilience of pedestrian and bicycle infrastructure, ensure continued ability to use pedestrian and bicycle infrastructure during heat events

Potential Funding: Active Transportation Fee, Local Transportation Funds, Measure A Transportation sales tax and mitigation fee and Grants

Timeline: None

Project Priority (H, M, L): M

Annex C City of Folsom

C.1 Introduction

This Annex details the hazard mitigation planning elements specific to the City of Folsom, a previously participating jurisdiction of the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to Folsom, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

C.2 Planning Process

As described above, Folsom followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table C-1. Additional details on Plan participation and City representatives are included in Appendix A.

Table C-1 City of Folsom – Planning Team

Name	Position/Title	How Participated
Ryan Neves	Senior Civil Engineer – Public Works	Reviewed draft LHMP and provided input. Coordinated review within the City. Attended coordination and planning meetings.
Dave Nugen	Director – Public Works	Reviewed draft LHMP and provided input
Ken Cusano	Fire Chief	Reviewed draft LHMP and provided input
Scott Zangrando	Building Official – Community Development	Reviewed draft LHMP and provided input

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the City integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the City incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table C-2.

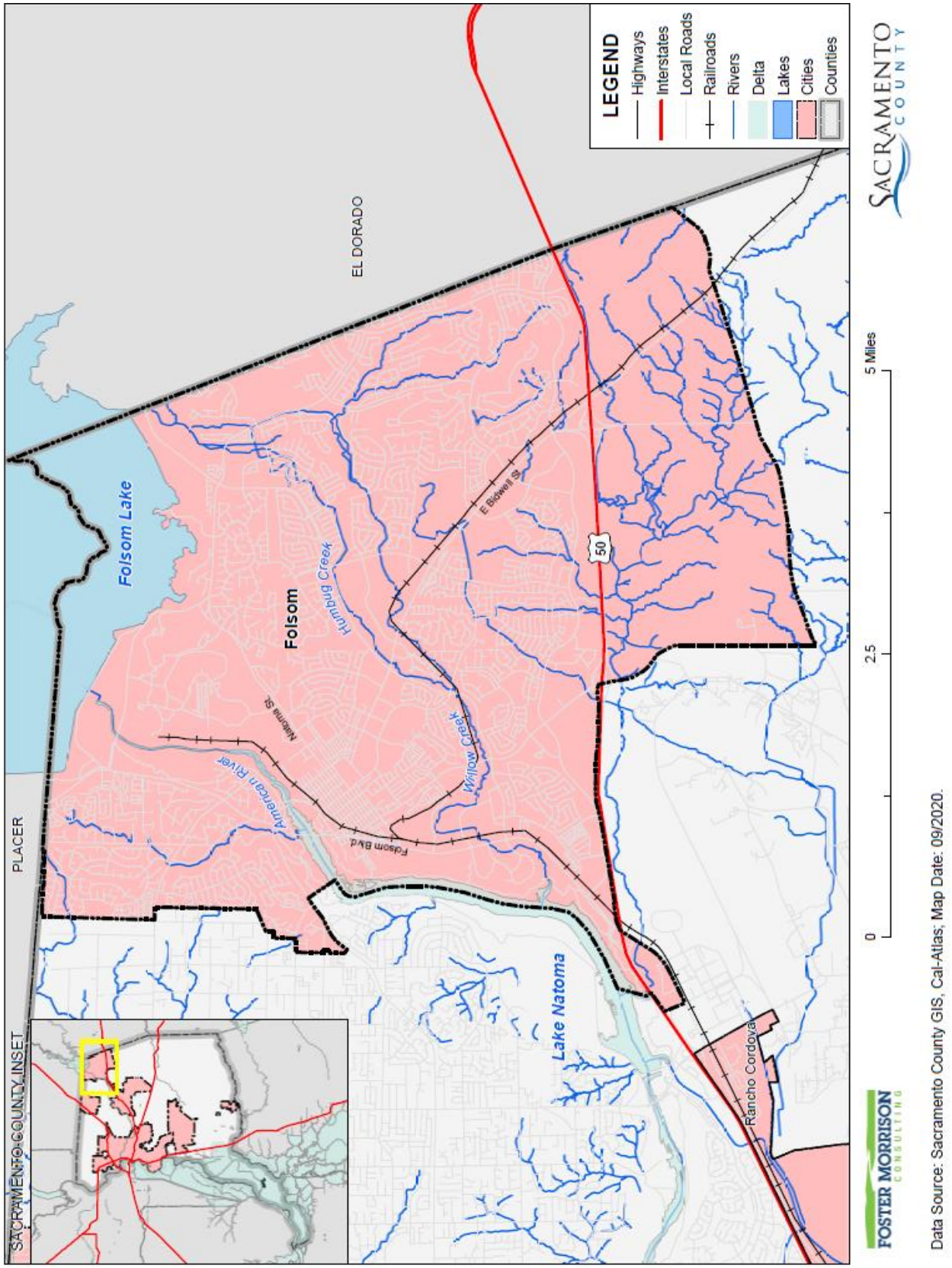
Table C-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
General Plan	The Safety Element was updated in 2021 and includes elements and references to the LHMP
Emergency Operations Plan	The EOP was updated in 2020 and includes elements of the LHMP
Capital Improvement Program	Constructed/implemented several projects identified in the LHMP

C.3 Community Profile

The community profile for the City of Folsom is detailed in the following sections. Figure C-1 displays a City map and the location of Folsom within Sacramento County.

Figure C-1 City of Folsom



C.3.1. Geography and Climate

Folsom is located about 25 miles east of California's state capitol in Sacramento, 85 miles from Lake Tahoe and 110 miles from San Francisco. Residents have access to Sacramento International Airport and air cargo operations at Mather Field Airport. Folsom has direct access to Highway 50 with three interchanges. Highway 50 connects to Interstate 5 and Interstate 80. The Folsom Lake Crossing, a new bridge across the American River below Folsom Dam, opened in March 2009 helping to relieve local traffic between El Dorado and Placer counties. Public transportation includes light rail service from Folsom to Sacramento. Local bus service connects Folsom's three light rail stations to major employment centers and other points of interest. Amtrak Rail service is available from downtown Sacramento.

Folsom enjoys mild winters that are cool and moist with some fogs and Mediterranean summers that are clear, hot, and dry. This climate is ideal for temperate fruit and nut crops, as well as some wine grapes and cold hardy citrus. Folsom's average temperature varies from low temperatures of 37 to 60 degrees to high temperatures of 53 to 94 degrees. Annual rainfall averages 23 inches per year falling primarily from November through March. Elevation is 350 feet.

C.3.2. History

Folsom is famous across the country thanks to a country song about a prison recorded by Johnny Cash in 1956. The City's rich history actually began more than a century earlier with California's great Gold Rush and arrival of the railroad. Gold was first discovered along the south bank of the American River in the area known as Negro Bar. The discovery led to massive gold mining operations, as well as a need for rail service.

In 1847, William Leidesdorff, a successful trader who owned a prosperous shipping business, traveled to Sacramento by steamboat to see the 35,000 acres he had purchased years earlier. His land holdings extended from today's Bradshaw Road along the south side of the American River to the present City of Folsom. That same year, U.S. Army Captain Joseph Folsom's regiment arrived in California. At the conclusion of the Mexican-American War, Folsom remained in the state and became interested in purchasing the land that Leidesdorff had left to his heirs following his death in 1848.

After a long fight to obtain the land, Folsom hired fellow railroad pioneer Theodore Judah to help establish a town site near the Negro Bar mining spot on the American River. Their early plans included shops along Sutter Street and a railroad depot. Folsom named the new town "Granite City." Judah and Folsom planned the town as a railroad terminus before there were railroads in California. Though Folsom didn't live to see it, his dream came true on Feb. 22, 1856 when the first train on the first railroad in the West arrived in Folsom from Sacramento.

Following Folsom's death at the age of 38, his successors renamed the town in his memory. By January 1856, every lot had been sold, and three new hotels were open in the town known as Folsom. Several decades later, construction began on Folsom Prison. Inmates helped construct the facility, which opened in 1880 when the first prisoners were moved to relieve over-crowding at San Quentin.

Following construction of the Folsom Powerhouse, Folsom made history in 1895 with the first long-distance transmission of electricity (22 miles from Folsom to Sacramento). The Powerhouse helped usher in the age of electricity with this notable accomplishment. The City's historic truss bridge was completed in 1893 to transport people, cattle and small vehicles across the American River. In 1917, the Rainbow Bridge opened to accommodate automobiles. It was the only option for crossing the river until the Lake Natoma Crossing opened in 1999.

Following a campaigned spearheaded by the Chamber of Commerce in 1946, Folsom became a city. The final vote was 285 in favor of incorporation and 168 opposed. Members of the first City Council were Leland Miller, Harry Patton, Eugene Kerr, Wendell Van Winkle and Norbert Relvas. Hazel McFarland was elected city clerk and Wilma Hoxie was the first treasurer. Council members elected Eugene Kerr as the City's first mayor.

C.3.3. Economy and Tax Base

US Census estimates show economic characteristics for the City of Folsom. These are shown in Table C-3 and Table C-4. Mean household income in the City was $146,144. Median household income in the City was $119,824.

Table C-3 City of Folsom – Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	80	0.2%
Construction	2,712	6.7%
Manufacturing	4,387	10.8%
Wholesale trade	2,436	6.0%
Retail trade	3,255	8.0%
Transportation and warehousing, and utilities	1,609	4.0%
Information	648	1.6%
Finance and insurance, and real estate and rental and leasing	3,890	9.6%
Professional, scientific, and management, and administrative and waste management services	6,465	15.9%
Educational services, and health care and social assistance	8,145	20.0%
Arts, entertainment, and recreation, and accommodation and food services	2,855	7.0%
Other services, except public administration	1,001	2.5%
Public administration	3,222	7.9%

Source: US Census Bureau American Community Survey 2019 Estimates

Table C-4 City of Folsom – Income and Benefits

Income Bracket	Percent
<$10,000	3.1%
$10,000 – $14,999	2.6%

Income Bracket	Percent
$15,000 - $24,9999	3.3%
$25,000 – $34,999	3.1%
$35,000 – $49,999	4.2%
$50,000 – $74,999	10.4%
$75,000 – $99,999	13.5%
$100,000 – $149,999	20.1%
$150,000 – $199,999	18.0%
$200,000 or more	21.7%

Source: US Census Bureau American Community Survey 2019 Estimates

Major employers include Intel Corporation, Folsom-Cordova Unified School District, Mercy Hospital, Kaiser Permanente, Maximus, Verizon, Costco, Walmart, Folsom State Prison, Home Depot, Target, Lowe's, Safe Credit Union, Trader Joe's, Kohl's, Best Buy, Winco, REI, Sam's Club, Cal-ISO, the City of Folsom, and Micron Technology.

The City has a wide and varied tax base. Tax base information is tracked and maintained by the Sacramento County Assessor's Office. The following tables show the tax base for the City. **Error! Reference source not found.** shows the secured real property value for the City of Folsom **Error! Reference source not found.** breaks out the City by land use.

C.3.4. Population

The California Department of Finance estimated the January 1, 2020 total population for the City of Folsom was 81,610.

C.4 Hazard Identification

Folsom identified the hazards that affect the City and summarized their location, extent, likelihood of future occurrence, potential magnitude, and significance specific to Folsom (see Table C-5).

Table C-5 City of Folsom—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Significant	Likely	Critical	Medium	–
Dam Failure	Significant	Unlikely	Critical	High	Medium
Drought & Water Shortage	Extensive	Occasional	Limited	Medium	High
Earthquake	Extensive	Unlikely	Catastrophic	Low	Low
Earthquake Liquefaction	Limited	Unlikely	Limited	Low	Low
Floods: 1%/0.2% annual chance	Significant	Occasional	Critical	Medium	Medium
Floods: Localized Stormwater	Limited	Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Limited	Low	Medium
Levee Failure	–	–	–	–	–
Pandemic	Extensive	Likely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Medium	Low
Subsidence	Limited	Unlikely	Limited	Low	Low
Volcano	–	–	–	–	–
Wildfire	Significant	Likely	Critical	Medium	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

C.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile Folsom's hazards and assess the City's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City is included in this Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards ranked of medium or high significance specific to the City (as identified in the Significance column of Table C-5) and also includes a vulnerability assessment to the three primary hazards to the State of California: earthquake, flood, and wildfire. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

C.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section C.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

C.5.2. Vulnerability Assessment and Assets at Risk

This section identifies Folsom's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

Values at Risk

The following data from the Sacramento County Assessor's Office is based on the 2020 Assessor's data. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitations are created by Proposition 13 and the Williamson Act as detailed in the Base Plan. With respect to Proposition 13, instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is most likely low and does not reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table C-6 shows the 2020 Assessor's values and content replacement values (e.g., the values at risk) broken down by property type for the City.

Table C-6 City of Folsom – Total Values at Risk by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	11	0	$57,801,677	$0	$0	$57,801,677
Care/Health	34	29	$33,795,033	$198,980,587	$198,980,587	$431,756,207
Church/Welfare	45	29	$10,534,820	$65,039,087	$65,039,087	$140,612,994
Industrial	50	35	$38,997,520	$130,857,414	$196,286,124	$366,141,056
Miscellaneous	1,229	1	$9,624,001	$37,884	$37,884	$9,699,769
Office	297	273	$194,343,450	$950,222,540	$950,222,540	$2,094,788,530
Public/Utilities	70	0	$27	$0	$0	$27
Recreational	20	14	$24,803,005	$78,052,297	$78,052,297	$180,907,599
Residential	23,183	22,858	$3,252,005,854	$8,238,222,337	$4,119,111,248	$15,609,339,393
Retail/ Commercial	373	353	$349,192,345	$921,809,268	$921,809,268	$2,192,810,881
Unknown	1	1	$0	$104,300	$0	$104,300
Vacant	1,745	21	$467,496,112	$3,031,956	$0	$470,528,068
Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**

Source: Sacramento County 2020 Parcel/Assessor's Data

Critical Facilities and Infrastructure

Critical facilities and infrastructure are those buildings and infrastructure that are crucial to a community. Should these be damaged, it makes it more difficult for the community to respond to and recover from a disaster. For purposes of this plan, a critical facility is defined as:

> *Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities. Critical facilities for the City are shown on Figure C-2 and contained in Table C-7.

Figure C-2 City of Folsom – Critical Facilities

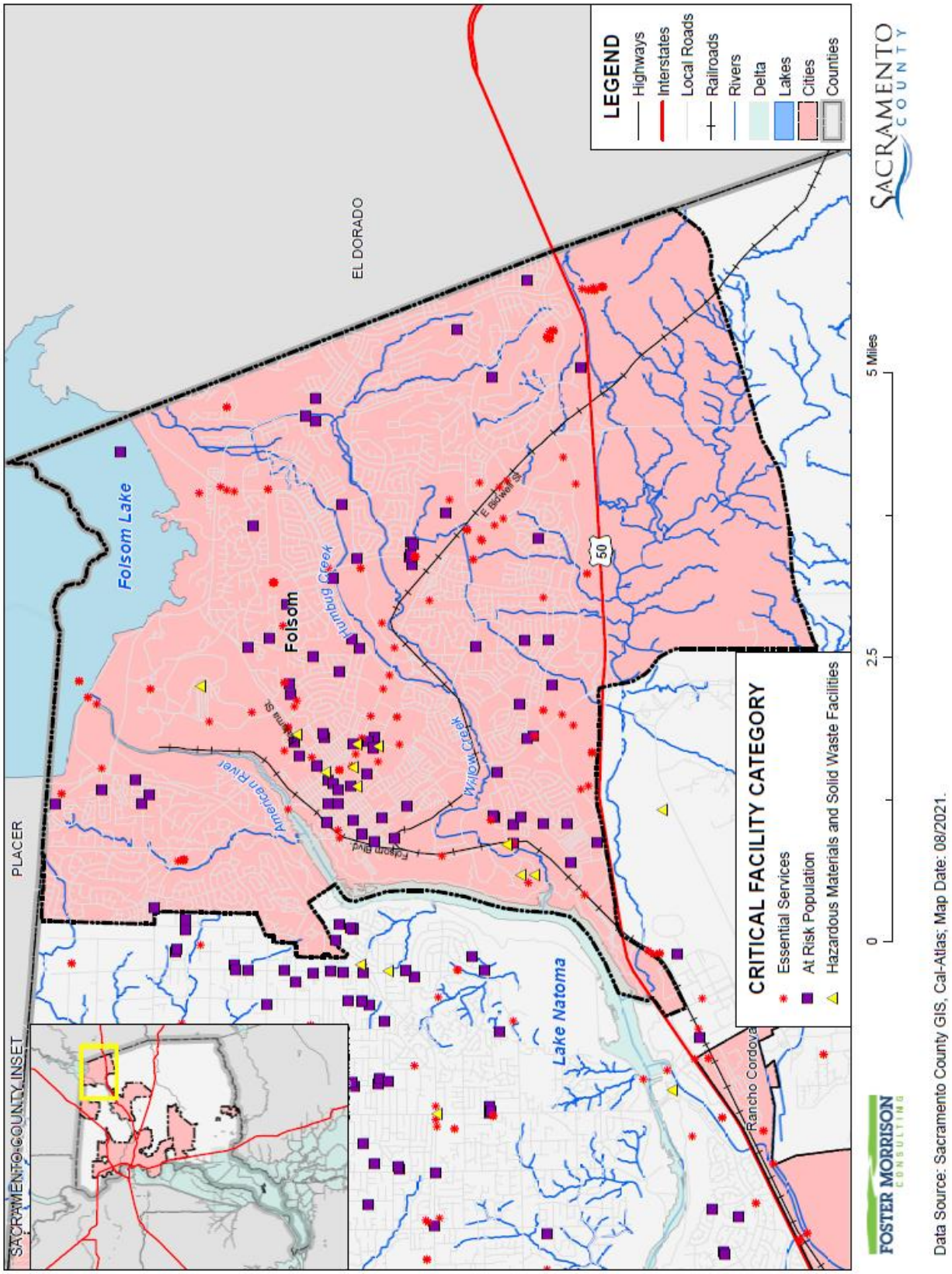


Table C-7 City of Folsom – Critical Facilities by Category and Type

Critical Facility Category	Critical Facility Type	Facility Count
Essential Services Facilities	Bridge	1
	Cellular Tower	7
	Emergency Evacuation Center	4
	FDIC Insured Banks	19
	Fire Station	5
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	86
	Power Plants	5
	Public Transit Stations	3
	Water Well	14
	Total	**152**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	1
	Community Center	1
	Day Care Center	13
	Mobile Home Parks	6
	Places of Worship	40
	School	28
	Total	**89**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	8
	Total	**10**
Folsom Total		**251**

Source: City of Folsom

Natural Resources

Natural resources are unique to each area and are difficult to replace. Should a natural disaster occur, these species and locations are at risk. The natural environment of Folsom presents a variety of natural resources. Environmental considerations have been taken into consideration during development protecting hillsides, riparian habitats, vernal pools, local streams and other localized environmentally sensitive areas. Much of these areas have been preserved in open space. The City of Folsom has a variety of natural resources of value to the community:

Vegetation Communities

The City of Folsom Planning Area includes the following vegetation communities:

- Chamise Chaparral

- Interior Live Oak Woodland
- Blue Oak Woodland and Savanna
- California Annual Grassland
- Cottonwood/Willow Riparian
- Freshwater Marsh
- Seasonal Wetlands
- Vernal Pools
- Lake Shoreline Fluctuation Zone
- Ruderal and Barren Areas

Special Status Animal Species

According to the California Department of Fish and Game, twenty nine special status wildlife species are known or suspected to occur in the Folsom area.

- Valley Elderberry Longhorn Beetle
- California Red-legged Frog
- Foothill Yellow-legged Frog
- Western Spadefoot
- Western Pond Turtle
- California Horned Lizard
- Bald Eagle
- Golden Eagle
- Peregrine Falcon
- Prairie Falcon
- Burrowing Owl
- Osprey
- Northern harrier
- Sharp-shinned hawk
- Cooper's hawk
- Ferruginous hawk
- Merlin (Falco columbarius)
- Long-eared owl
- Short-eared owl
- Loggerhead Shrike
- Tricolor blackbird
- Yellow-breasted Chat
- Yellow Warbler
- Greater Sandhill Crane
- Willow Flycatcher
- Purple Martin
- Pallid bat
- Townsends big-eared bat
- California mastiff bat

Special Status Plant Species

A special-status plant species, as defined here, meets one or more of the following criteria:

- Officially listed by the California Department of Fish and Game (CDFG) as rare, threatened, or endangered and/or by the U.S. Fish and Wildlife Service (USFWS) as threatened or endangered or proposed for listing.
- A federal or State candidate species for listing as threatened or endangered or State candidate for listing as rare. Such a species may become formally listed during the course of a project.
- Listed under one of the following categories in the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Vascular Plants of California (Skinner and Pavlik 1994) and/or the Electronic Inventory of Rare and Endangered Vascular Plants of California (Skinner and Pavlik 1994; update 2001):
  - ✓ List 1A – Plants presumed extinct in California.
  - ✓ List 1B – Plants rare, threatened, or endangered in California and elsewhere.
  - ✓ List 2 – Plants rare, threatened, or endangered in California but more common elsewhere.

Table C-8 lists the special status plant species in the vicinity of Folsom.

Table C-8 Special-Status Plant Species Occurring in the General Vicinity of Folsom

Species	Status/Federal /State/CNPS[1]	Habitat Requirements[2]	Blooming Period
Atriplex joaquiniana San Joaquin spearscale	-/-/1B	Chenopod scrub, alkali meadow, grassland; in seasonal alkali wetlands or alkali sink scrub.	Apr-Oct
Balsamorhiza macrolepis var macrolepis Big-scale balsamroot	-/-/1B	Grassland, cismontane woodland; sometimes on serpentine.	Mar-Jun
Calystegia stebbinsii Stebbin's morning glory	FE/SE/1B	Chaparral, cismontane woodland; in open areas on red clay soils of the Pine Hill formation, or on gabbroic or serpentine soils. (Endemic to Pine Hill formation in El Dorado and Nevada counties.)	Apr-Jul
Ceanothus roderickii Pine Hill ceanothus	FE/SR/1B	Cismontane woodland, chaparral; on gabbroic soils, often in "historically disturbed" areas. (Endemic to the Pine Hill Area in Eldorado County.)	May-Jun
Chlorogalum grandiflorum Red Hills soaproot	-/-/1B	Cismontane woodland, chaparral, lower montane coniferous forest; on serpentine and gabbro substrates; often on "historically disturbed" sites.	May-Jun
Clarkia biloba ssp. Brandegeae Brandegee's clarkia	-/-/1B	Chaparral, cismontane woodland; often on roadcuts.	May-Jul
Cordylanthus mollis ssp. Hispidus Hispid bird's-beak	-/-/1B	Meadows, playas, grassland; in damp alkaline soils, especially in alkali meadows and sinks.	Jun-Sep
Downingia pusilla Dwarf downingia	-/-/2	Mesic grassland, vernal pools; on margins of different types of vernal pools and vernal lakes.	Mar-May
Eryngium pinnatisectum Tuolumne button-celery	-/-/1B	Cismontane woodland, lower montane coniferous forest, vernal pools; on mesic sites.	Jun-Aug
Fremontodendron decumbens Pine Hill flannelbush	FE/SR/1B	Chaparral, cismontane woodland; on rocky ridges, often among rocks and boulders. Endemic to gabbroic and serpentine soils. (Endemic to Eldorado and Nevada Counties.)	Apr-Jul

Species	Status/Federal /State/CNPS[1]	Habitat Requirements[2]	Blooming Period
Fritillaria eastwoodiae Butte County fritillary	-/-/3	Chaparral, cismontane woodland, lower montane coniferous forest; usually on dry slopes in serpentine, red clay, or sandy loam soils; sometimes on mesic sites.	Mar-May
Galium californicum ssp. Sierra El Dorado bedstraw	FE/SR/1B	Cismontane woodland, chaparral, lower montane coniferous forest; on gabbroic soils in mostly oak woodland. (Endemic to El Dorado County.)	May-Jun
Gratiola heterosepala Boggs Lake hedge- hyssop	-/SE/1B	Freshwater marshes and swamps, vernal pools; in clay soils, usually in vernal pools, sometimes on lake margins.	Apr-Aug
Helianthemum suffrutescens Bisbee Peak rush rose	-/-/3	Chaparral; in openings, often on serpentine, gabbroic, or Ione formation soils.	Apr-Jun
Juncus leiospermus var. ahartii Ahart's dwarf rush	-/-/1B	Vernal pools; restricted to edges of pools.	Mar-May
Juncus leiospermus var. leiospermus Red Bluff dwarf rush	-/-/1B	Chaparral, grassland, cismontane woodland, vernal pools; in vernally mesic sites or at edges of vernal pools.	Mar-May
Lathyrus sulphureus var. argillaceus Dubious pea	-/-/3	Cismontane woodland, lower and upper montane coniferous forest.	Apr
Legenere limosa Legenere	-/-/1B	Vernal pools; in beds of pools. (Many historical occurrences extirpated.)	Apr-Jun
Navarretia myersii ssp. Myersii Pincushion navarretia	-/-/1B	Vernal pools, mesic grassland; on clay soils within non-native grassland.	May
Orcuttia tenuis Slender Orcutt grass	FT/SE/1B	Vernal pools.	May-Oct
Orcuttia viscid Sacramento Orcutt grass	FE/SE/1B	Vernal pools. (Endemic to Sacramento County.)	Apr-Jul
Sagittaria sanfordii Sanford's arrowhead	-/-/1B	Marshes and swamps; in standing or slow-moving, fresh-water ponds and ditches.	May-Oct
Senecio layneae Layne's ragwort	FT/SR/1B	Chaparral, cismontane woodland; on ultramafic soils; occasionally along streams.	Apr-Jul
Wyethia reticulate El Dorado County mule ears	-/-/1B	Chaparral, cismontane woodland, lower montane coniferous forest; in openings on stony red clay and gabbroic soils. (Endemic to El Dorado County.)	May-Jul

Footnotes:

1 Status:

FE - Federally-listed as endangered.

FT - Federally-listed as threatened.

SE - State-listed as endangered.

SR - State-listed as rare.

1B - CNPS (California Native Plant Society): Plants rare, threatened or endangered in California and elsewhere.

2 - CNPS: Plants rare, threatened, or endangered in California but more common elsewhere.

3 - CNPS: Plants about which we need more information – a review list.

4 - CNPS: Plants of limited distribution – a watch list.

2 Sources: CNPS (2001); CNDDB (2002); Hickman (1993) 3 Source: CNDDB (2002)

Historic and Cultural Resources

Historic and cultural resources are difficult to replace. Should a natural disaster occur, these properties and locations can be at risk.

The City of Folsom has a stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. OHP administers the National Register of Historic Places, the California Register of Historical Resources, California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the Base Plan. Table C-9 lists the historical buildings in the City.

Table C-9 City of Folsom – Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Chinese Diggings, Natoma Station Ground Sluice (P712)				X	11/22/1988	Folsom
Chung Wah Cemetery (N1918)	X				8/21/1995	Folsom
Cohn House (N1001)	X				1/21/1982	Folsom
Coloma Road at Nimbus Dam (746)		X			7/5/1960	Folsom
Folsom Depot (N1035)	X				2/19/1982	Folsom
Folsom Powerhouse (N258)	X				10/2/1973	Folsom
Folsom-Overland Pony Express Route in California (702)		X			9/11/1959	Folsom
Negro Bar (P798)				X	5/31/1994	Folsom
Old Folsom Powerhouse (633)		X			3/3/1958	Folsom
Southern Pacific Railroad Superintendent House (N2411)	X				6/13/2008	Folsom
Terminal of California's First Passenger Railroad (558)		X			12/31/1956	Folsom
Yeong Wo Cemetery (P810)				X	5/30/1995	Folsom

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

In addition to the registered sites, there are several assets within Folsom that define the community and represent the City's history. Some of the historical sites of importance to Folsom are listed below.

- Gold Creek Bridge (formerly part of Lincoln Highway)
- Hinkle Creek Nature Area (prehistoric archeological site)

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. Information from the City of Folsom General Plan Housing Element, the California Department of Finance, the US Census Bureau form the basis of this discussion.

Historic Population Trends and Current Population

Population growth can increase the number of people living in hazard prone areas. Folsom has generally seen periods of moderate and large growth. Folsom has seen growth rates as shown in Table C-10.

Table C-10 City of Folsom – Population Changes Since 1950

Year	Population	Change	% Change
1950	1,690	–	–
1960	3,925	2,235	132.2%
1970	5,810	1,885	48.0%
1980	11,003	5,193	89.4%
1990	29,802	18,779	170.9%
2000	51,884	22,082	74.1%
2010[1]	72,203	20,319	39.2%
2020[2]	81,610	9,407	13.0%

Source: [1]US Census Bureau, [2]California Department of Finance

Special Populations and Disadvantaged Communities

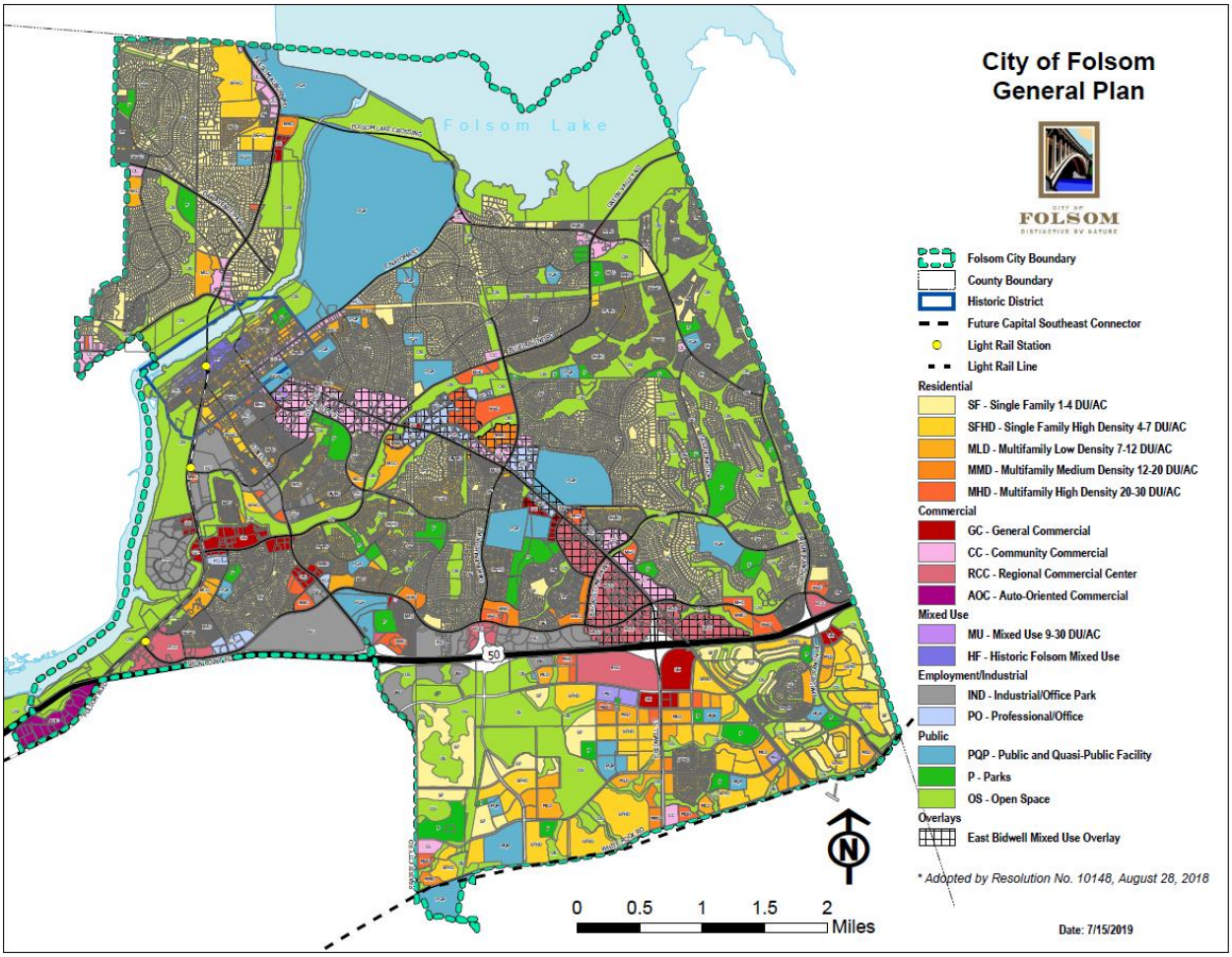
The City of Folsom noted that there are locations within the City with higher percentages of individuals who would be particularly vulnerable during a hazard event, including the elderly, disabled individuals, those with limited English skills and those without access to personal transportation. Increasing number of assisted living, memory care, and skilled nursing facilities within the city will escalate emergency service responses. Unhoused population throughout the wildland urban interface areas pose a potential significant fire risk during dry conditions.

Land Use

State planning law requires that the land use element of a general plan include a statement of the standard population density, building intensity, and allowed uses for the various land use designations in the plan (Government Code Section 65302(a)). The City's land use designations are generally described below and mapped on the Land Use Diagram (Figure C-3). The Folsom Municipal Code provides detailed land use and development standards for development.

With this General Plan, a variety of new land use designations have been established to reflect the more mixed and, in some cases, more intense land uses envisioned for Folsom. New mixed-use designations provide the opportunity for a combination of residential, commercial, and office uses on a single site, depending on the designation. Future land use for the City of Folsom from the City of Folsom General Plan Land Use Element is shown on Figure C-3.

Figure C-3 City of Folsom – Land Use Diagram



Source: City of Folsom General Plan Land Use Element, 2018

Development since 2016 Plan

As discussed in Section 4.3.1 of the Base Plan, future development has occurred in the County since the last Plan. Some of this has occurred in hazard prone areas. The City Building Department tracked total building permits issued since 2016 for the City. These are tracked by total development, property use type, and hazard risk area. These are shown in Table C-11 and Table C-12.

Table C-11 City of Folsom – Total Development Since 2016

Property Use	2016	2017	2018	2019	2020
Commercial	8	27	39	55	16

Property Use	2016	2017	2018	2019	2020
Industrial	1	3	0	0	0
Residential	162	153	418	470	498
Total	**171**	**183**	**457**	**525**	**514**

Source: City of Folsom Building Department

Table C-12 City of Folsom – Development in Hazard Areas since 2016

Property Use	1% Annual Chance Flood	Levee Protected Area	Wildfire Risk Area[1]	Other
Commercial	0	0	0	0
Industrial	0	0	0	0
Residential	0	0	0	0
Total	**0**	**0**	**0**	**0**

Source: City of Folsom Building Department

[1]Moderate or higher wildfire risk area

While the data shows no changes in development in the City since 2016, including development in mapped hazard areas, all development is subject to current building standards to include any requirements for building in hazard areas which act to mitigate hazard exposure. Further development in hazard areas is only one factor of many that contribute to an overall change in hazard vulnerability. Based on these considerations, it cannot be definitively stated as to whether the development or even lack of development contributed to an increase or decrease in vulnerability for Folsom.

Future Development

The Sacramento Council on Governments (SACOG) modeled population projections for the City of Folsom and other areas of the region in 2012 for a Metropolitan Transportation Plan/Sustainable Communities Strategy report. This forecast uses a 2008 base year estimate with projections to 2020 and 2035 for population, housing units, households and employment. SACOG estimated the City population in 2020 and 2035 to be 74,664 and 78,689 respectively.

The City of Folsom's Housing Element noted that Folsom's household population is projected to increase from 66,228 in 2008 to 81,064 in 2020 and 96,852 in 2035 (with an AAGR of 1.42 percent each year from 2008 to 2035). The number of households is projected to grow from 24,360 in 2008 to 30,520 in 2020 and 34,004 in 2035 (with an AAGR of 1.24 percent).

GIS Analysis

The City of Elk Folsom provided a list of projects that the City is seeing be developed. Using GIS, the following methodology was used in determining parcel counts and acreages with future development projects in the City of Folsom. Future development areas in the City were provided in mapped format by the City. 2 of areas were provided. Using the GIS parcel spatial file for each of these areas, the 2 areas associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine

the parcel counts within each area. Figure C-4 shows the locations of future development areas the City is planning to develop. Table C-13 shows the summary of parcels and acreages of each future development area in the City.

Figure C-4 City of Folsom – Future Development Areas

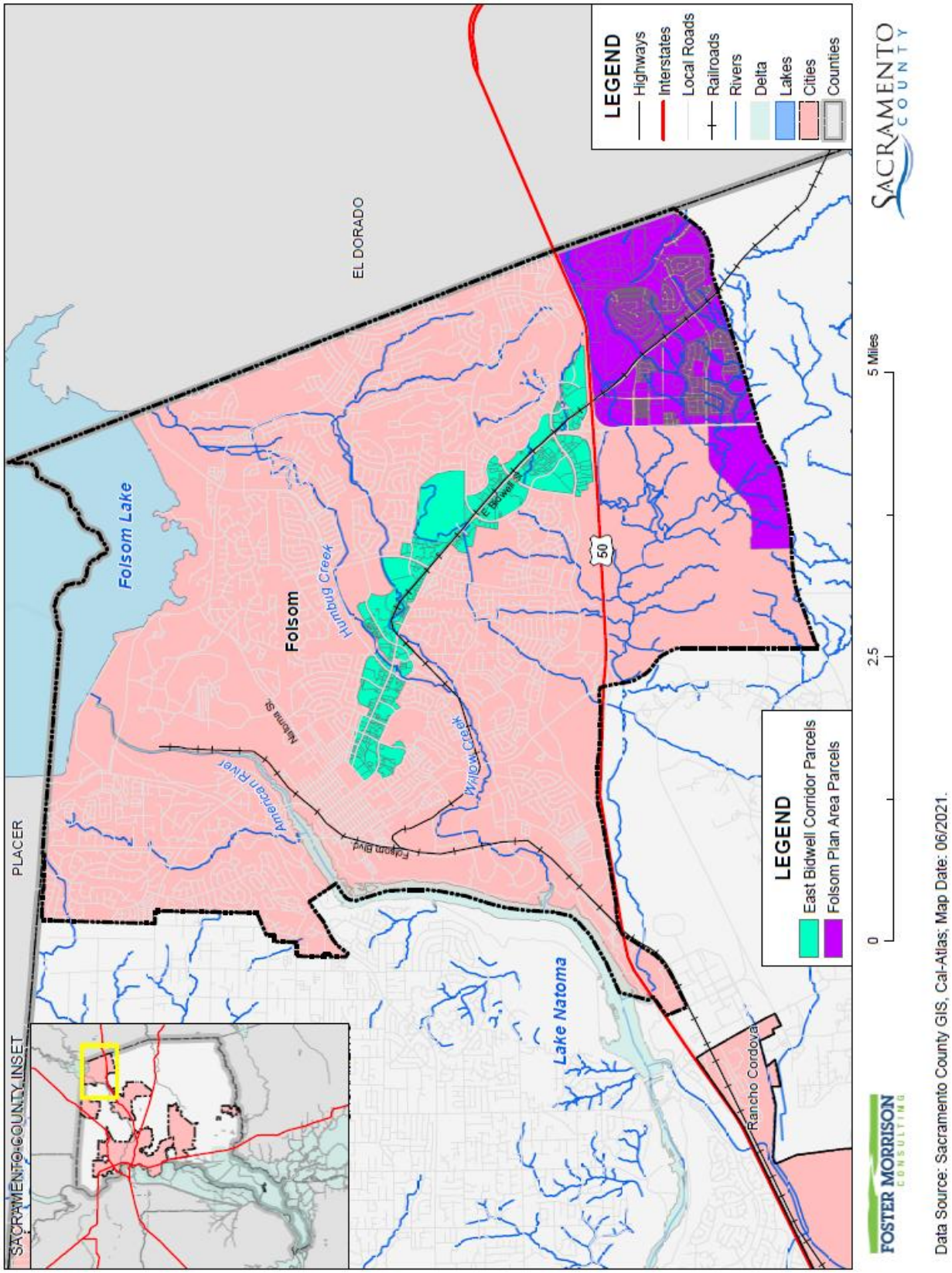


Table C-13 City of Folsom – Future Development Parcel and Acre Counts

Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
East Bidwell Corridor	344	284	964.7
Folsom Plan Area	2,172	383	1,674.1
Grand Total	2,516	667	2,638.8

Source: City of Folsom

C.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table C-5 as high or medium significance hazards. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, populations at risk, critical facilities and infrastructure, and future development.

Power Outage/Power Failure

Though not a standalone hazard, an impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal

agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power shortage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the City, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the City noted that climate change is of concern, no specific impacts of climate change could be recalled. The City and HMPC

members noted that the strength of storms does seem to be increasing and the temperatures are getting hotter.

Vulnerability to and Impacts from Climate Change

The 2012 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the City and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

Future Development

The City could see population fluctuations as a result of climate impacts relative to those experienced in other regions, and these fluctuations are expected to impact demand for housing and other development.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The City would be affected for as long as the flood waters from the dam failure took to drain downstream.

Geographic flood extent from the DWR DSOD and Cal OES dam inundation areas are shown on Figure C-5 and Figure C-6 in Table C-14. The City falls outside of the Folsom Dam 235,000 cfs scenario, as discussed in Section 4.3.7 of the Base Plan. Note, the Cal OES and DSOD dam inundation data did not include inundation mapping of all dams of concern to the Sacramento County Planning Area and the City; thus, the below analysis reflects information based on available data. Other dams may be identified as a concern to the City. Based on available data, the City falls within the inundation areas of Folsom, Willow Hill, and Hinkle dams.

Figure C-5 City of Folsom – Dam Inundation Areas for Dams Inside County

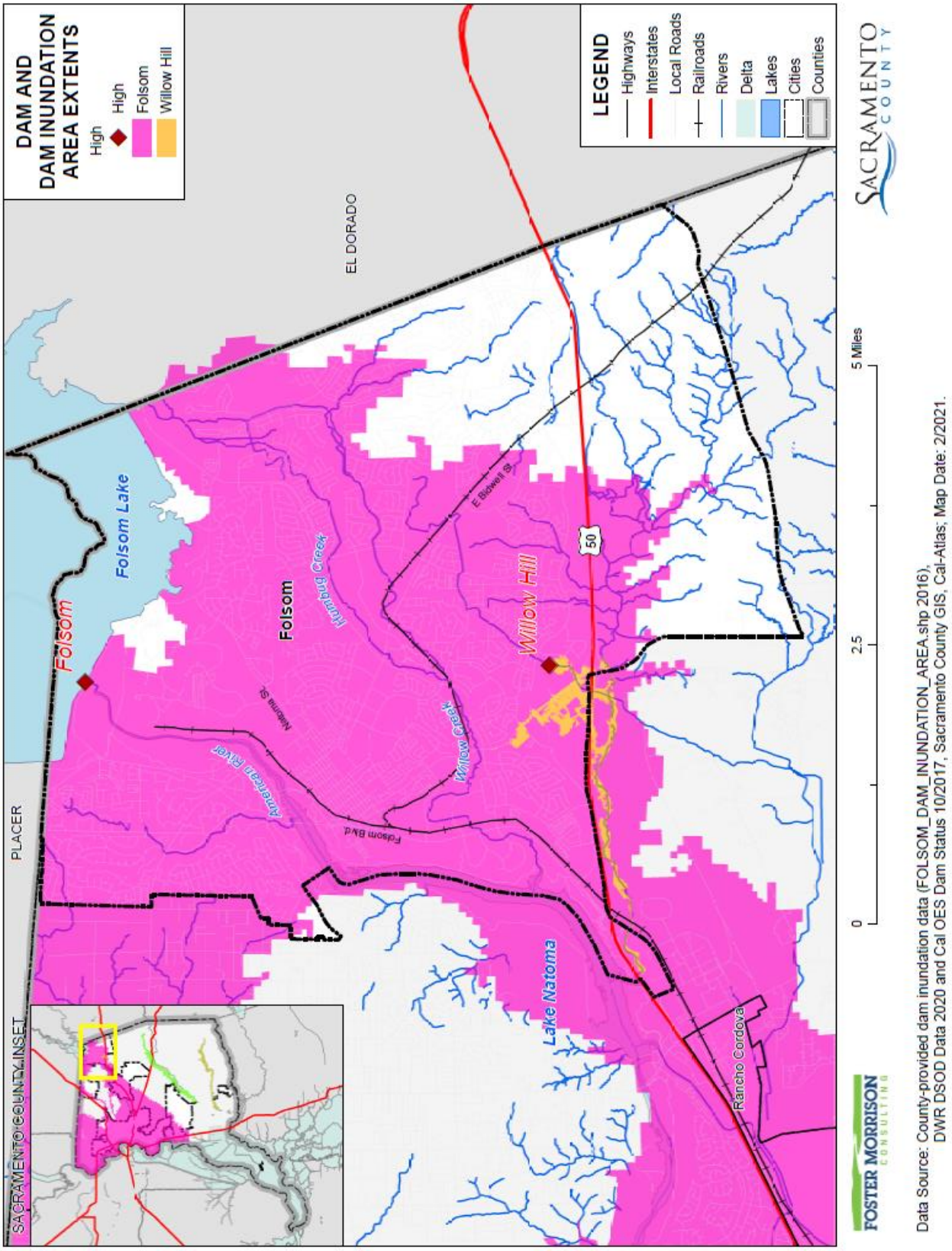


Figure C-6 City of Folsom – Dam Inundation Areas from Dams Outside County

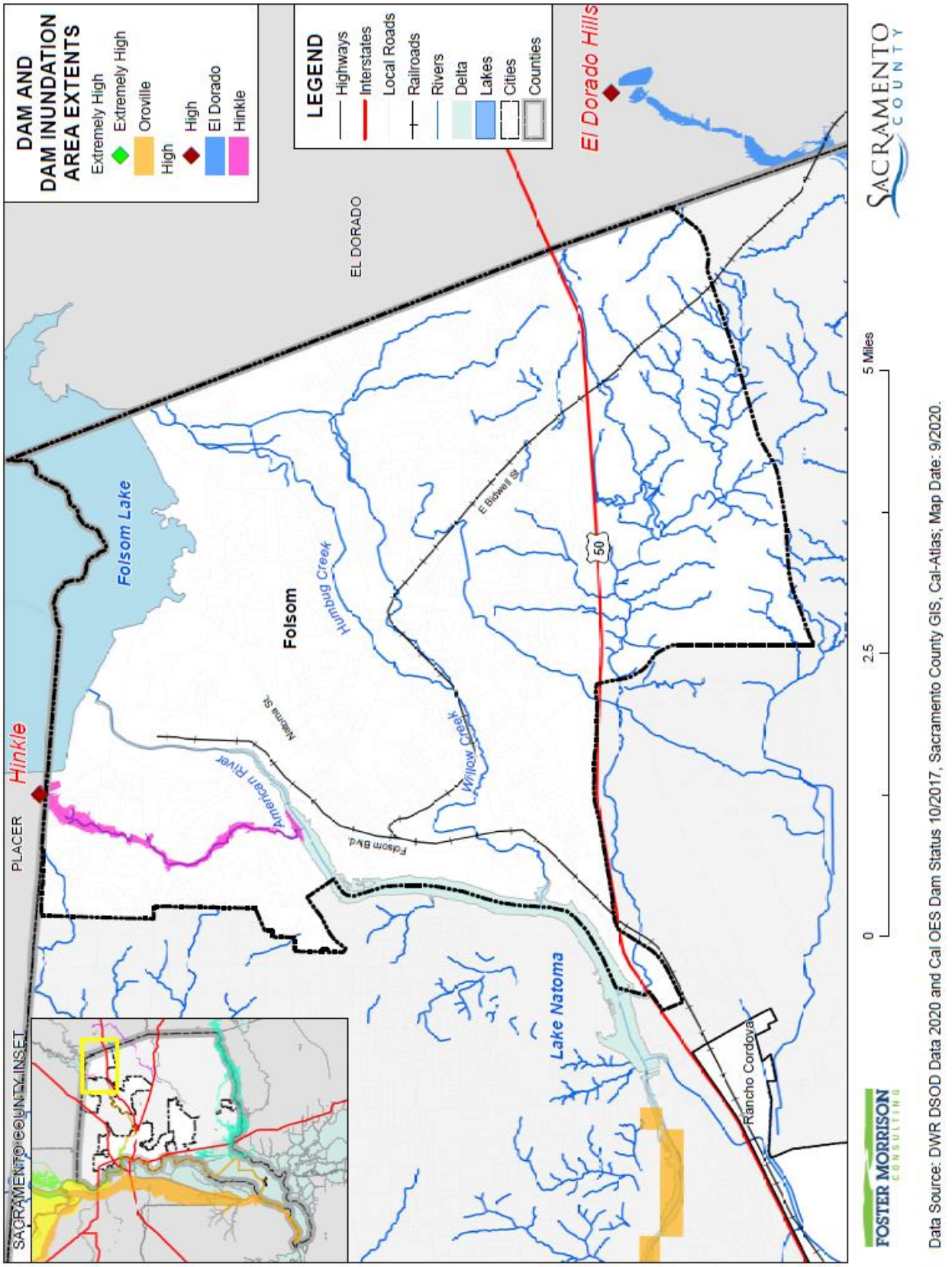


Table C-14 City of Folsom – Geographical Dam Inundation Extents

Dam Inundation Area	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Folsom	15,025.46	2.32%	9,759.53	2.70%	5,265.93	1.85%
Willow Hill	84.84	0.01%	56.66	0.02%	28.19	0.01%
Hinkle	102.20	0.02%	70.41	0.02%	31.79	0.01%

Source: Cal OES, DSOD

Past Occurrences

There has been no state or federal disaster declarations for dam failure in the County. On the morning of July 17, 1995, spillway gate 3 failed at the Folsom Dam. The failure resulted in an uncontrolled release of nearly 40 percent of Folsom Lake at a peak rate of approximately 40, 000 cubic feet per second. The failure caused no fatalities.

There have been no new occurrences of a dam failure since the 2016 update to the Sacramento County Local Hazard Mitigation Plan.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. A failure of the Folsom or other high or extremely high hazard dam can cause significant loss of life, property damage, loss of critical facilities and infrastructure, natural resources, and displacement of City residents.

Mass evacuation of the inundation area may be essential to save lives, if warning time should permit. Extensive search and rescue operations may be required to assist trapped or injured persons. Emergency medical care, food, and temporary shelter would be required for injured or displaced persons. Identification and burial of many dead persons would pose difficult problems; public health would be a major concern. Many families would be separated, particularly if the failure should occur during working hours, and a personal inquiry or locator system would be essential. These and other emergency operations could be seriously hampered by the loss of communications, damage to transportation routes, and the disruption of public utilities and other essential services.

Governmental assistance could be required and may continue for an extended period. These efforts would be required to remove debris and clear roadways, demolish unsafe structures, assist in re-establishing public services and utilities, and provide continuing care and welfare for the affected population including, as required, temporary housing for displaced persons.

Assets at Risk

Based on the vulnerability of Folsom to the dam failure hazard, the sections that follow describes significant assets at risk in the City of Folsom. This section includes the values at risk, inundated acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Folsom. The methodology described in Section 4.3.7 of the Base Plan was followed in determining structures and values at risk to dam failure. Table C-15 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in dam inundation areas in the City.

Table C-15 City of Folsom – Count and Values of Parcels at Risk by Dam Inundation Area and Property Use

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Folsom Dam – High Hazard Dam Inside County						
Agricultural	5	0	$26,081,136	$0	$0	$26,081,136
Care / Health	34	29	$33,795,033	$198,980,587	$198,980,587	$431,756,207
Church / Welfare	43	29	$10,534,802	$65,039,087	$65,039,087	$140,612,976
Industrial	50	35	$38,997,520	$130,857,414	$196,286,124	$366,141,056
Miscellaneous	918	0	$573,934	$0	$0	$573,934
Office	293	269	$181,759,902	$921,620,077	$921,620,077	$2,025,000,056
Public / Utilities	62	0	$18	$0	$0	$18
Recreational	16	12	$16,932,747	$32,929,459	$32,929,459	$82,791,665
Residential	20,151	19,932	$3,120,808,226	$7,303,727,479	$3,651,863,877	$14,076,399,502
Retail / Commercial	334	315	$301,386,803	$797,071,485	$797,071,485	$1,895,529,773
Unknown	1	1	$0	$104,300	$0	$104,300
Vacant	383	16	$139,718,509	$2,032,092	$0	$141,750,601
Folsom Total	**22,290**	**20,638**	**$3,870,588,630**	**$9,452,361,980**	**$5,863,790,696**	**$19,186,741,224**
Willow Hill Dam – High Hazard Dam Inside County						
Care / Health	2	2	$3,507,322	$43,825,821	$43,825,821	$91,158,964
Church / Welfare	6	2	$679,466	$4,946,959	$4,946,959	$10,573,384
Miscellaneous	7	0	$13	$0	$0	$13
Office	8	6	$13,929,393	$301,901,447	$301,901,447	$617,732,287
Public / Utilities	2	0	$9	$0	$0	$9
Residential	1	1	$7,577,025	$59,533,768	$29,766,884	$96,877,677
Retail / Commercial	9	8	$15,230,659	$36,385,673	$36,385,673	$88,002,005
Vacant	1	0	$5,011,161	$0	$0	$5,011,161

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Folsom Total	**36**	**19**	**$45,935,048**	**$446,593,668**	**$416,826,784**	**$909,355,500**
Hinkle Dam – High Hazard Dam Outside County						
Industrial	1	0	$0	$0	$0	$0
Miscellaneous	10	0	$386	$0	$0	$386
Public / Utilities	1	0	$0	$0	$0	$0
Residential	155	154	$187,468,757	$198,549,072	$99,274,554	$485,292,382
Retail / Commercial	5	4	$4,814,520	$9,896,731	$9,896,731	$24,607,982
Vacant	7	1	$523,922	$90,202	$0	$614,124
Folsom Total	**179**	**159**	**$192,807,585**	**$208,536,005**	**$109,171,285**	**$510,514,874**

Source: CAL OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data

Population at Risk

The DSOD and Cal OES dam inundation areas were overlayed on the parcel layer. Those residential parcel centroids that intersect the dam inundation areas were counted and multiplied by the Census Bureau average household factors for Folsom – 2.63. This is shown in Table C-27.

Table C-16 City of Folsom – Count of Improved Residential Parcels and Population by Dam Inundation Area

Jurisdiction	Folsom Dam Inundation Area		Willow Hill Dam Inundation Area		Hinkle Dam Inundation Area	
	Improved Residential Parcels	Population	Improved Residential Parcels	Population	Improved Residential Parcels	Population
Folsom	19,632	51,632	1	3	154	405

Source: Cal OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Folsom in identified dam inundation areas. GIS was used to determine whether the critical facility locations intersect a Cal OES/DSOD dam inundation area. Details of critical facilities in mapped dam inundation areas in the City of Folsom are shown in Figure C-7 for dams inside the County, Figure C-8 for dams outside the County, Figure C-9 for the Folsom Dam 235,000 cfs scenario, and detailed by dam inundation in Table C-17. Details of critical facility definition, type, name and address and jurisdiction by dam inundation area are listed in Appendix F.

Figure C-7 City of Folsom – Critical Facilities in Dam Inundation Areas from Dams Inside the County

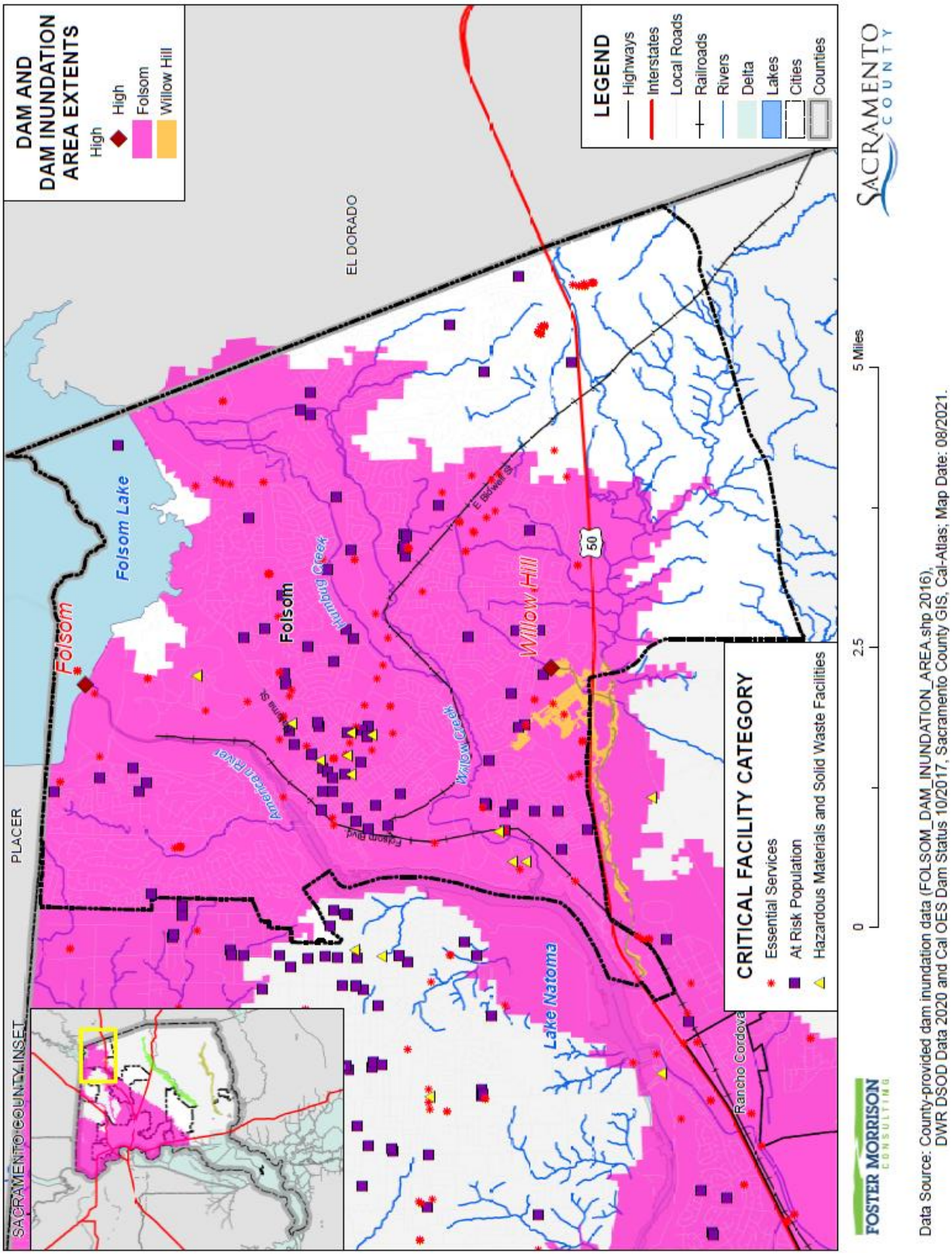


Figure C-8 City of Folsom – Critical Facilities in Dam Inundation Areas from Dams Outside the County

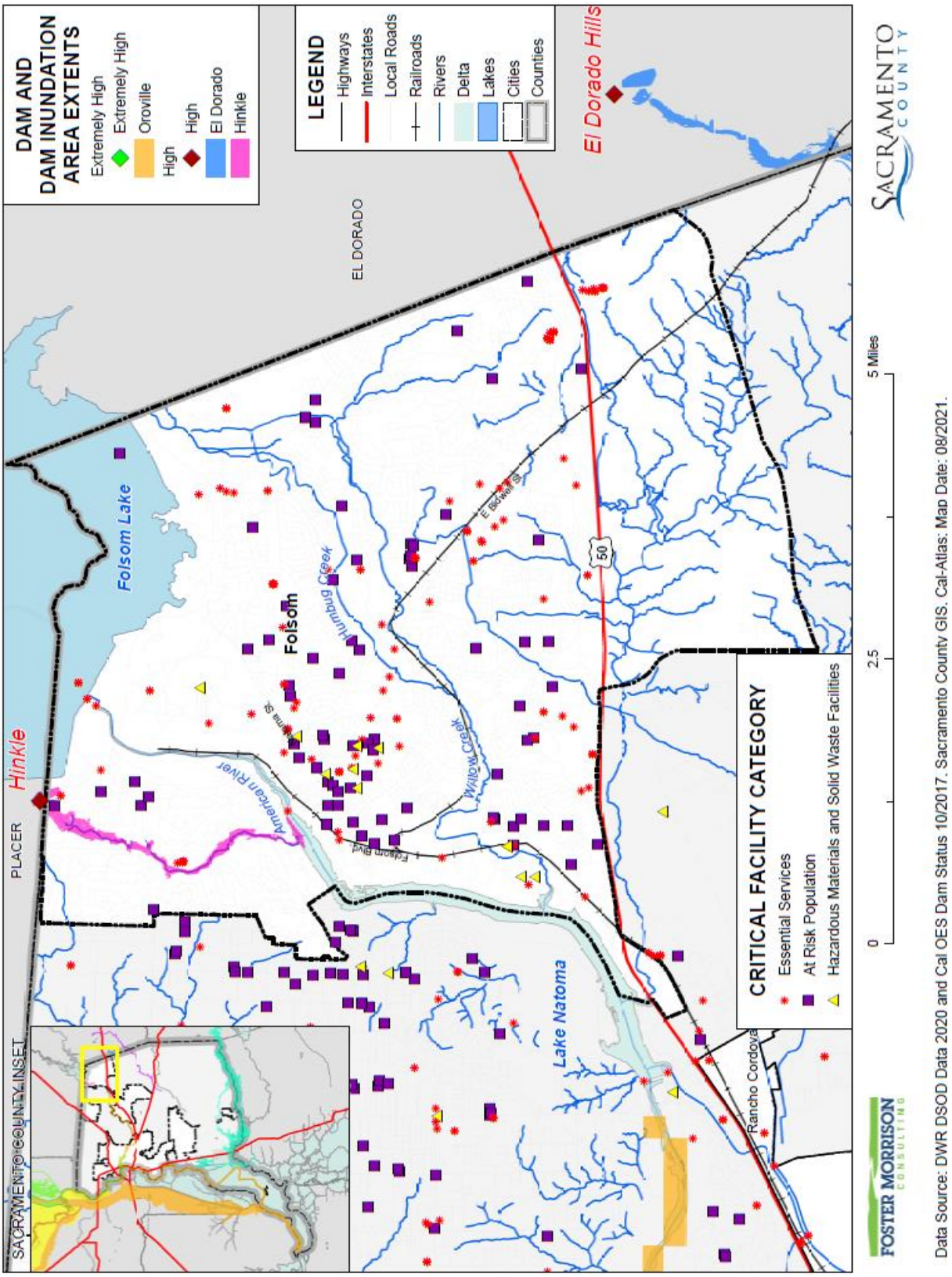


Figure C-9 City of Folsom – Critical Facilities in Folsom 235,000 cfs Dam Inundation Area

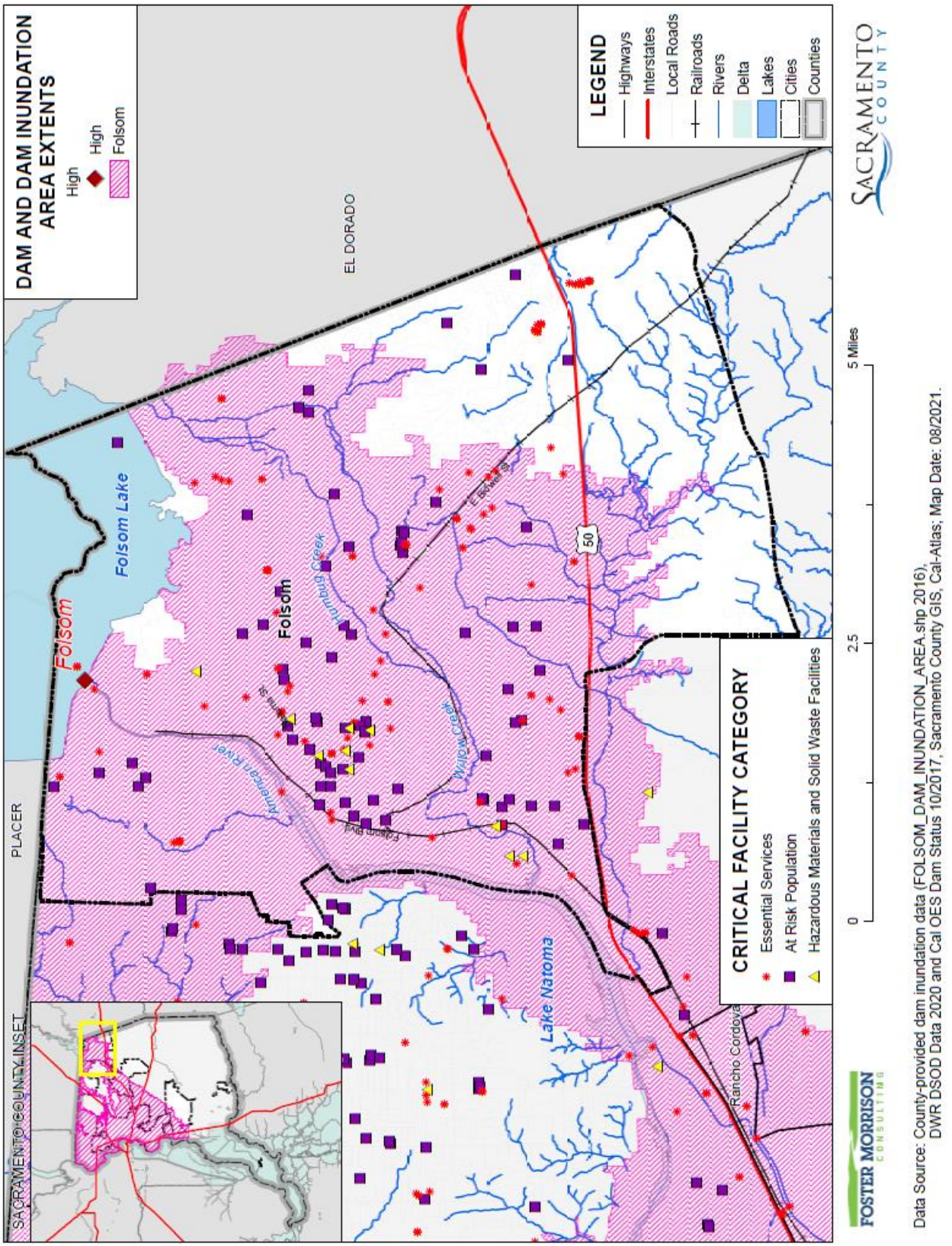


Table C-17 City of Folsom – Critical Facilities in Dam Inundation Areas

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
Folsom Dam (High Hazard Dam Inside the County)		
Essential Services Facilities	Bridge	1
	Cellular Tower	2
	Emergency Evacuation Center	4
	FDIC Insured Banks	18
	Fire Station	5
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	53
	Power Plants	5
	Public Transit Stations	3
	Water Well	10
	Total	**69**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	1
	Day Care Center	12
	Mobile Home Park	6
	Places of Worship	39
	School	25
	Total	**84**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	8
	Total	**10**
Folsom Dam Total		**203**
Willow Hill (High Hazard Dam Inside the County)		
Essential Services Facilities	FDIC Insured Banks	2
	Total	**2**
At Risk Population Facilities	Places of Worship	1
	Total	**1**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Willow Hill Dam Total		**3**
Hinkle (High Hazard Dam Outside the County)		
Essential Services Facilities	Mobile Home Park	1
	Total	**1**
At Risk Population Facilities	–	–

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
	Total	**0**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Hinkle Dam Total		**1**

Source: Cal OES, DSOD, Sacramento County GIS

Future Development

Future dam failures are considered unlikely. However, given the high number of affected parcels, future development in the City could be affected by dam failures and associated flooding. The City enforces it floodplain ordinance, which helps to reduce risk to flooding by requiring structures in the 1% annual chance floodplains to be above the base flood elevation, which depending on inundation depths and affected areas may provide some relief. Siting of future development areas should take dam failure flooding into account.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure C-10 shows the locations of future development areas the City is planning to develop on the dam inundation zones from the Folsom Dam 235,000 cfs scenario. The Folsom Dam Inundation map covers the same area as the 235,000 cfs. As such, only one map is shown below. Table C-18 shows the parcels and acreages of each future development area in the City in the Folsom 235,000 cfs release inundation area.

Figure C-10 City of Folsom – Future Development and Folsom Dam 235,000 cfs Scenario

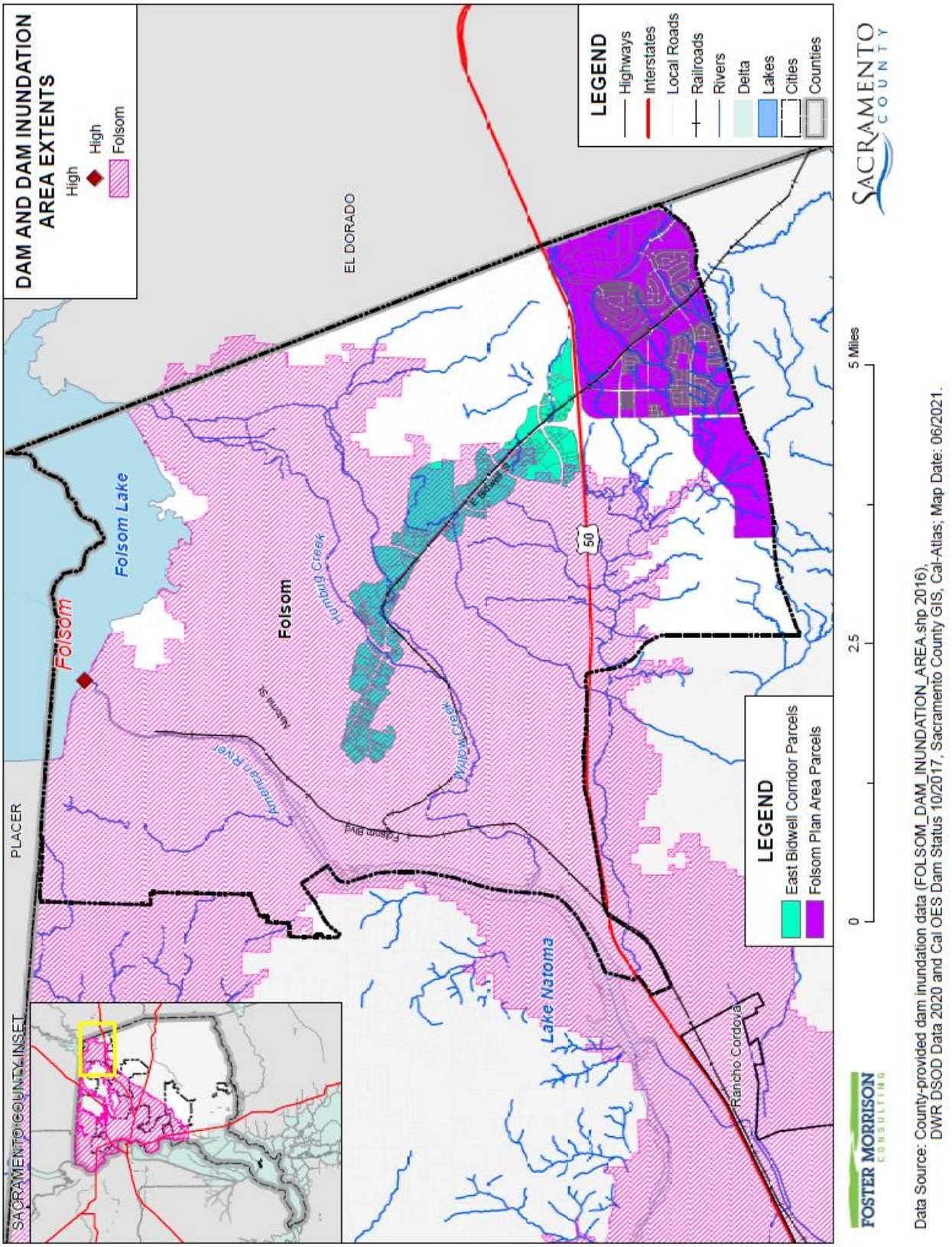


Table C-18 City of Folsom – Future Development in Dam Inundation Areas

Dam Inundation Area/ Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Folsom			
East Bidwell Corridor	282	236	738.4
Folsom Total	**282**	**236**	**738.4**

Source: City of Folsom, Cal OES, DSOD

Drought & Water Shortage

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the City, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the City and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There have been two state and one federal disaster declaration from drought. This can be seen in Table C-19.

Table C-19 Sacramento County – State and Federal Drought Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

From 2012 to 2015, the City of Folsom experienced a drought, which affected water supply. During that period, water agencies implemented conservation efforts and Folsom Lake reached record low water levels.

Since drought is a regional phenomenon, past occurrences of drought for the City are the same as those for the County and includes 4 multi-year droughts since 1950. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the City, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users.

The City draws its water supply from Folsom Lake. The Lake is traditionally capable of delivering adequate quantities of water. There have been times in the recent past where Lake levels have fallen greatly. The vulnerability of the City to drought is City-wide, but impacts may vary and include reduction in water supply and an increase in dry fuels. The potential for a reduction in water supply during drought conditions generally leads to both mandated and voluntary conservations measures during extended droughts. During these times, the costs of water can also increase. The increased dry fuels and fuel loads associated with drought conditions can also result in an increased fire danger. In areas of extremely dry fuels, the intensity and speed of fires can be significant. Water supply and flows for fire suppression can also be an issue during extended droughts.

Other qualitative impacts associated with drought in the planning area are those related to water intensive activities such as, municipal usage, commerce, tourism, recreation and agricultural use. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

With more precipitation likely falling as rain instead of snow in the Sierra's, and warmer temperatures causing decreased snowfall to melt faster and earlier, water supply is likely to become more unreliable. In addition, drought and water shortage is predicted to become more common. This means less water available for use over the long run, and additional challenges for water supply reliability, especially during periods of extended drought.

Future Development

The City of Folsom has the capacity in their water rights appropriations to supply water to the Folsom Plan Area. Conservation efforts were put in place to account for the projected increase in water demand due to the development. As the population in the area continues to grow, so will the demand for water. Ongoing planning will be needed by the City and water agencies to account for population growth and increased future water demands.

Earthquake

Likelihood of Future Occurrence–Unlikely
Vulnerability–Low

Though a low significance hazard to the City, given its importance in the State of California, earthquake is profiled here. Earthquake remains a low priority hazard for mitigation planning purposes.

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

Since earthquakes are regional events, the whole of the City is at risk to earthquake. Folsom and the surrounding area are relatively free from significant seismic and geologic hazards. The City of Folsom General Plan Background Report noted that the West Branch of the Bear Mountain fault is located approximately five miles northeast of the city limits. California Geological Survey (CGS) classifies this fault as Late Quaternary, with movement sometime in the last 700,000 years, but not in the last 11,000 years. The Bear Mountain fault is part of the Foothills fault system, which is 360 miles long and has a slip rate of 0.05 mm per year, +/-0.03 mm, with a maximum magnitude of 6.5. In comparison the San Andres Fault has a slip rate ranging from 17 to 34 mm per year, depending on location. The eastern edge of Folsom is the location of the inactive Mormon Island Fault, which extends in the City for around two miles before crossing into El Dorado County. The fault zone was evaluated for earthquake activity in 1983 and it was concluded that it has not undergone displacement during the last 65,000 to 70,000 years at minimum, and probably has not been the locus of large displacements since the late Mesozoic.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in

whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The City is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the City fall within a low to moderate shake risk.

Past Occurrences

The City noted no past occurrences of earthquakes or that affected the City in any meaningful way. No record of damage was found for 1975 event nor was damage recorded in 2014.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County's mountainous terrain lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured housing is very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. Although there no catalog exists, there are some URM buildings located within Folsom's Historic District.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The City of Folsom is within the less hazardous Zone 3.

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

Impacts from earthquake in the City will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

Earthquake Analysis

Due to the regional effects of an earthquake, a Hazus earthquake analysis was performed on a countywide basis. This can be found in Section 4.3.11 of the Base Plan. While these runs were not done specific to the City, maps showing damage in the County show greater areas of damage near the cities in the County

Future Development

Although new growth and development corridors would fall in the area affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in the earthquake area will continue to occur. The City enforces the state building code, which mandates construction techniques that minimize seismic hazards. Future development in the City is subject to these building codes.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the City, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the City. Historically, the City has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the City of Folsom have been subject to historical flooding. Folsom is traversed by several stream systems and is at risk to the 1% and 0.2% flood.

Location and Extent

The City of Folsom has areas located in the 1% and 0.2% annual chance flood zones. This is seen in Figure C-11. In the City of Folsom, much of the flood damage occurs in the floodplains of the American River, Willow Creek, and Humbug Creek.

Figure C-11 City of Folsom – FEMA DFIRM Flood Zones

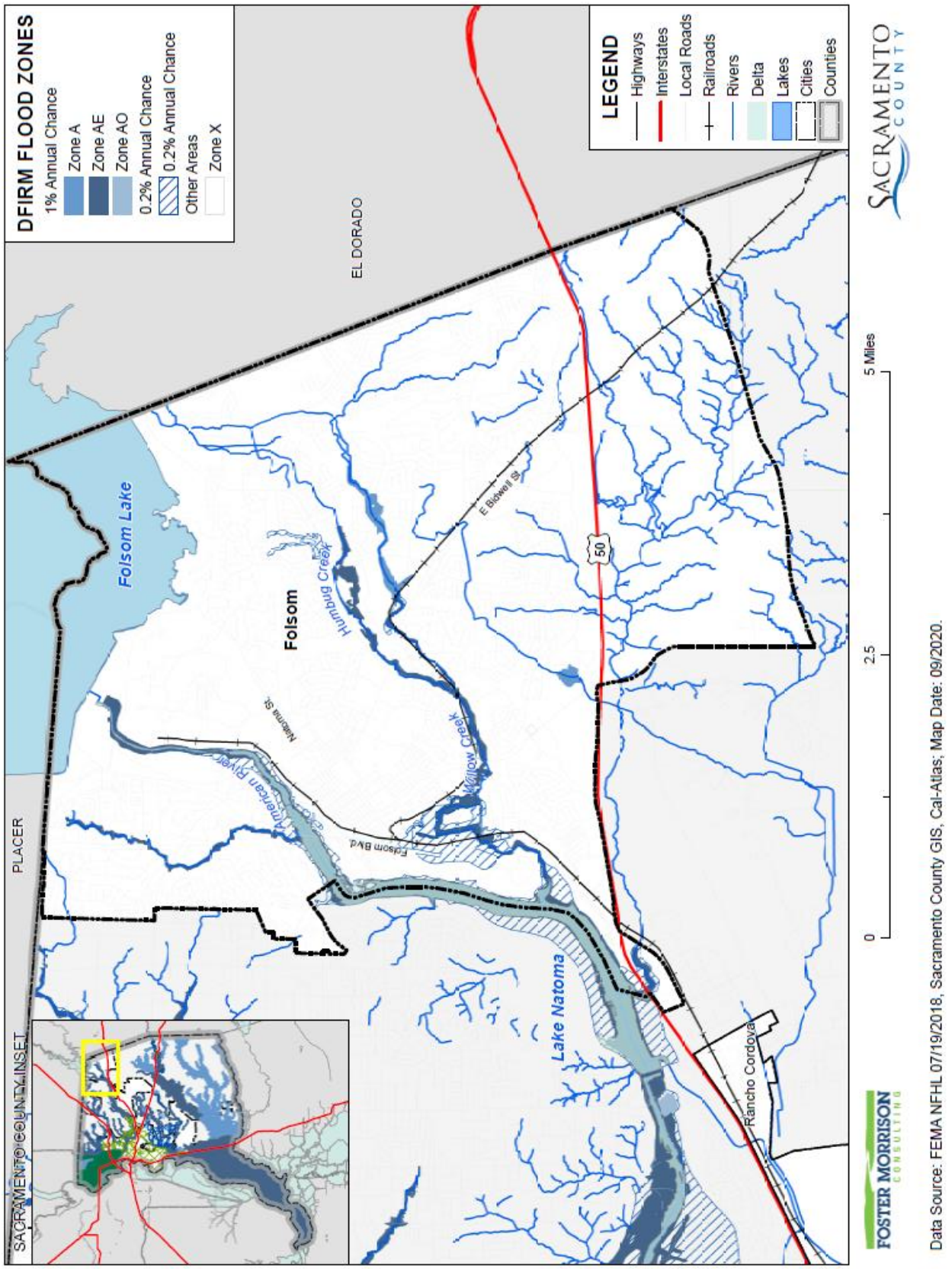


Table C-20 details the DFIRM mapped flood zones located within the City.

Table C-20 City of Folsom– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in City
A	1% annual chance flooding: No base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AE	1% annual chance flooding: Base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood. Flood insurance is not mandatory but is available.	X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	
X (unshaded)	No flood hazard	X

Source: FEMA

Folsom faces potential flooding hazards from the streams and rivers that cross the City, as well as from potential dam failure. In Folsom, the American River is impounded by Folsom Dam and further downstream by Nimbus Dam. Hinkle Creek, Willow Creek, Linda Creek, and Humbug Creek, tributaries to the American River, are impounded by dams on the creeks or downstream by Nimbus Dam. Dams and other flood management facilities control floodwaters by regulating the amount of water passing through a particular reach of river or creek at a given time.

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the City vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the City tends to have a shorter speed of onset, due to the amount of water that flows through the City.

Geographical flood extent for the City from the FEMA DFIRMs are shown in Table C-21.

Table C-21 City of Folsom – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
1% Annual Chance	340	1.69%	50	0.45%	290	3.18%
0.2% Annual Chance	387	1.92%	128	1.16%	259	2.83%
Other Areas	19,395	96.39%	10,812	98.38%	8,583	93.99%
Total	**20,122**	**100.00%**	**10,990**	**100.00%**	**9,132**	**100.00%**

Source: FEMA DFIRM 11/2/2018

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table C-22. These events also likely affected the City to some degree.

Table C-22 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

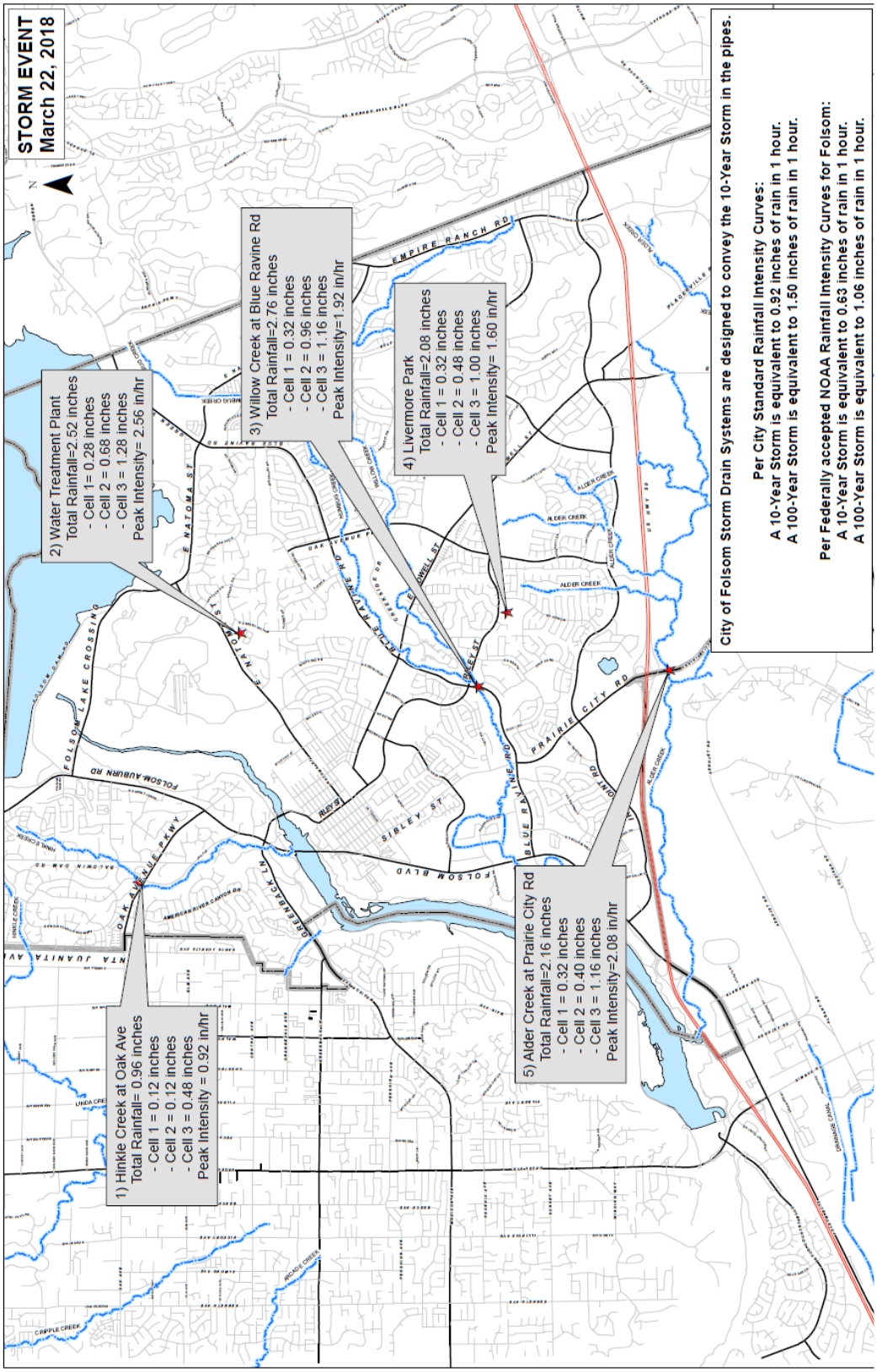
Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The City noted one occurrence of major flooding since the 2016 LHMP:

March 22, 2018 – Roads up and down Folsom, El Dorado Hills and other portions of Sacramento County and the surrounding region were flooded as the rain pounded Northern California. Storm intensities ranged from 0.92 inches per hour to 2.56 inches per hour. Storm drains in the City were overwhelmed. City storm drains were built and designed to handle a 10-year flood event. The March 2018 flooding was a 100-year or larger event. A rainfall summary is included in Figure C-12. Pictures of flooding can be seen in Figure C-13 through Figure C-15.

Figure C-12 City of Folsom March 2018 Rainfall Summary



Source: City of Folsom Public Works

Figure C-13 2018 Flooding Along Cerrito Drive in Folsom

Source: City of Folsom Public Works

Figure C-14 2018 Flooding – Iron Point East of Cavitt

Source: City of Folsom Public Works

Figure C-15 2018 Storms – Intersection of Hancock and Sombrero

Source: City of Folsom Public Works

Vulnerability to and Impacts from Flood

Floods have been a part of the City's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

The City noted that its main concerns would be the safety concern from inundated roads and bridges/culverts not allowing emergency vehicular traffic, including concerns of large scale evacuation of skilled nursing facilities, residential care facilities, and hospitals.

Assets at Risk

Based on the vulnerability of Folsom to the flood hazard, the sections that follow describes significant assets at risk in the City of Folsom. This section includes the values at risk, flooded acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Folsom. The methodology described in Section 4.3.12 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table C-23 is a summary table for the City of Folsom. Parcel counts, values, estimated contents, and total values in the City are shown for the 1% and 0.2% annual chance flood zones, as well as for those properties that fall outside of the mapped FEMA DFIRM flood zones. Table C-24 breaks down Table C-23 and shows the property use, improved

parcel count, improved values, estimated contents, and total values that fall in FEMA flood zones in the City.

Table C-23 City of Folsom – Count and Value of Parcels at Risk in Summary DFIRM Flood Zones

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard	35	12	$5,281,096	$4,537,463	$2,523,630	$12,342,190
0.2% Annual Chance Flood Hazard	314	246	$77,965,503	$226,093,495	$207,922,441	$511,981,447
Other Areas	26,709	23,356	$4,355,347,245	$10,355,726,712	$6,319,092,964	$21,030,166,864
City of Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table C-24 City of Folsom – Count and Values of Parcels at Risk by Detailed Flood Zone and Property Use

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	4	0	$9			$9
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	0	0	$0	$0	$0	$0
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	0	0	$0	$0	$0	$0
Zone A Total	**4**	**0**	**$9**	**$0**	**$0**	**$9**
Zone AE						

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	15	0	$110	$0	$0	$110
Office	1	1	$400,000	$600,000	$600,000	$1,600,000
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	10	10	$1,218,050	$3,847,261	$1,923,630	$6,988,942
Retail/ Commercial	1	0	$1,995,665	$0	$0	$1,995,665
Unknown	0	0	$0	$0	$0	$0
Vacant	4	1	$1,667,262	$90,202	$0	$1,757,464
Zone AE Total	**31**	**12**	**$5,281,087**	**$4,537,463**	**$2,523,630**	**$12,342,181**
1% Annual Chance Flood Hazard Total	**35**	**12**	**$5,281,096**	**$4,537,463**	**$2,523,630**	**$12,342,190**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	1	1	$757,701	$2,272,701	$2,272,701	$5,303,103
Industrial	2	2	$5,414,688	$38,509,200	$57,763,800	$101,687,688
Miscellaneous	45	0	$1,709			$1,709
Office	33	30	$21,742,398	$81,377,545	$81,377,545	$184,497,488
Public/Utilities	4	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	206	197	$28,273,835	$74,819,458	$37,409,722	$140,503,023
Retail/ Commercial	15	15	$16,094,485	$29,098,673	$29,098,673	$74,291,831
Unknown	0	0	$0	$0	$0	$0
Vacant	8	1	$5,680,687	$15,918	$0	$5,696,605
0.2% Annual Chance Total	**314**	**246**	**$77,965,503**	**$226,093,495**	**$207,922,441**	**$511,981,447**
0.2% Annual Chance Flood Hazard Total	**314**	**246**	**$77,965,503**	**$226,093,495**	**$207,922,441**	**$511,981,447**
Other Areas						

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Zone X						
Agricultural	11	0	$57,801,677	$0	$0	$57,801,677
Care/Health	34	29	$33,795,033	$198,980,587	$198,980,587	$431,756,207
Church/Welfare	44	28	$9,777,119	$62,766,386	$62,766,386	$135,309,891
Industrial	48	33	$33,582,832	$92,348,214	$138,522,324	$264,453,368
Miscellaneous	1,165	1	$9,622,173	$37,884	$37,884	$9,697,941
Office	263	242	$172,201,052	$868,244,995	$868,244,995	$1,908,691,042
Public/Utilities	66	0	$27	$0	$0	$27
Recreational	20	14	$24,803,005	$78,052,297	$78,052,297	$180,907,599
Residential	22,967	22,651	$3,222,513,969	$8,159,555,618	$4,079,777,896	$15,461,847,428
Retail/ Commercial	357	338	$331,102,195	$892,710,595	$892,710,595	$2,116,523,385
Unknown	1	1	$0	$104,300	$0	$104,300
Vacant	1,733	19	$460,148,163	$2,925,836	$0	$463,073,999
Zone X Total	**26,709**	**23,356**	**$4,355,347,245**	**$10,355,726,712**	**$6,319,092,964**	**$21,030,166,864**
Other Areas Total	**26,709**	**23,356**	**$4,355,347,245**	**$10,355,726,712**	**$6,319,092,964**	**$21,030,166,864**
Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table C-25 summarizes Table C-24 above and shows City of Folsom loss estimates and improved values at risk by FEMA 1% and 0.2% annual chance flood zones.

Table C-25 City of Folsom – Flood Loss Estimates

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood Hazard	35	12	$4,537,463	$2,523,630	$7,061,093	$1,412,219	0.00%
0.2% Annual Chance Flood Hazard	314	246	$226,093,495	$207,922,441	$434,015,936	$86,803,187	0.05%
Grand Total	**349**	**258**	**$230,630,958**	**$210,446,071**	**$441,077,029**	**$88,215,406**	**0.05%**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data
*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone
**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table C-24 and Table C-25, the City of Folsom has 12 parcels and $7.1 million of structure and contents values or values in the 1% annual chance flood zone, and 246 improved parcels and $434 million of structure and contents values in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.11 of the Base Plan, there is a 1% chance in any given year of a flood event causing $1.4 million in damage and a 0.2% chance in any given year of a flood event causing $86.8 million in damage in the City of Folsom. The loss ratio of 0.00% and 0.05% indicates that flood losses for 1% and 0.2% annual chance flooding, respectively, would be relatively minor.

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits. The same methodology, as discussed in Section 4.3.12 of the Base Plan, was used for the City of Folsom as well as for the County as a whole. Table C-26 represents a detailed and summary analysis of total acres for each FEMA DFIRM flood zone in the City.

Table C-26 City of Folsom – Flooded Acres by Flood Zone

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	0.0	0.00%	0.0	0.00%	0.0	0.00%
Care/Health	0.0	0.00%	0.0	0.00%	0.0	0.00%
Church/Welfare	0.9	0.00%	0.0	0.00%	0.9	0.01%
Industrial	0.0	0.00%	0.0	0.00%	0.0	
Miscellaneous	42.5	0.21%	0.0	0.00%	42.5	0.47%
Office	0.2	0.00%	0.1	0.00%	0.0	0.00%
Public/Utilities	41.4	0.21%	0.0	0.00%	41.4	0.45%
Recreational	0.0	0.00%	0.0	0.00%	0.0	0.00%
Residential	19.4	0.10%	19.4	0.18%	0.0	0.00%
Retail/ Commercial	0.0	0.00%	0.0	0.00%	0.0	0.00%
Unknown	0.0	0.00%	0.0	0.00%	0.0	0.00%
Vacant	0.0	0.00%	0.0	0.00%	0.0	0.00%
Zone A Total	**104.4**	**0.52%**	**19.5**	**0.18%**	**84.9**	**0.93%**

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Zone AE						
Agricultural	0.0	0.00%	0.0	0.00%	0.0	0.00%
Care/Health	0.9	0.00%	0.9	0.01%	0.0	0.00%
Church/Welfare	0.0	0.00%	0.0	0.00%	0.0	0.00%
Industrial	1.5	0.01%	1.5	0.01%	0.0	0.00%
Miscellaneous	142.8	0.71%	0.0	0.00%	142.8	1.56%
Office	3.7	0.02%	1.7	0.02%	2.0	0.02%
Public/Utilities	21.5	0.11%	0.0	0.00%	21.5	0.23%
Recreational	0.0	0.00%	0.0	0.00%	0.0	0.00%
Residential	22.3	0.11%	22.3	0.20%	0.0	0.00%
Retail/ Commercial	4.7	0.02%	3.9	0.04%	0.9	0.01%
Unknown	0.0	0.00%	0.0	0.00%	0.0	0.00%
Vacant	38.4	0.19%	0.2	0.00%	38.2	0.42%
Zone AE Total	**235.7**	**1.17%**	**30.5**	**0.28%**	**205.3**	**2.25%**
1% Annual Chance Flood Hazard Total	**340.2**	**1.69%**	**50.0**	**0.45%**	**290.2**	**3.18%**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	0.0	0.00%	0.0	0.00%	0.0	0.00%
Care/Health	0.4	0.00%	0.4	0.00%	0.0	0.00%
Church/Welfare	1.3	0.01%	1.3	0.01%	0.0	0.00%
Industrial	19.4	0.10%	19.4	0.18%	0.0	0.00%
Miscellaneous	191.3	0.95%	0.0	0.00%	191.3	2.09%
Office	55.1	0.27%	49.6	0.45%	5.6	0.06%
Public/Utilities	12.4	0.06%	0.0	0.00%	12.4	0.14%
Recreational	0.5	0.00%	0.5	0.00%	0.0	0.00%
Residential	29.2	0.14%	28.1	0.26%	1.0	0.01%
Retail/ Commercial	29.1	0.14%	27.8	0.25%	1.3	0.01%
Unknown	0.0	0.00%	0.0	0.00%	0.0	0.00%
Vacant	48.0	0.24%	0.8	0.01%	47.2	0.52%
0.2% Annual Chance Total	**386.7**	**1.92%**	**128.0**	**1.16%**	**258.8**	**2.83%**
0.2% Annual Chance Flood Hazard Total	**386.7**	**1.92%**	**128.0**	**1.16%**	**258.8**	**2.83%**

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Other Areas						
Zone X						
Agricultural	991.1	4.93%	0.0	0.00%	991.1	10.85%
Care/Health	87.9	0.44%	84.0	0.76%	3.9	0.04%
Church/Welfare	203.9	1.01%	71.4	0.65%	132.5	1.45%
Industrial	116.6	0.58%	85.5	0.78%	31.1	0.34%
Miscellaneous	2,560.2	12.72%	4.0	0.04%	2,556.1	27.99%
Office	754.8	3.75%	646.2	5.88%	108.7	1.19%
Public/Utilities	1,606.8	7.99%	0.0	0.00%	1,606.8	17.60%
Recreational	244.4	1.21%	137.8	1.25%	106.6	1.17%
Residential	9,568.6	47.55%	9,205.1	83.76%	363.6	3.98%
Retail/ Commercial	624.2	3.10%	569.9	5.19%	54.3	0.59%
Unknown	0.0	0.00%	0.0	0.00%	0.0	0.00%
Vacant	2,636.1	13.10%	8.2	0.07%	2,627.9	28.78%
Zone X Total	**19,394.8**	**96.39%**	**10,812.2**	**98.38%**	**8,582.6**	**93.99%**
Other Areas Total	**19,394.8**	**96.39%**	**10,812.2**	**98.38%**	**8,582.6**	**93.99%**
Galt Total	**20,121.7**	**100.00%**	**10,990.1**	**100.00%**	**9,131.5**	**100.00%**

Source: FEMA 11/2/2018 DFIRM

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Folsom – 2.63. According to this analysis, there is a total population of 26 and 518 residents of the City at risk to flooding in the 1% and 0.2% annual chance floodplains, respectively. This is shown in Table C-27.

Table C-27 City of Folsom – Count of Improved Residential Parcels and Population by Flood Zone

Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Folsom	10	26	197	518

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Folsom in identified DFIRM flood zones. GIS was used to determine whether the critical facility locations intersect a DFIRM flood zone, and if so, which flood zone they intersect. Details of critical facilities in DFIRM flood zones in the City of Folsom are shown in Figure C-16 for and detailed by dam inundation in Table C-28. Details of critical facility definition, type, name, and address and jurisdiction by DFIRM flood zones are listed in Appendix F.

Figure C-16 City of Folsom – Critical Facilities in FEMA DFIRM Flood Zones

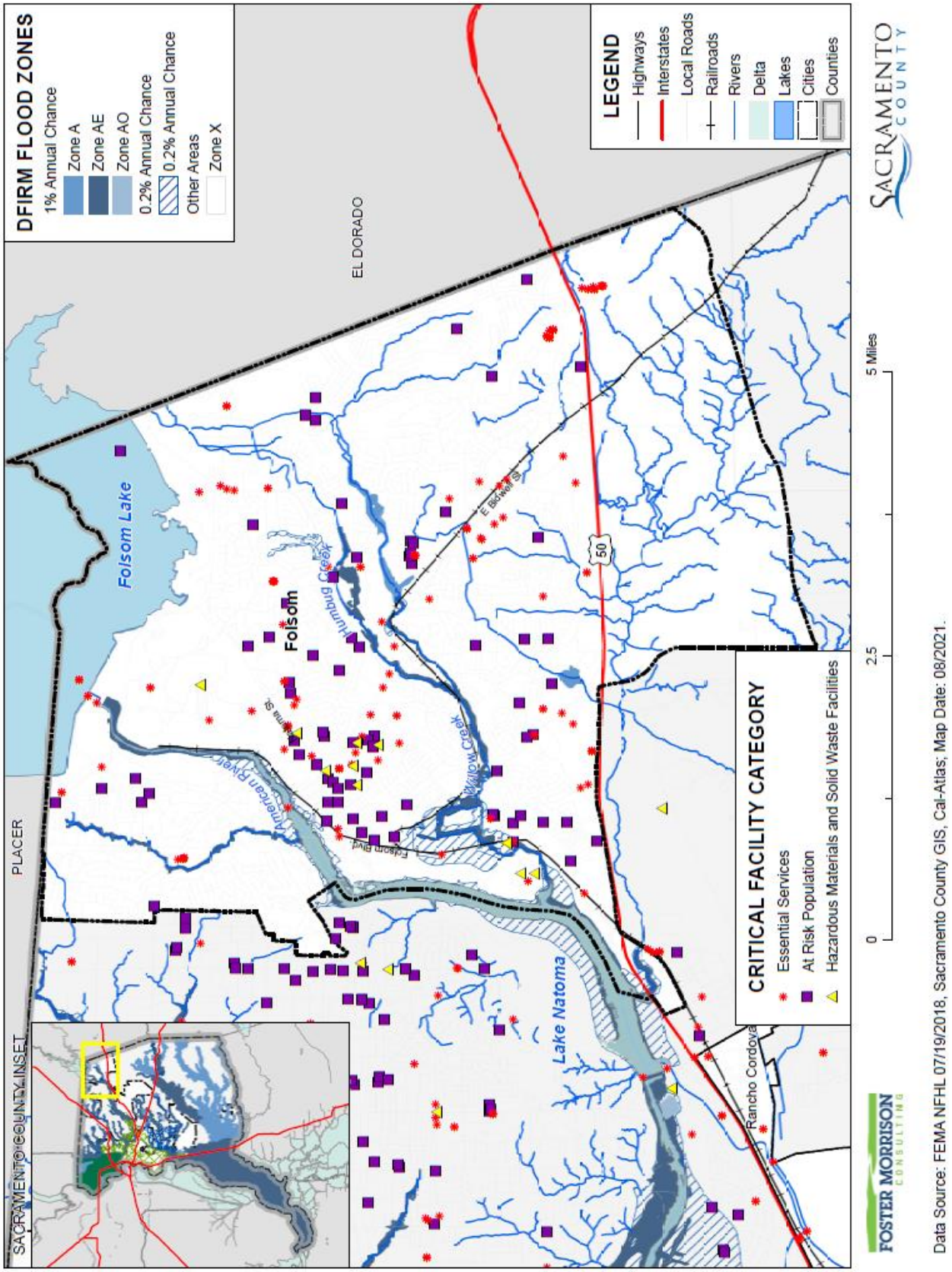


Table C-28 City of Folsom – Critical Facilities in DFIRM Flood Zones by Category and Type

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
1% Annual Chance Flood Hazard		
Essential Services Facilities	Bridge	1
	Water Well	4
	Total	**5**
At Risk Population Facilities	School	1
	Total	**1**
1% Annual Chance Flood Hazard Total		**6**
0.2% Annual Chance Flood Hazard		
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	1
	Total	**1**
0.2% Annual Chance Flood Hazard Total		**1**
Other Areas		
Essential Services Facilities	Cellular Tower	7
	Emergency Evacuation Center	4
	FDIC Insured Banks	19
	Fire Station	5
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	86
	Power Plants	5
	Public Transit Stations	3
	Water Well	10
	Total	**147**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	1
	Community Center	1
	Day Care Center	13
	Mobile Home Parks	6
	Places of Worship	40
	School	27
	Total	**88**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	7
	Total	**9**
Other Areas Total		**244**

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
Folsom Total		**251**

Source: City of Folsom, FEMA 7/19/2018 DFIRM

Insurance Coverage, Claims Paid, and Repetitive Losses

Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures located within a 100-year floodplain – a requirement that affects nearly all mortgages financed through commercial lending institutions. Flood insurance is also recommended for all structures protected by levees, even if not mapped within a floodplain.

The City of Folsom joined the National Flood Insurance Program (NFIP) on January 6, 1982. The City does not participate in CRS program. NFIP data indicates that as of March 24, 2020, there were 189 flood insurance policies in force in the City with $62,819,100 of coverage. Of the 189 policies, 186 were residential (single-family homes) and 3 were non-residential. Of the 189 policies, 21 were in A zones, and 168 were in B, C, and X zones. There have been 26 historical claims for flood losses totaling $501,081.90. NFIP data further indicates that there are 5 repetitive loss (RL) and 0 severe repetitive loss (SRL) buildings in Folsom. There have been 2 substantial damage claims since 1978.

Based on this analysis of insurance coverage, the City has values at risk to the 1% annual chance and greater floods. Of the 12 improved parcels within the 1% annual chance flood zone, 21 (or 100 percent) of those parcels maintain flood insurance. This can be seen on Table C-29.

Table C-29 City of Folsom – Percentage of Policy Holders to Improved Parcels in the 1% Annual Chance Floodplain

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Folsom	12	21	100.0%

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data

California Department of Water Resources Best Available Maps (BAM)

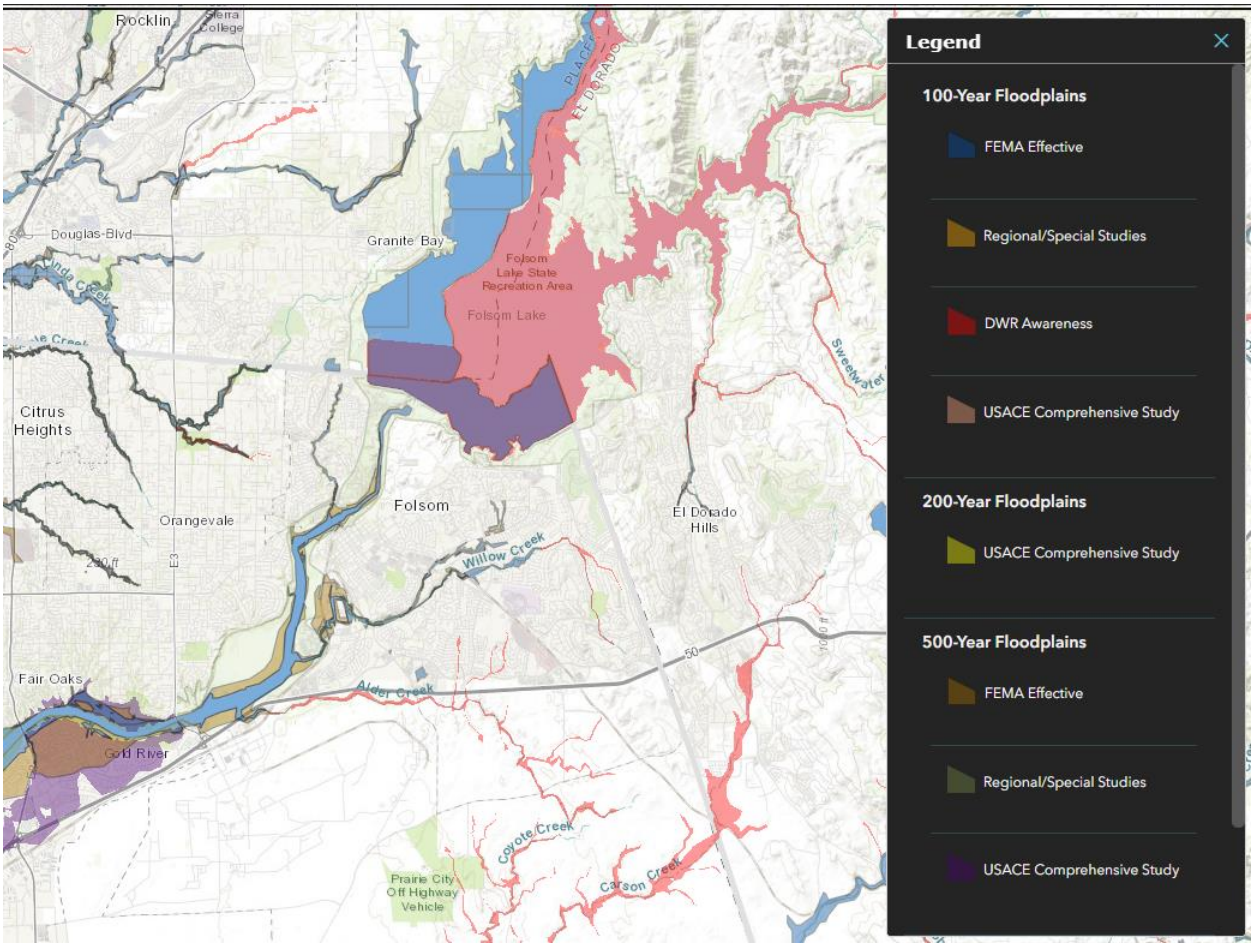
The FEMA regulatory maps provide just one perspective on flood risks in Sacramento County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Nevada-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-(as applicable), and 500-year event risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all

currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the City than that provided in the FEMA DFIRMs. The BAM map for Folsom is shown in Figure C-17.

Figure C-17 City of Folsom – Best Available Map



Source: California DWR

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1%r (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2%(2002 Sac and San Joaquin River Basins Comp Study).

Future Development

The potential for flooding may increase as floodwaters are channeled due to land development. Such changes can exacerbate flooding problems inside and outside of natural floodplains by altering or confining

natural drainage channels. Floodplain modeling and master planning should be based on build out property use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the overall floodplain.

The City enforces the floodplain ordinance. If any development is to occur in the floodplain, it would have to conform to the elevation standards of the floodplain ordinance. No development is expected in the floodplain in the future.

Alder Creek is located in the Folsom Plan Area development. The City of Folsom is currently developing the 100-year floodplain for this portion of Alder Creek. Structures within the new development will not encroach within the floodplain. Development that affects the floodplain boundaries will provide Conditional Letter of Map Revision (CLOMR) and/or Letter of Map Revision (LOMR) reports.

The City noted that it is currently completing updated floodplain modeling and mapping for portions Hinkle Creek, Willow Creek, Humbug Creek, and Alder Creek.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure C-18 shows the locations of future development areas the City is planning to develop on the DFIRM flood zones. Table C-30 shows the parcels and acreages of each future development area in the City in the DFIRM flood zones.

Figure C-18 City of Folsom – Future Development and FEMA DFIRM Flood Zones

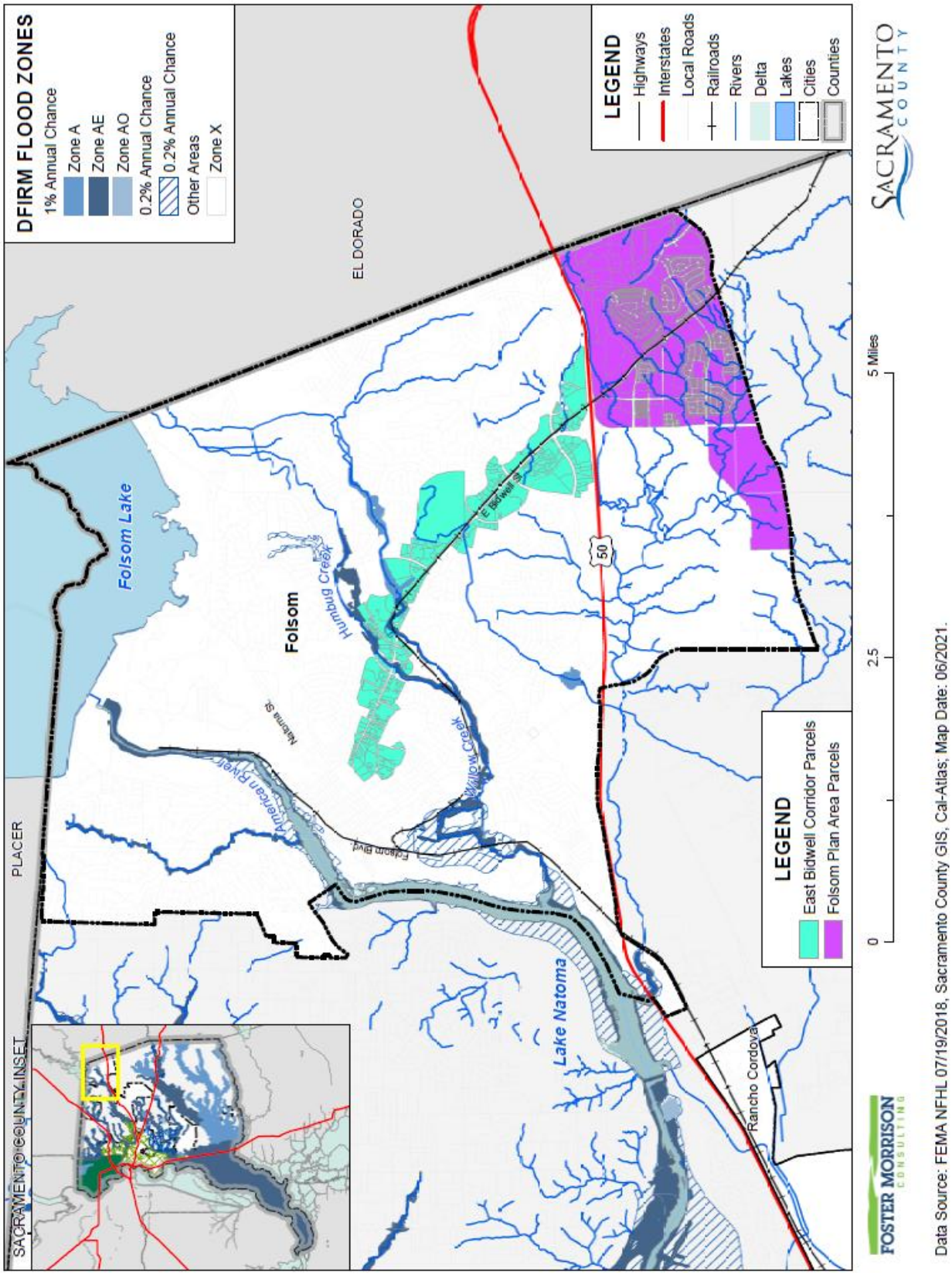


Table C-30 City of Folsom – Future Development Areas and DFIRM Flood Zones

Flood Zone/Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
1% Annual Chance Flood Hazard			
East Bidwell Corridor	1	1	0.2
1% Annual Chance Flood Hazard Total	**1**	**1**	**0.2**
0.2% Annual Chance Flood Hazard			
East Bidwell Corridor	9	7	12.4
0.2% Annual Chance Flood Hazard Total	**9**	**7**	**12.4**
Other Areas			
East Bidwell Corridor	334	276	952.1
Folsom Plan Area	2,172	383	1,674.1
Other Areas Total	**2,506**	**659**	**2,626.2**
Grand Total	**2,516**	**667**	**2,638.8**

Source: City of Folsom, FEMA 7/19/2018 DFIRM

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The City of Folsom is subject to localized flooding throughout the City. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the City vary by location. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the City tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Table C-31 identifies known and past occurrences of such areas and the associated problems encountered. This list is an initial inventory of key problem areas and is not intended to be a complete inventory of all problems and locations associated with severe weather events and localized flooding in the City of Folsom.

Table C-31 City of Folsom's Road List of Localized Flooding Problem Areas

Road Name	Flooding	High Water/Creek Crossing	Flooded by Runoff from Neighboring Property	Damaged/ Insufficient Storm Drain System
Blue Ravine/Folsom Blvd.	X			X
Humbug Creek Drive		X		
Orchard Terrace Court			X	
Bayline Circle			X	
Ballard Court		X		
Berma Road	X	X		
Thompson Circle	X			X
Baurer Circle				X
Briggs Ranch Drive	X		X	
Rebecca Way	X	X		
Redevelopment Area				
Rumsey Way	X			X
Duchow Way	X			X
Sibley Street	X			X
Wool Street	X			X
Morman Street	X			X
Natoma Street	X			X

Source: City of Folsom

Past Occurrences

There are areas of localized flooding within the City. Most have been addressed with capital improvement projects and adjustments in maintenance activities. There have been no past occurrences of note since 2016.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the City and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected

with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

The main concerns would be the safety concern from inundated roads not allowing emergency vehicular traffic, as well as damage to public and private property.

Future Development

Future development in the City will add more impervious surfaces causing an increase in stormwater runoff and the continued need to drain these waters. The City will need to be proactive to ensure that increased development has proper siting and drainage for stormwaters. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding will reduce future risks of losses.

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the City, County, and surrounding region is at risk, as pandemic is a regional, national, and international event. The speed of onset of pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table C-32.

Table C-32 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic.

- The **1918-1919 Influenza Pandemic (H1N1)**
- The **February 1957-1958 Influenza Pandemic (H2N2)**
- The **1968 Influenza Pandemic (H3N2)**

To date, the 21st century has seen two acknowledged pandemics.

- **2009 Swine Flu (H1N1**)
- **2019/2020 COVID 19**

Vulnerability to and Impacts from Pandemic

Pandemic has and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. A pandemic does not affect the buildings, critical facilities, and infrastructure in the City. A pandemic can have varying levels of impact to the citizens of the City and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently) and unemployment rose significantly. Supply chains for food can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

Fire Department staffing was critically affected during the pandemic when almost half of the members were off work from contract tracing and/or testing positive for COVID. In order to maintain service delivery, the remaining emergency responders were required to remain at work with little down-time.

Future Development

Future development is not expected to be significantly impacted by this hazard, though population growth in the City could increase exposure to a pandemic event, and increase the ability of each disease to be transmitted among the population of the City. If the median age of City residents continues to increase,

vulnerability to pandemic diseases may increase, due to the fact that these diseases are often more deadly to senior citizens.

Severe Weather: Extreme Cold and Freeze

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the National Weather Service), extreme cold often accompanies a winter storm or is left in its wake. Winter snowstorms can include heavy snow, ice, blizzard conditions, and cold temperatures. Freezing temperatures can also occur without the accompanying winter storm.

Location and Extent

Extreme cold and freeze are regional issues, meaning the entire City is at risk to cold weather and freeze events. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of extreme cold and freeze, temperature data from the County from the WRCC indicates minimum temperatures fall below 32°F on 8.3 days with no days falling below 0°F. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days at a time.

Past Occurrences

There has been no federal or state disaster declarations in the County for extreme cold and freeze. The City noted that cold and freeze is a regional phenomenon; events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

Vulnerability to and Impacts from Severe Weather: Freeze and Snow

The City experiences temperatures below 32 degrees during the winter months. The temperature moves to the low 20s in rather extreme situations. Freeze can cause injury or loss of life to residents of the City, especially to vulnerable populations. While it is rare for buildings to be affected directly by freeze, damages to pipes that feed building can be damaged during periods of extreme cold.

Extreme cold and freeze can affect critical facilities and infrastructure, down trees, break pipes, and can be a life safety issue. When extreme cold is coupled with high winds or ice storms, power lines may be downed, resulting in an interruption of utilities and critical services. Transportation networks, communications, and utilities infrastructure are the most vulnerable physical assets in the City. The elderly and young population is most vulnerable to temperature extremes. The residents of nursing homes and elder care facilities, as well as transient and homeless populations are especially vulnerable to extreme cold events.

Future Development

Future development built to code should be able to withstand issues associated with extreme cold and freeze events. Pipes at risk of freezing should be buried or insulated from freeze as new facilities are improved or added. Vulnerability to extreme cold will increase as the average age of the population in the County shifts and homelessness becomes more of an issue.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and lasts for several weeks. Heat kills by taxing the human body beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature." Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the City, there are risk to the built environment from extreme heat. While extreme heat on its own does not usually affect structures, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat and high winds can cause Public Safety Power Shutdown (PSPS) events, creating significant issues in the City. However, PSPS events in the City have been declining with PG&E's refined system for shutting power off in high wildfire risk areas.

Location and Extent

Heat is a regional phenomenon and affects the whole of the City. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

The City Planning Team noted that since extreme heat is a regional phenomenon, events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

Vulnerability to and Impacts from Extreme Heat

The City experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-115°F in rather extreme situations. During these times, drought conditions may worsen and the City may see an increase in dry fuels. Health issues are the primary concern with this hazard, although economic impacts can also be an issue.

The elderly and individuals below the poverty level are the most vulnerable to extreme temperatures. Nursing homes and elder care facilities are especially vulnerable to extreme heat events if power outages occur and air conditioning is not available. In addition, individuals below the poverty level may be at increased risk to extreme heat if use of air conditioning is not affordable. This is especially true of homeless people and the transient population.

Days of extreme heat have been known to result in medical emergencies, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts. Extreme heat can also dry out vegetations, making it more vulnerable to wildfire ignitions.

Opening and staffing "Cooling Centers" for multiple days during heat warnings issued by the National Weather Service. Concerns are for the elderly who are medically vulnerable during these events and the possibility of evacuation or movement from facilities that may become inoperable due to power loss.

Future Development

Future development of new buildings in the City will likely not be affected by extreme heat. Extreme heat is more likely to affect vulnerable populations. Vulnerability to extreme heat will increase as the average age of the population in each City shifts. It is encouraged that nursing homes and elder care facilities have emergency plans or backup power to address power failure during times of extreme heat and in the event of a PSPS. Low income residents and homeless populations are also vulnerable. Cooling centers for these populations should be utilized when necessary.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the City occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the City falls mainly in the fall, winter, and spring months. Wind often accompanies these storms; hail and lightning are rare in the City.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the City. All portions of the City are at risk to heavy rains and storms. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Hail and lightning are rare in the City and Sacramento County. Duration of severe storms in California, Sacramento County, and the City can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the City. This is the cause of many of the federal disaster declarations related to flooding. The storms in February 1986 caused the Folsom dam to exceed its design capacity. Heavy rains affected Sacramento County and the other areas of the American River drainage basin. Rainfalls of up to 29″ fell between February 11 and 20. The Folsom Dam did not fail, but Folsom Lake was 1.56 ft into surcharge storage, holding 18,200 acre-feet more than design capability. Dam improvements since 1986 have and will increase capacity of the dam. Past events of heavy rains and storms were discussed in the Past Occurrences section of the Flood: 14%/0.2% Annual Chance discussion above.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the City. These events can cause significant and localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the City, but also can cause damage, with lightning occasionally igniting wildfires.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

Concerns would be the safety concern from inundated roads not allowing emergency vehicular traffic, potential damage to existing infrastructure, as well as damage to public and private property.

Future Development

Building codes in the City ensure that new development is built to current building standards, which should reduce the risk to future development in the City from heavy rains and storms. New critical should be built to withstand hail damage, lightning, and thunderstorm winds. With adherence to development standards, future losses to new development should be minimal.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also contibute to PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire City is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and City. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The City noted that high winds is a regional phenomenon and affects the City on an annual basis. Those past occurrences were shown in the Base Plan in Section 4.3.5.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the City throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power

lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly. During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the City will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Increased PSPS events
- Occasional building damage, primarily to roofs

Future Development

Future development projects will consider wind hazards at the planning, and design stage with the goal of reducing vulnerability. The City enforces the state building code and other ordinances, which regulate construction techniques that minimize damage from windstorms. Future development in the City is subject to these building codes. New critical facilities should also consider adding generators for times of PSPS.

Wildfire

Likelihood of Future Occurrence– Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the City of Folsom. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. These high winds can result in red flag days, and can result in PSPS events in the City. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

The City has many areas that are susceptible to small fires that could grow into some form and size of urban interface fire. These areas can be divided into four main areas: the American River/Lake Natoma corridor,

the various parkways and easements, natural areas involving wetlands and dredger tailings, and open fields and rangelands.

American River/Lake Natoma Corridor

The American River flows from the base of Folsom Dam into the Lake Natoma Recreation area. The property adjacent to the river is owned by the State of California, maintained by the State of California Parks and Recreation Department. The area is mostly natural habitat accessed through limited roadways, a bicycle/horse trail and numerous footpaths. These means of ingress provide access to remote areas in which fires can begin and access for fire equipment is difficult.

The area upstream from the Rainbow Bridge is mostly rough and steep terrain with very limited access. This creates an opportunity for fires to grow at a rapid rate and gain momentum while continuing to burn towards the residential structures that are scattered about the edge of the beltway. The natural growth, type of construction, and roofing materials provide ample opportunity for fire to spread into residential areas. Negro Bar, Folsom Powerhouse, and Willow Creek Recreation areas are downstream of the bridge. At the west end of Negro Bar are bluffs that are 300 feet high in some locations.

Adjacent to the Negro Bar area is the bluff area on Greenback Lane and an area known as the Orangevale cut. Both of these locations have very steep terrain with dry, flashy, rapid burning fuels. They directly interface with residential and multi-family structures with wood shake roofs. These areas have occasional fires throughout the fire season and require continuous monitoring and aggressive fire suppression activities to prevent a catastrophic event from occurring.

Parkways & Easements

Throughout the City, there exist numerous un-maintained alleyways, easements, and rights-of-way. In many locations, these provide easy access to residential structures or other types of vegetation, which could increase the likelihood that a fire may rapidly spread beyond the capabilities of responding units. Areas of concern include the Hinkle Creek, Willow Creek, Humbug Creek and Blue Ravine Parkway beltways.

Natural Areas, Wetlands, and Dredger Tailings

Continuous development of the City has created many landlocked areas, mandatory wetland areas and the preservation of pre-existing dredger tailings. Areas of this nature tend to be surrounded by residential developments and are difficult to access. Their proximity to development provides an opportunity for ideal fire conditions to spread fire via flying brands and consumption of small stands of trees.

Open Fields and Rangelands

The east areas of Folsom provide the greatest opportunity for a large-scale fire to start and spread uncontrollably into developed areas or into the foothills of El Dorado Hills. This undeveloped area is considered a Local Response Area (LRA) because it is within the city limits. The land south of U.S. 50 is within the State Response Area (SRA) and a fire in this area, pushed by a southerly or westerly wind, could severely impact the City of Folsom. This LRA is also classified as a Mutual Threat Zone by the California Department of Forestry and Fire Protection, thereby requiring their fire response due to the potential of a

major fire. The hilly, rocky terrain with its numerous rock outcroppings around developed areas and along the Sacramento/El Dorado County line makes it very difficult to contain a fire before it rapidly grows and threatens structures. This portion of the City is also where numerous transmission towers and repeater antennas are located on the ridge tops. They can be both a source of ignition for a wildland fire and an exposure from a fire starting in lowlands.

While certain areas may be more prone to wildfires, wildfire can affect all areas of the City. CAL FIRE has estimated that the risk varies across the City and has created maps showing risk variance. Following the methodology described in Section 4.3.19 of the Base Plan, wildfire maps for the City of Folsom were created. Figure C-19 shows the CAL FIRE FHSZ in the City. As shown on the maps, FHSZs within the City range from urban unzoned to high. Figure C-20 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, fire threat within the City range from low to very high.

Figure C-19 City of Folsom – Fire Hazard Severity Zones

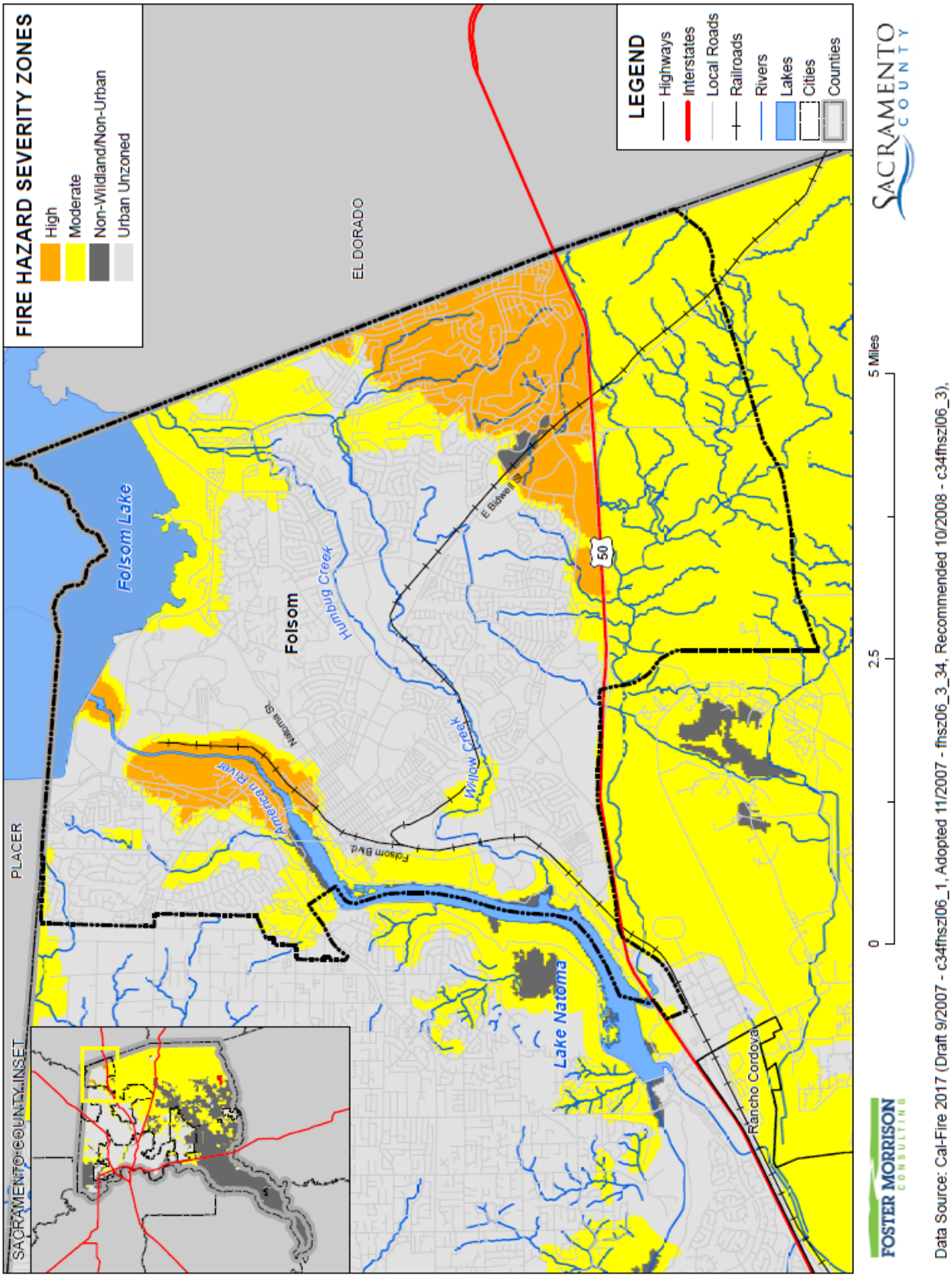
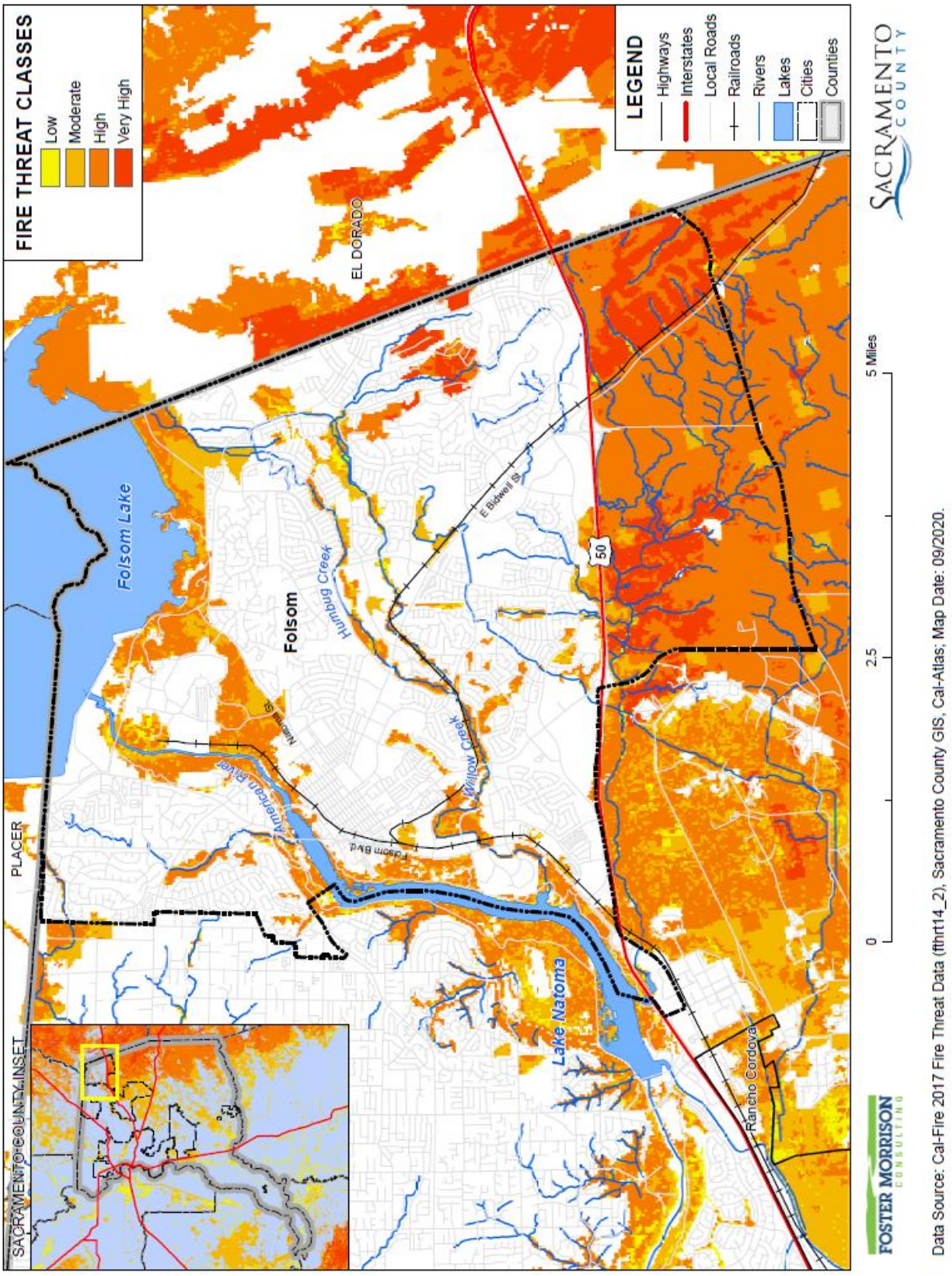


Figure C-20 City of Folsom – Fire Threat Areas



Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more. Geographical FHSZ extent from CAL FIRE is shown in Table C-33. Geographical Fire Threat Area extents from CAL FIRE are shown on Table C-34.

Table C-33 City of Folsom – Geographical FHSZ Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	2,500.1	12.43%	1,335.4	12.15%	1,164.8	12.76%
Moderate	7,339.7	36.48%	2,326.6	21.17%	5,013.1	54.90%
Non-Wildland/non-Urban	149.5	0.74%	10.9	0.10%	138.6	1.52%
Urban Unzoned	10,132.2	50.35%	7,317.2	66.58%	2,815.0	30.83%
Total	**20,121.7**	**100.00%**	**10,990.1**	**100.00%**	**9,131.5**	**100.00%**

Source: CAL FIRE

Table C-34 City of Folsom – Geographical Fire Threat Area Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	1,014.7	5.04%	32.4	0.29%	982.4	10.76%
High	3,938.6	19.57%	189.1	1.72%	3,749.5	41.06%
Moderate	1,001.6	4.98%	82.0	0.75%	919.5	10.07%
Low	134.7	0.67%	17.3	0.16%	117.5	1.29%
No Threat	14,032.0	69.74%	10,669.4	97.08%	3,362.6	36.82%
Total	20,121.7	100.00%	10,990.1	100.00%	9,131.5	100.00%

Source: CAL FIRE

Past Occurrences

There has been no state and one federal disaster declaration due to fire, as shown in Table C-35. It should be noted that this fire disaster was from an explosion in Roseville, and not from an actual wildfire.

Table C-35 Sacramento County – State and Federal Wildfire Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

There is no history of wildfires near the City of Folsom. The closest occurrence being the King Fire in the City of Pollock Pines located in the neighboring El Dorado County. Smoke from the Lightning Complex fires (August 2020) blanketed Folsom and the surrounding areas resulting in a very unhealthy to a hazardous air quality index. The Fire Department was able to distribute N95 masks to City workers who were performing required duties outside. Opened "clean air" centers for community members to take shelter at.

Vulnerability to and Impacts from Wildfire

Fuel loads in the City, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. The more urbanized areas within the County are not immune from fire. The dry vegetation and hot and sometimes windy weather, combined with continued growth, result in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the City, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Folsom is not immune to numerous types of grass and brush fires and any one of them may accelerate into an urban interface wildfire. Such a situation could lead to evacuation of large portions of the population and the potential for significant loss of personal property, structures, and rangeland. The natural fuels available in or near the City vary greatly in the rate and intensity of burning. Fires in heavy brush and stands of trees burn with great intensity but more slowly than in dry grass and leaves. Dense fuels will propagate fire better than sparse fuels.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and timber; and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the City. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the City by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the City; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from wildfires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate a PSPS which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Assets at Risk

Based on the vulnerability of Folsom to the wildfire hazard, the sections that follow describes significant assets at risk in the City of Folsom. This section includes the values at risk, population at risk, and critical facilities at risk.

Values at Risk in Fire Hazard Severity Zones

GIS was used to determine the possible impacts of wildfire within the City of Folsom. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire hazard severity zones. Summary analysis results for Folsom are shown in Table C-36, which summarizes total parcel counts, improved parcel counts and their structure values by fire hazard severity zone. Table C-37 breaks out the Table C-36 by adding the property use details by fire hazard severity zone for the City.

Table C-36 City of Folsom – Count and Value of Parcels by Fire Hazard Severity Zone

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
High	3,153	2,738	$639,852,655	$1,639,767,622	$1,026,226,584	$3,305,846,828
Moderate	5,544	3,619	$1,068,214,044	$1,638,882,317	$998,944,800	$3,706,041,180
Non-Wildland/Non-Urban	10	4	$11,822,351	$66,472,063	$33,236,032	$111,530,446
Urban Unzoned	18,351	17,253	$2,718,704,794	$7,241,235,668	$4,471,131,619	$14,431,072,047
Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table C-37 City of Folsom – Count and Value of Parcels by Fire Hazard Severity Zone and Property Use

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
High						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	2	0	$18	$0	$0	$18
Industrial	2	1	$1,604,844	$3,234,177	$4,851,266	$9,690,287
Miscellaneous	150	1	$408,621	$37,884	$37,884	$484,389
Office	12	11	$28,819,971	$122,833,097	$122,833,097	$274,486,165
Public/Utilities	6	0	$0	$0	$0	$0
Recreational	4	4	$7,139,380	$45,189,782	$45,189,782	$97,518,944
Residential	2,707	2,657	$455,785,584	$1,228,316,553	$614,158,290	$2,298,260,394

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Retail / Commercial	64	59	$52,030,189	$239,156,265	$239,156,265	$530,342,719
Unknown	0	0	$0	$0	$0	$0
Vacant	206	5	$94,064,048	$999,864	$0	$95,063,912
High Total	**3,153**	**2,738**	**$639,852,655**	**$1,639,767,622**	**$1,026,226,584**	**$3,305,846,828**
Moderate						
Agricultural	10	0	$57,801,668	$0	$0	$57,801,668
Care/Health	7	6	$6,056,563	$10,896,402	$10,896,402	$27,849,367
Church/Welfare	1	1	$443,829	$2,807,121	$2,807,121	$6,058,071
Industrial	8	4	$2,949,768	$13,473,417	$20,210,126	$36,633,310
Miscellaneous	402	0	$8,728,996	$0	$0	$8,728,996
Office	69	61	$51,269,683	$182,022,948	$182,022,948	$415,315,579
Public/Utilities	21	0	$9	$0	$0	$9
Recreational	5	2	$8,527,440	$8,745,773	$8,745,773	$26,018,986
Residential	3,641	3,494	$540,716,319	$1,293,129,855	$646,564,929	$2,480,411,123
Retail / Commercial	54	49	$59,066,392	$127,697,501	$127,697,501	$314,461,394
Unknown	1	1	$0	$104,300	$0	$104,300
Vacant	1,325	1	$332,653,377	$5,000	$0	$332,658,377
Moderate Total	**5,544**	**3,619**	**$1,068,214,044**	**$1,638,882,317**	**$998,944,800**	**$3,706,041,180**
Non-Wildland/Non-Urban						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	5	0	$37	$0	$0	$37
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	4	4	$8,222,439	$66,472,063	$33,236,032	$107,930,534
Retail / Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	1	0	$3,599,875	$0	$0	$3,599,875
Non-Wildland/Non-Urban Total	**10**	**4**	**$11,822,351**	**$66,472,063**	**$33,236,032**	**$111,530,446**

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Urban Unzoned						
Agricultural	1	0	$9	$0	$0	$9
Care/Health	27	23	$27,738,470	$188,084,185	$188,084,185	$403,906,840
Church/Welfare	42	28	$10,090,973	$62,231,966	$62,231,966	$134,554,905
Industrial	40	30	$34,442,908	$114,149,820	$171,224,732	$319,817,459
Miscellaneous	672	0	$486,347	$0	$0	$486,347
Office	216	201	$114,253,796	$645,366,495	$645,366,495	$1,404,986,786
Public/Utilities	43	0	$18	$0	$0	$18
Recreational	11	8	$9,136,185	$24,116,742	$24,116,742	$57,369,669
Residential	16,831	16,703	$2,247,281,512	$5,650,303,866	$2,825,151,997	$10,722,737,342
Retail / Commercial	255	245	$238,095,764	$554,955,502	$554,955,502	$1,348,006,768
Unknown	0	0	$0	$0	$0	$0
Vacant	213	15	$37,178,812	$2,027,092	$0	$39,205,904
Urban Unzoned Total	**18,351**	**17,253**	**$2,718,704,794**	**$7,241,235,668**	**$4,471,131,619**	**$14,431,072,047**
Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Values at Risk in Fire Threat Areas

GIS was used to determine the possible impacts of wildfire within the City of Folsom. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in Fire Threat Areas. Summary analysis results for Folsom are shown in Table C-38, which summarizes total parcel counts, improved parcel counts and their structure values by Fire Threat Area. Table C-39 breaks out the Table C-38 by adding the property use details by threat areas for the City.

Table C-38 City of Folsom – Count and Value of Parcels by Fire Threat Areas

Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	788	63	$131,919,565	$37,185,086	$18,611,485	$187,716,135
High	1,737	706	$441,821,634	$327,213,052	$181,478,986	$950,513,693
Moderate	389	273	$51,523,132	$147,125,846	$86,757,208	$285,406,188
Low	52	31	$5,126,140	$14,542,079	$7,271,039	$26,939,258
No Threat	24,092	22,541	$3,808,203,373	$10,060,291,607	$6,235,420,317	$20,103,915,227
Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table C-39 City of Folsom – Count and Value of Parcels by Fire Threat Areas and Property Use

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High						
Agricultural	1	0	$10	$0	$0	$10
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	74	1	$4,995,094	$37,884	$37,884	$5,070,862
Office	0	0	$0	$0	$0	$0
Public/Utilities	1	0	$9	$0	$0	$9
Recreational	0	0	$0	$0	$0	$0
Residential	81	62	$16,143,152	$37,147,202	$18,573,601	$71,863,954
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	631	0	$110,781,300	$0	$0	$110,781,300
Very High Total	**788**	**63**	**$131,919,565**	**$37,185,086**	**$18,611,485**	**$187,716,135**
High						
Agricultural	9	0	$57,801,658	$0	$0	$57,801,658
Care/Health	3	2	$7,662,687	$1,353,852	$1,353,852	$10,370,391
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	233	0	$3,705,716	$0	$0	$3,705,716
Office	4	4	$5,445,692	$35,011,968	$35,011,968	$75,469,628
Public/Utilities	13	0	$0	$0	$0	$0
Recreational	1	0	$550,332	$0	$0	$550,332
Residential	798	698	$128,860,316	$290,226,349	$145,113,166	$564,199,852
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	676	2	$237,795,233	$620,883		$238,416,116
High Total	**1,737**	**706**	**$441,821,634**	**$327,213,052**	**$181,478,986**	**$950,513,693**
Moderate						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	2	2	$1,347,398	$3,997,771	$3,997,771	$9,342,940
Church/Welfare	0	0	$0	$0	$0	$0

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	84	0	$967	$0	$0	$967
Office	2	2	$4,719,040	$22,390,801	$22,390,801	$49,500,642
Public/Utilities	2	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	275	269	$40,699,600	$120,737,274	$60,368,636	$221,805,512
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	24	0	$4,756,127	$0	$0	$4,756,127
Moderate Total	**389**	**273**	**$51,523,132**	**$147,125,846**	**$86,757,208**	**$285,406,188**
Low						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	15	0	$69	$0	$0	$69
Office	0	0	$0	$0	$0	$0
Public/Utilities	1	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	31	31	$4,859,154	$14,542,079	$7,271,039	$26,672,272
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	5	0	$266,917	$0	$0	$266,917
Low Total	**52**	**31**	**$5,126,140**	**$14,542,079**	**$7,271,039**	**$26,939,258**
No Threat						
Agricultural	1	0	$9	$0	$0	$9
Care/Health	29	25	$24,784,948	$193,628,964	$193,628,964	$412,042,876
Church/Welfare	45	29	$10,534,820	$65,039,087	$65,039,087	$140,612,994
Industrial	50	35	$38,997,520	$130,857,414	$196,286,124	$366,141,056
Miscellaneous	823	0	$922,155	$0	$0	$922,155
Office	291	267	$184,178,718	$892,819,771	$892,819,771	$1,969,818,260
Public/Utilities	53	0	$18	$0	$0	$18
Recreational	19	14	$24,252,673	$78,052,297	$78,052,297	$180,357,267
Residential	21,998	21,798	$3,061,443,632	$7,775,569,433	$3,887,784,806	$14,724,797,803

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Retail/ Commercial	373	353	$349,192,345	$921,809,268	$921,809,268	$2,192,810,881
Unknown	1	1	$0	$104,300	$0	$104,300
Vacant	409	19	$113,896,535	$2,411,073	$0	$116,307,608
No Threat Total	**24,092**	**22,541**	**$3,808,203,373**	**$10,060,291,607**	**$6,235,420,317**	**$20,103,915,227**
Folsom Total	**27,058**	**23,614**	**$4,438,593,844**	**$10,586,357,670**	**$6,529,539,035**	**$21,554,490,501**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Population at Risk

The FHSZ dataset was overlayed on the parcel layer. Those residential parcel centroids that intersect the FHSZs were counted and multiplied by the 2010 Census Bureau average household factors for the City of Folsom – 2.63. According to this analysis, there is a total population of 16,177 residents of Folsom at risk to moderate or higher FHSZs, while there is a total of 1,568 in the moderate or higher fire threat areas. This is shown in Table C-40 and Table C-41, respectively.

Table C-40 City of Folsom – Count of Improved Residential Parcels and Population by Fire Hazard Severity Zone

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Folsom	0	0	2,657	6,988	3,494	9,189

Source: CAL FIRE, US Census Bureau Average Household Sizes: Folsom (2.63)

Table C-41 City of Folsom – Count of Improved Residential Parcels and Population by Fire Threat Area

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Folsom	62	163	698	1,836	269	707

Source: CAL FIRE, US Census Bureau Average Household Sizes: Folsom (2.63)

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Folsom in identified FHSZs. Critical facilities in a FHSZ in the City of Folsom are shown in Figure C-21 and detailed in Table C-42. Critical facilities in a fire threat area in the City of Folsom are shown in Figure C-22 and detailed in Table C-43. Details of critical facility definition, type, name and address and jurisdiction by fire hazard severity zone are listed in Appendix F.

Figure C-21 City of Folsom – Critical Facilities in Fire Hazard Severity Zones

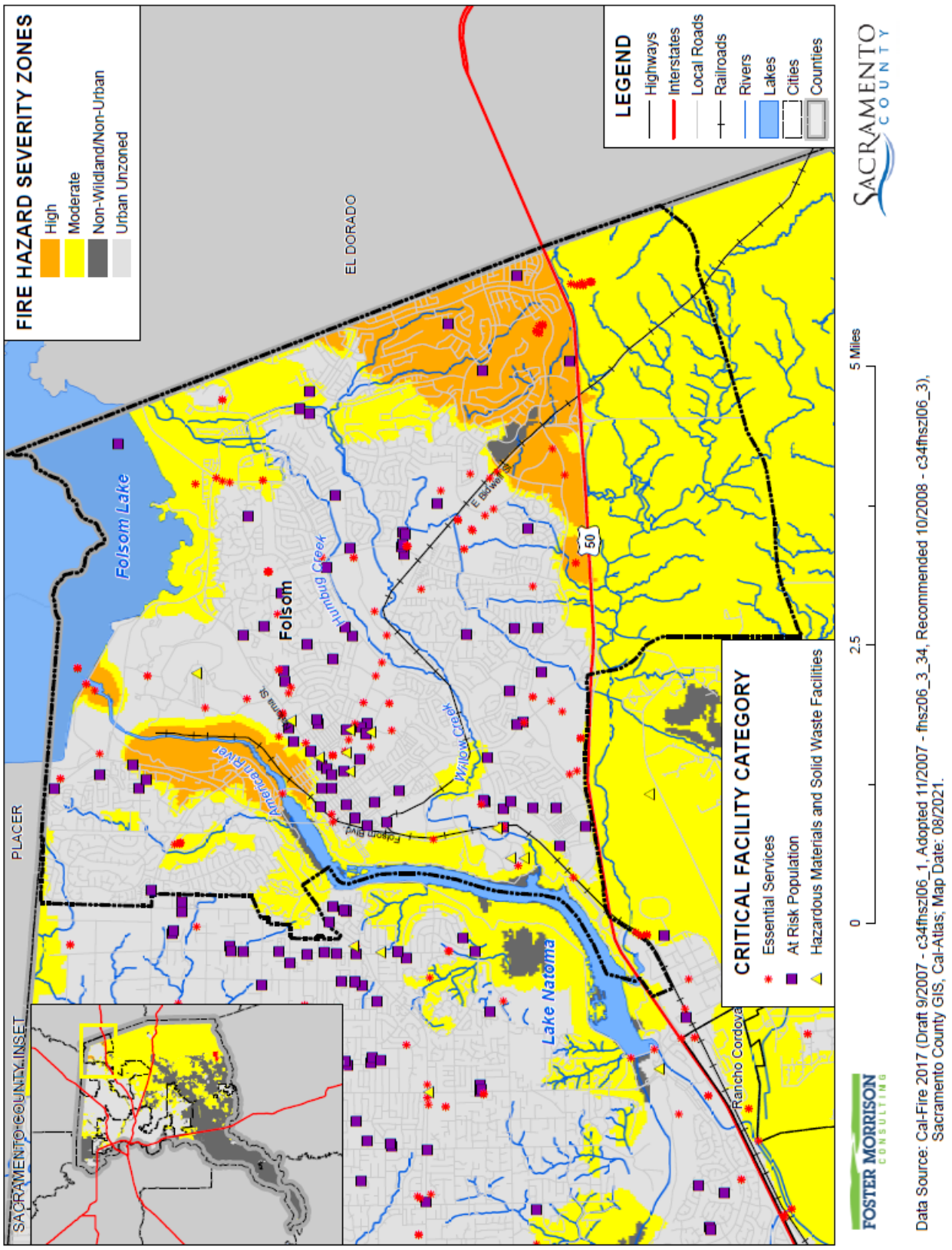


Table C-42 City of Folsom – Critical Facilities by Fire Hazard Severity Zone

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
High		
Essential Services Facilities	FDIC Insured Banks	2
	Microwave Service Towers	28
	Power Plants	1
	Total	**31**
At Risk Population Facilities	Day Care Center	1
	Places of Worship	1
	School	2
	Total	**4**
High Total		**35**
Moderate		
Essential Services Facilities	Cellular Tower	7
	FDIC Insured Banks	4
	Fire Station	1
	Hospital or Urgent Care	1
	Law Enforcement	1
	Microwave Service Towers	17
	Public Transit Stations	2
	Water Well	1
	Total	**34**
At Risk Population Facilities	Day Care Center	2
	Mobile Home Parks	1
	Places of Worship	4
	School	3
	Total	**10**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	1
	Total	**1**
Moderate Total		**45**
Non-Wildland/Non-Urban		
Essential Services Facilities	Bridge	1
	Water Well	4
	Total	**5**
At Risk Population Facilities	School	1
	Total	**1**
Non-Wildland/Non-Urban Total		**6**

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
Urban Unzoned		
Essential Services Facilities	Emergency Evacuation Center	4
	FDIC Insured Banks	13
	Fire Station	4
	Hospital or Urgent Care	3
	Law Enforcement	3
	Microwave Service Towers	41
	Power Plants	4
	Public Transit Stations	1
	Water Well	9
	Total	**82**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	1
	Community Center	1
	Day Care Center	10
	Mobile Home Parks	5
	Places of Worship	35
	School	22
	Total	**74**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	1
	Leaky Underground Storage Tank	8
	Total	**9**
Urban Unzoned Total		**165**
Folsom Total		**251**

Source: CAL FIRE, Sacramento County

Figure C-22 City of Folsom – Critical Facilities in Fire Threat Areas

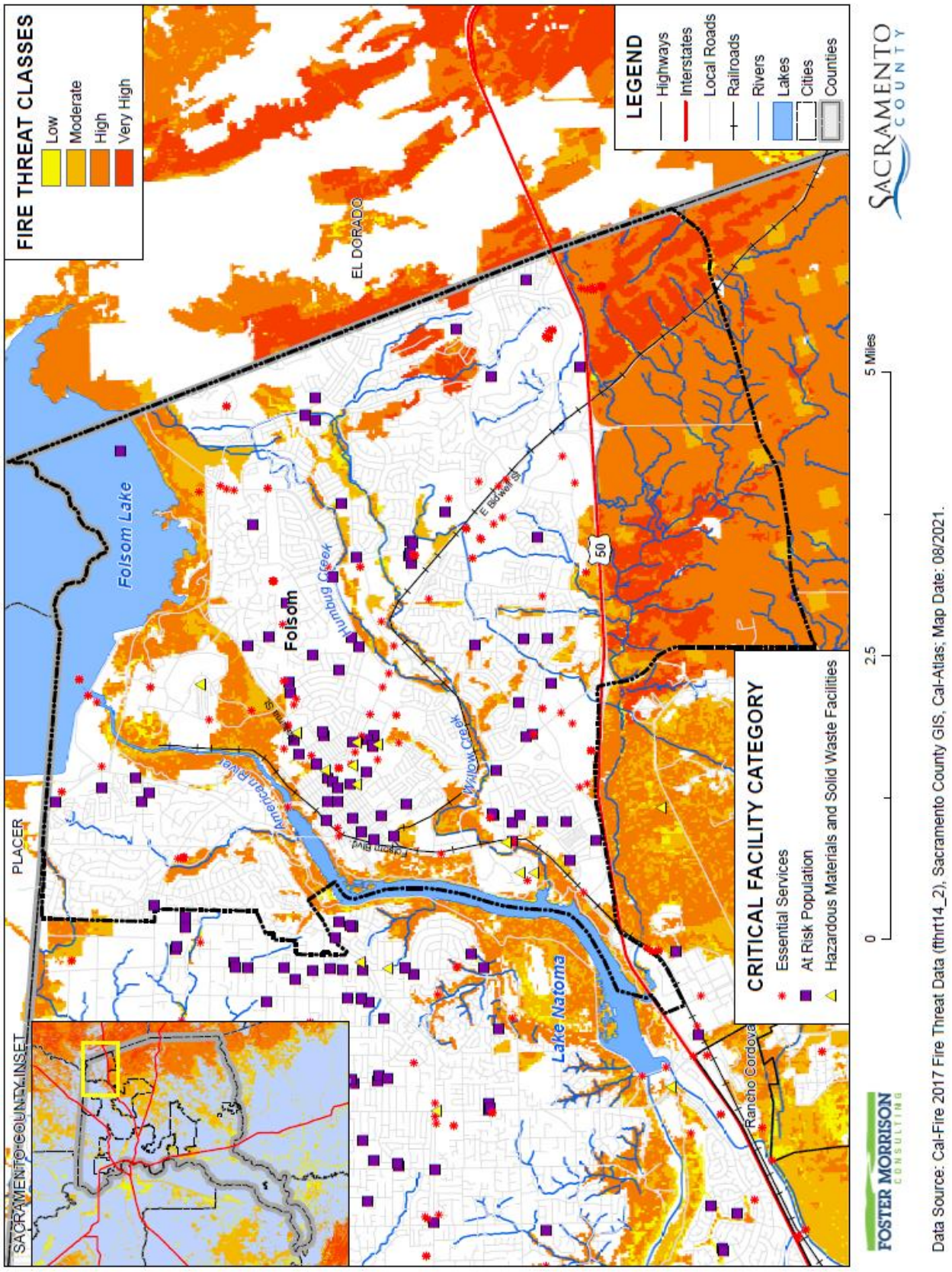


Table C-43 City of Folsom – Critical Facilities by Fire Threat Areas

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
High		
Essential Services Facilities	Cellular Tower	4
	Microwave Service Towers	4
	Total	**8**
High Total		**8**
Moderate		
Essential Services Facilities	Power Plants	1
	Water Well	1
	Total	**2**
Moderate Total		**2**
No Threat		
Essential Services Facilities	Bridge	1
	Cellular Tower	3
	Emergency Evacuation Center	4
	FDIC Insured Banks	19
	Fire Station	5
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	80
	Power Plants	4
	Public Transit Stations	3
	Water Well	13
	Total	**140**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	1
	Community Center	1
	Day Care Center	13
	Mobile Home Parks	6
	Places of Worship	40
	School	28
	Total	**89**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	8
	Total	10
No Threat Total		**239**
Very High		

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
Essential Services Facilities	Microwave Service Towers	2
	Total	**2**
Very High Total		**2**
Folsom Total		**251**

Source: CAL FIRE, Sacramento County

Future Development

Additional growth and development within moderate or higher fire hazard severity zones in the City would place additional values at risk to wildfire. City building codes are in effect and should continue to be updated as appropriate to reduce this risk.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure C-23 shows the locations of future development areas the City is planning to develop on the FHSZs. Table C-44 shows the parcels and acreages of each future development area in the City in each FHSZ. Figure C-24 shows the locations of future development areas the City is planning to develop on the Fire Threat Area. Table C-45 shows the parcels and acreages of each future development area in the City in each Fire Threat Area.

Figure C-23 City of Folsom – Future Development in FHSZs

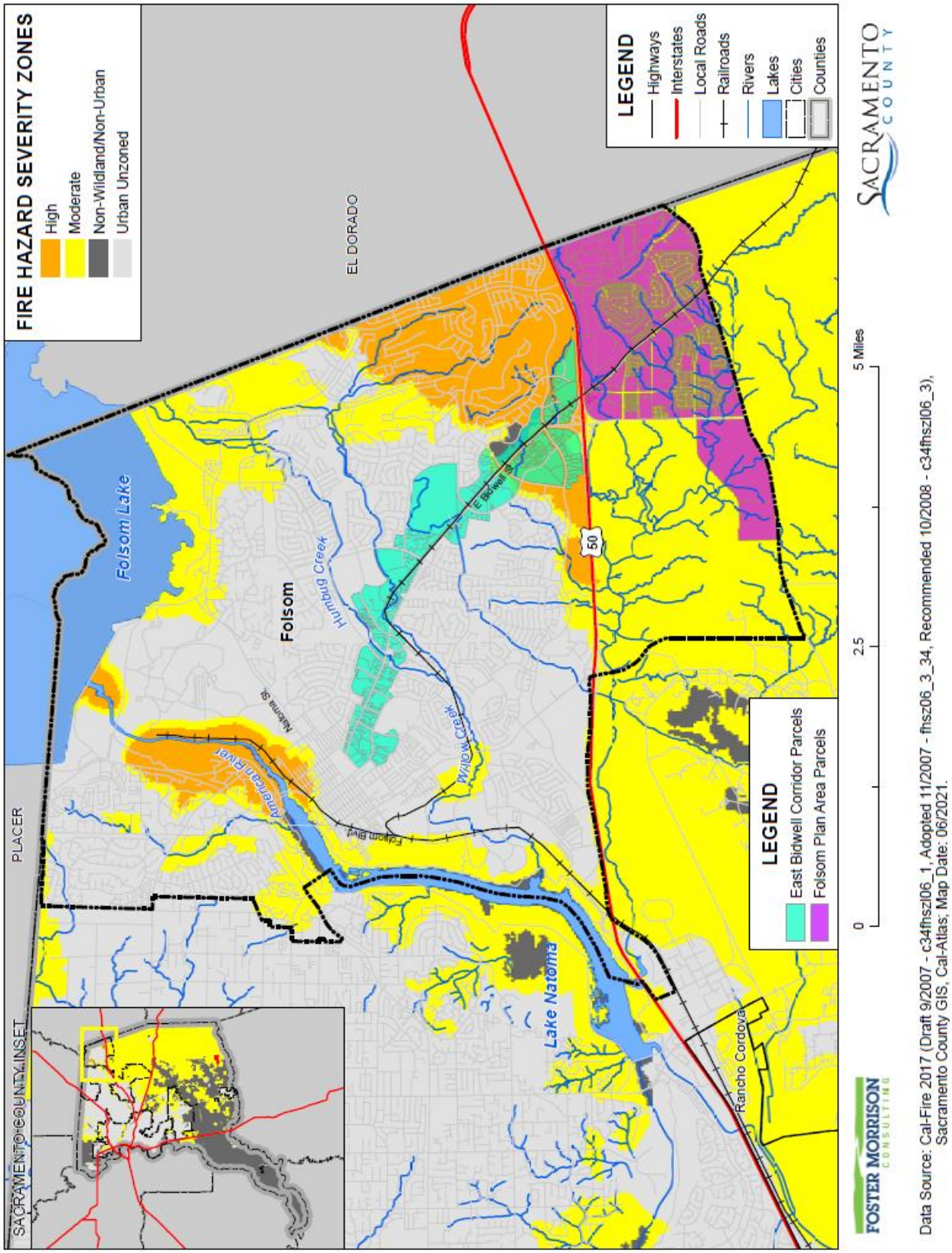


Table C-44 City of Folsom – Future Development by FHSZ

Fire Hazard Severity Zone/ Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
High			
East Bidwell Corridor	78	65	237.1
Folsom Plan Area	1	0	0.5
High Total	**79**	**65**	**237.5**
Moderate			
East Bidwell Corridor	9	8	35.4
Folsom Plan Area	2,171	383	1,673.7
Moderate Total	2,180	391	1,709.0
Non-Wildland/Non-Urban			
East Bidwell Corridor	2	0	33.5
Non-Wildland/Non-Urban Total	**2**	**0**	**33.5**
Urban Unzoned			
East Bidwell Corridor	255	211	658.8
Urban Unzoned Total	**255**	**211**	**658.8**
Grand Total	**2,516**	**667**	**2,638.8**

Source: City of Folsom, CAL FIRE

Figure C-24 City of Folsom – Future Development and Fire Threat Areas

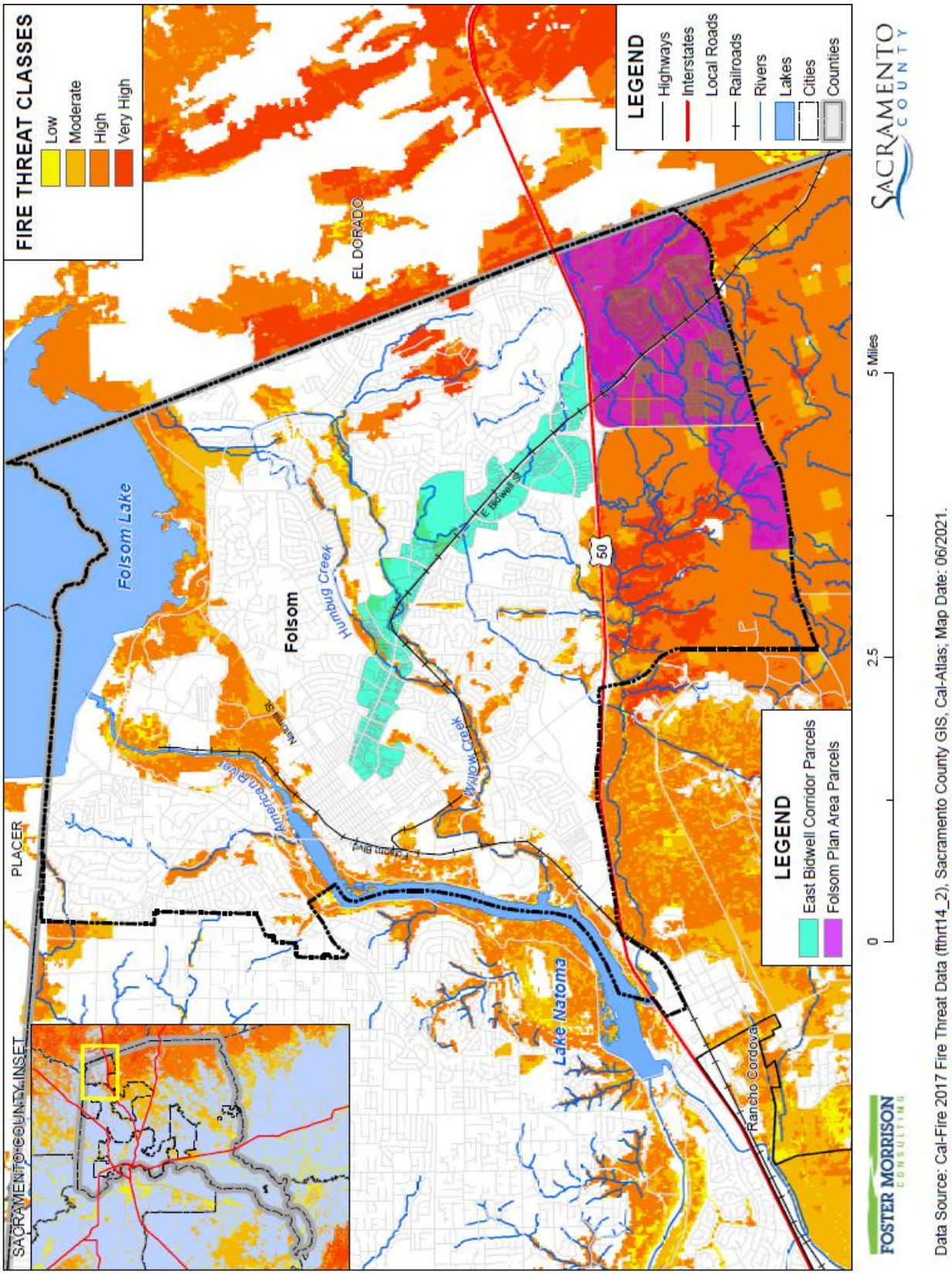


Table C-45 City of Folsom – Future Development by Fire Threat Area

Fire Threat/ Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Very High			
Folsom Plan Area	669	15	456.5
Very High Total	**669**	**15**	**456.5**
High			
East Bidwell Corridor	9	4	33.0
Folsom Plan Area	1,497	368	1,201.2
High Total	**1,506**	**372**	**1,234.2**
Moderate			
East Bidwell Corridor	3	0	5.6
Moderate Total	**3**	**0**	**5.6**
Low			
Folsom Plan Area	5	0	13.9
Low Total	**5**	**0**	**13.9**
No Threat			
East Bidwell Corridor	332	280	926.0
Folsom Plan Area	1		2.5
No Threat Total	**333**	**280**	**928.6**
Grand Total	**2,516**	**667**	**2,638.8**

Source: City of Folsom, CAL FIRE

C.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

C.6.1. Regulatory Mitigation Capabilities

Table C-46 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Folsom.

Table C-46 City of Folsom Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2018	General Plan map is available on the City's website. The General Plan document is available for viewing or purchase at the City's Planning Department. Economic Development and Transportation is addressed in the General Plan.
Capital Improvements Plan	Y	The fiscal Operating Budget and Capital Improvement Plan is available on the City's website.
Economic Development Plan	Y	
Local Emergency Operations Plan	Y	The Emergency Operations Plan was updated in 2020. The plan addresses hazards and includes the Wildfire Protection Plan as a threat specific annex.
Continuity of Operations Plan		
Transportation Plan		
Stormwater Management Plan/Program	Y	Stormwater Management is discussed in the City's Design Standards, and in section 8.70 of the Folsom Municipal Code.
Engineering Studies for Streams	Y	
Community Wildfire Protection Plan	Y	Included within the current Emergency Operations Plan.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Open Space Mitigation Plan – Covers the Folsom Plan Area and include Oak Tree Mitigation Plan and Wildfire Protection Plan.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: 2013
Building Code Effectiveness Grading Schedule (BCEGS) Score	Y	Score: 2
Fire department ISO rating:	Y	Rating: 3
Site plan review requirements	Y	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	The Zoning Ordinance is Title 17 of the Folsom Municipal Code.
Subdivision ordinance	Y	The Subdivision Ordinance is Title 16 of the Folsom Municipal Code.
Floodplain ordinance	Y	The Floodplain Ordinance is within section 14.32 of the Folsom Municipal Code.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	Weed/Brush Hazard Abatement/Fuel Modification (FMC 8.36 and 8.37) Stormwater Management and Discharge Control Ordinance (FMC 8.70) Hillside Development Standards Ordinance (FMC 14.33)
Flood insurance rate maps	Y	

Elevation Certificates	Y
Acquisition of land for open space and public recreation uses	Y
Erosion or sediment control program	Y
Other	
How can these capabilities be expanded and improved to reduce risk?	
Continue to implement and enforce the existing programs and regulations, and to update regulations as warranted. The City will look for ways to mitigate with future programs.	

Source: City of Folsom

General Plan (2018)

Folsom's General Plan is a long term policy guide for the physical, economic, and environmental growth of the City. It is comprised of goals, policies, and implementation programs which are based on an assessment of current and future needs and available resources.

Folsom's General Plan is strongly oriented toward physical development of land uses, a circulation network, and supporting facilities and services. Because of this, the General Plan document is the principle tool for City use in evaluating public and private building projects and municipal service improvements.

Folsom Evacuation Plan (2020)

This evacuation plan provides guidance for the evacuation and movement of people during any disaster, or any type of major call/critical incident, that we may encounter in the City of Folsom. It mirrors the information located in the current City of Folsom Emergency Operations Plan, but is updated to reflect changes to notification methods. It also describes the organization and responsibilities for conducting evacuation operations. One of the fundamental assumptions of evacuation is that sufficient warning time will be available to evacuate the threatened population. During and following any evacuation, perimeter access controls will be necessary to eliminate any re-entry of the hazard area by unauthorized persons. This appendix establishes procedures to provide a safe and orderly evacuation of a threatened population.

The overall objectives of evacuation operations are:

- Expedite movement of persons from hazardous areas
- Control evacuation traffic
- Provide transportation for those without vehicles and for those with special needs (language barriers, physical/mental disability, elderly, etc.)
- Provide perimeter control and security for evacuated areas
- Provide a controlled area from which evacuation will take place, and prevent entry by unauthorized persons
- Maintain law and order in the evacuation area

Folsom Community Wildfire Protection Plan (2013)

This Community Wildfire Protection Plan (CWPP) is a collaborative effort between the City of Folsom, the Folsom Fire Department (FFD), California Department of Forestry and Fire Protection (CAL-FIRE), US Bureau of Reclamation (Reclamation), US Bureau of Land Management, and concerned Folsom

residents and property owners. The Folsom Fire Safe Council (FFSC) has provided fundamental services to Folsom neighborhoods and facilitated homeowner participation in this effort. The plan has been developed in cooperation with and reviewed by the California Department of Parks and Recreation.

Emergency Operations Plan (2020)

The City of Folsom Emergency Operations Plan (EOP) addresses the planned response for the City of Folsom to emergencies associated with disasters, technological incidents, or other dangerous conditions created by either man or nature. It provides an overview of operational concepts, identifies components of the City emergency management organization, and describes the overall responsibilities of local, state, and federal entities.

C.6.2. Administrative/Technical Mitigation Capabilities

Table C-47 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Folsom.

Table C-47 City of Folsom's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	Y	
Mitigation Planning Committee		
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	There are various maintenance programs in place to reduce risks.
Mutual aid agreements	Y	California Master Mutual Aid Agreement, Law Enforcement Mutual Aid Agreement, Fire and Rescue Mutual Aid Agreement, Public Works Mutual Aid Agreement, County of Sacramento Operational Area Council, U.S. Army Corps of Engineers Rehabilitation Inspection PL84-99 Program, NFIP, County of Sacramento OES, County of Sacramento EMD.
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
Floodplain Administrator	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
Emergency Manager	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
Community Planner	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.

Civil Engineer	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
GIS Coordinator	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigations. There is coordination between agencies and staff and it is effective.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Reverse 911/City-owned AM station/SMS messaging (Nixle)
Hazard data and information		
Grant writing	Y	
Hazus analysis		
Other		
How can these capabilities be expanded and improved to reduce risk?		
The City will work to fill existing vacant positions to ensure overlap in knowledge and training. Training on mitigation of hazards will be sought on a position by position basis.		

Source: City of Folsom

C.6.3. Fiscal Mitigation Capabilities

Table C-48 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table C-48 City of Folsom's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	There are funding resources that have been used in the past and can be used in the future.
Authority to levy taxes for specific purposes	Y	There are funding resources that have been used in the past and can be used in the future.
Fees for water, sewer, gas, or electric services	Y	There are funding resources that have been used in the past and can be used in the future.
Impact fees for new development	Y	There are funding resources that have been used in the past and can be used in the future.
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	Y	
Community Development Block Grant	Y	There are funding resources that have been used in the past and can be used in the future.

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Other federal funding programs	Y	FEMA, U.S. Army Corps of Engineers Rehabilitation Inspection PL84-99 Program
State funding programs	Y	Cal OES
Other		
How can these capabilities be expanded and improved to reduce risk?		
Developing a City-wide stormwater utility fee could allow the City to better address necessary ongoing storm water infrastructure maintenance and reduce flooding.		

Source: City of Folsom

C.6.4. Mitigation Education, Outreach, and Partnerships

Table C-49 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table C-49 City of Folsom's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	City of Folsom Community Emergency Response Team.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Ongoing public outreach material regarding water conservation, household hazardous waste pickup, emergency preparedness, fire safety,
Natural disaster or safety related school programs	Y	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	Y	Frequent training with regional partners such as SMUD, PG&E, County of Operational Emergency Services, Sacramento County Water Agency, and Department of Homeland Security.
Other		
How can these capabilities be expanded and improved to reduce risk?		
Continue to train staff and implement programs like the CERT program. Training with regional partners will continue and seek to be expanded, especially after much of it had to be postponed due to Covid.		

Source: City of Folsom

C.6.5. Other Mitigation Efforts

The City of Folsom maintains many annual programs to mitigate against natural hazards:

- Fuel modification program (fire management for open space)
- Annual weed hazard abatement program
- Creek/outfall vegetation maintenance
- Public education/outreach for extreme weather
- Routine storm drain operations and maintenance
- Wildfire prevention outreach
- Wildfire Hazard Identification
- Detention Basin Maintenance and Operation
- Stream and Creek Routine Maintenance Agreement with California Department of Fish and Wildlife

C.7 Mitigation Strategy

C.7.1. Mitigation Goals and Objectives

The City of Folsom adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

C.7.2. NFIP Mitigation Strategy

The City of Folsom joined the National Flood Insurance Program (NFIP) on January 6, 1982. As a participant of the NFIP, the City of Folsom has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the City. The City of Folsom will continue to comply with the requirements of the NFIP in the future.

In addition, the City of Folsom actively participates with Sacramento County to address local NFIP issues through a regional approach. Many of the program activities are the same for the City of Folsom as for Sacramento County since participation at the County level includes all local jurisdictions.

The City of Folsom Community Development Department provides public outreach activities which include map information services, public awareness, public hazard disclosure, and flood protection information. This information is readily available to the public and consists of current and accurate flood mapping. Information about our stormwater management program and up-to-date information related to the maintenance of our drainage system may be found through the Public Works Department.

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS which are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The City of Folsom is not a current participant in the CRS program.

More information about the floodplain administration in the City of Folsom can be found in Table C-50.

Table C-50 City of Folsom Compliance with NFIP

NFIP Topic	Comments
Insurance Summary	
How many NFIP policies are in the community? What is the total premium and coverage?	189 policies $98,970 in premiums $62,819,100 in coverage
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	26 claims $501,081.90 in claims paid 2 substantial damage claims
How many structures are exposed to flood risk within the community?	12 in 1% annual chance 246 in 0.2% annual chance
Repetitive Loss (RL) and Severe Repetitive Loss Properties (SRL)	5 RL properties 0 SRL properties
Describe any areas of flood risk with limited NFIP policy coverage	None
Staff Resources	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	No
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	Permit review, GIS, education or outreach, inspections, engineering capability, Storm Drainage and Flood Control Management Program
What are the barriers to running an effective NFIP program in the community, if any?	None
Compliance History	
Is the community in good standing with the NFIP?	Y
Are there any outstanding compliance issues (i.e., current violations)?	No
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	CAV 6/11/2019
Is a CAV or CAC scheduled or needed?	No
Regulation	
When did the community enter the NFIP?	Digital
Are the FIRMs digital or paper?	1/6/1982
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Yes, General Plan and Floodplain Policy strongly discourages building in the floodplain, unless it can be mitigated
Provide an explanation of the permitting process.	Plans are reviewed to determine flood zone information
Community Rating System	
Does the community participate in CRS?	N
What is the community's CRS Class Ranking?	N/A

NFIP Topic	Comments
What categories and activities provide CRS points and how can the class be improved?	N/A
Does the plan include CRS planning requirements?	N/A

C.7.3. Mitigation Actions

The planning team for the City of Folsom identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Severe Weather: High Winds and Tornadoes
- Wildfire

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather:

Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Severe Weather: High Winds and Tornadoes, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140).

Project Description: Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Safety Element of General Plan

Responsible Office: City of Folsom Planning Department

Priority (H, M, L): High

Cost Estimate: Jurisdictional board/staff time

Potential Funding: Local budgets

Benefits (avoided Losses): Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

Schedule: As soon as possible

Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Severe Weather: High Winds and Tornadoes, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City and County play a key role in public outreach/education efforts to communicate the potential risk and vulnerability of their community to the effects of natural hazards. A comprehensive multi-hazard public education program will better inform the community of natural hazards of concern and actions the public can take to be better prepared for the next natural disaster event.

Project Description: A comprehensive multi-hazard outreach program will ascertain both broad and targeted educational needs throughout the community. The City will work with the County and other agencies as appropriate to develop timely and consistent annual outreach messages in order to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will leverage and build upon existing mechanisms, will include elements to meet the objectives of Goal 3 of this LHMP Update, and will consider:

- Using a variety of information outlets, including websites, local radio stations, news media, schools, and local, public sponsored events;
- Creating and distributing (where applicable) brochures, leaflets, water bill inserts, websites, and public service announcements;
- Displaying public outreach information in County office buildings, libraries, and other public places and events;
- Developing public-private partnerships and incentives to support public education activities.

Location of Project: Citywide

Other Alternatives: Continue public information activities currently in place.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing County outreach programs will be reviewed for effectiveness and leveraged and expanded upon to reach the broader region.

Responsible Office: City of Folsom in partnership with the County

Priority (H, M, L): High

Cost Estimate: Annual costs to be determined, and will depend on the scope and frequency of activities and events as well as volunteer participation

Benefits (Losses Avoided): Increase residents' knowledge of potential hazards and activities required to mitigate hazards and be better prepared. Protect lives and reduce damages, relatively low cost to implement.

Potential Funding: Local budgets, grant funds

Timeline: Ongoing/Annual public awareness campaign

Action 3. Redevelopment Area Drainage Improvements

Hazards Addressed: Flooding, Localized Flooding, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: In 2005 the City completed a Drainage Master Plan for its Redevelopment Area. The plan identifies nine drainage CIP's. The City has constructed one of the CIP's; funding is needed to construct the remaining eight drainage improvement projects.

Project Description: Capital Improvement Drainage Projects.

Other Alternatives: Establish an assessment district to obtain funding.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Public Works CIP Program.

Responsible Agency/ Department/Partners: Public Works Department

Cost Estimate: $8,000,000

Benefits (Losses Avoided): Life Safety; Reduction of Property Loss

Potential Funding: General Fund until establishment an assessment district or stormwater utility fee.

Timeline: Ongoing

Project Priority (H, M, L): Medium

Action 4. Stormwater Basin Maintenance and Operation Project

Hazards Addressed: Flooding, Localized Flooding, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The detention basins within the City have significant natural growth, causing the design capacities and overall basin effectiveness to decrease. A regular maintenance and operational schedule is necessary to ensure the field conditions of each detention basin is consistent with the design capacities.

Project Description: Ongoing rehabilitation of the existing City-maintained stormwater basins located throughout the City.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Public Works Department Capital Improvement Projects

Responsible Agency/ Department/Partners: Public Works Department

Cost Estimate: Varies based upon needed work at each basin, but approximately $500,000 annually to address multiple basins each year

Benefits (Losses Avoided): Potential losses avoided including residential, commercial, and public infrastructures.

Potential Funding: Fund is provided by the General Fund until a stormwater utility fee is adopted.

Timeline: Ongoing – funding constrained.

Project Priority (H, M, L): Medium

Action 5. Stormwater Utility Fee

Hazards Addressed: Flooding, Localized Flooding, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Folsom does not have a dedicated stormwater utility to fund operation and maintenance of the storm drainage system or implementation of its Stormwater Quality Program. Funds are needed for maintenance of the drainage system including, pipes, structures, detention basins and creeks/streams and water quality protection. Due to current California Law a ballot measure is required to assess taxes for a stormwater utility. In 2006 the City completed a Funding Feasibility Study; next steps include an opinion research and survey, fee development, ballot measure development and fee implementation.

Project Description: Implementation of a dedicated stormwater utility to fund operation and maintenance of the storm drainage system.

Other Alternatives: Continue an underfunded program and/or reduce services.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Public Works Department Administration.

Responsible Agency/ Department/Partners: Folsom Public Works/Utilities Department

Cost Estimate: $100,000

Benefits (Losses Avoided): Improved maintenance, increase reliability, reduction of property loss

Potential Funding: City of Folsom budget

Timeline: Ongoing

Project Priority (H, M, L): High

Action 6. Fuel Reduction and Modification

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The expense of removing and/or modifying materials which create a wildfire hazard can often be cost prohibitive for both private and public property owners. Encouraging joint efforts such as volunteer cleanup days and chipper programs can reduce the cost to anyone stakeholder and facilitate mitigation efforts

Project Description: Remove and/or modify materials which create a wildfire hazard.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Community Wildfire Protection Plan through the Fire Safe Council.

Responsible Agency/ Department/Partners: Folsom Fire Department and Fire Safe Council

Cost Estimate: Up to $100,000 per year

Benefits (Losses Avoided): Life safety, reduction of property loss

Potential Funding: Fund raising, private donation, grant funding

Timeline: Ongoing

Project Priority (H, M, L): Medium

Action 7. Comprehensive Cooling City Strategy

Hazards Addressed: Climate Change, Extreme Heat

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Extreme heat is an ongoing issue in the City and in recent years has been further compounded by climate change. 2020 and 2021 have been some of the hottest years on record. Vulnerable populations are especially vulnerable to extreme heat event and temperature extremes stress existing utility infrastructure causing outages that impact those populations to a higher degree.

Project Description: As a result of the City's recent completion in June 2021 of their Climate Adaptation and Resiliency Report for the City of Folsom, additional policies were developed and included in the City's 2021 updated Safety Element to the General Plan.

Specifically, SN1.1.2 establishes a Comprehensive Cooling Strategy:

> *Develop and implement a Cool City Strategy, in coordination with the Sacramento Metropolitan Air Quality Management District, to reduce the impacts of the Urban Heat Island effect through various measures including increasing the urban tree canopy and use of cool roofs and cool pavements as well as increasing green space in the City.*

This project includes developing and implementing a Comprehensive Cooling City Strategy to meet this new Safety Element policy.

Other Alternatives: Continue to grow and develop without consideration of these Cool City strategies

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Folsom General Plan 2021 Safety Element

Responsible Agency/ Department/Partners: Community Development Department

Cost Estimate: $250,000 (for the strategy development report)

Benefits (Losses Avoided): Reduction in adverse heat affects to City infrastructure and the community as a whole. Reduce life safety and public health impacts to populations at risk during extreme heat events.

Potential Funding: FEMA and other grant funds, capital improvement program

Timeline: Ongoing

Project Priority H, M, L): Medium

Action 8. Identification and Upgrades to Heating and Cooling Centers

Hazards Addressed: Climate Change, Extreme Heat and Cold, Pandemic

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Older adults and vulnerable populations are particularly vulnerable to extremes of temperature that are common throughout the Sacramento Valley. Extreme temperatures stress existing utility infrastructure causing outages that impact those populations to a higher degree. This is becoming more of an issue as the City continues to experience more extreme heat days due in part to climate change– 2020 and 2021 have been some of the hottest years on record.

Project Description: This project will continue to identify any additional locations that could be used for heating and cooling centers during severe weather events, and will continue to identify and install backup generators or other backup power systems as needed for all centers. The need for other facility upgrades will also be evaluated and will include any improvements or procedures to address pandemic related public health requirements. Additional outreach to City residents and vulnerable populations will also be conducted during extreme temperature events.

Other Alternatives: No additional local City provided facilities and would rely on existing facilities or non-governmental support or defer to County.

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Folsom Emergency Operations Plan

Responsible Agency/ Department/Partners: Folsom Fire Department

Cost Estimate: No cost to approximately $200,000 per identified location if an existing building requires the installation of emergency generator(s)

Benefits (Losses Avoided): Reduce life safety and public health impacts to populations at risk during extreme weather events, which includes the very young, very old, medically fragile, cognitively-impaired, physically-impaired, and other special needs groups.

Potential Funding: Fund-raising, FEMA and other grant funds, public/private donations

Timeline: Ongoing

Project Priority (H, M, L): Medium

Action 9. Landscape and Irrigation Modifications

Hazards Addressed: Drought & Water Shortage

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Landscaped areas within the numerous landscaping and lighting districts as well as around City owned facilities do not all meet current water conservation standards. A Preliminary Engineer's Report has been prepared to identify landscaping and irrigation modifications necessary within these areas.

Project Description: Ongoing improvements to the existing areas including drought tolerant plants in landscaped areas and more efficient irrigation systems.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Parks and Recreation Department Capital Improvement Projects and ongoing routine maintenance projects

Responsible Agency/ Department/Partners: Parks and Recreation

Cost Estimate: $25,000-$50,000 per year

Benefits (Losses Avoided): Reduced drought risk and water shortage in the City.

Potential Funding: Local funds

Timeline: Ongoing

Project Priority (H, M, L): Medium

Action 10. Landscape Ordinance and Model Water Efficient Landscape Ordinance Implementation

Hazards Addressed: Drought

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Allow for proper landscape selection and to reduce drought risk in the City.

Project Description: Update as needed and maintain to incorporate proper selection, planting, and maintenance practices into landscape ordinance.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Development Process

Responsible Agency/ Department/Partners: Community Development

Cost Estimate: Staff time

Benefits (Losses Avoided): Reduced drought risk and water shortage in the City.

Potential Funding: Local funds

Timeline: Ongoing

Project Priority (H, M, L): Medium

Action 11. Post Disaster Staff Training

Hazards Addressed: Multi-hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Training for department staff increase responsiveness and efficiency and lessons learned from past hazards and disasters.

Project Description: Office of Emergency Services trainings and post disaster planning classes and webinars for various department staff

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Training classes and webinars

Responsible Agency/ Department/Partners: Community Development

Cost Estimate: Staff Time and cost of attending seminars/trainings

Benefits (Losses Avoided): Improve staff response time and efficiency during hazards

Potential Funding: Department training budgets

Timeline: Ongoing

Project Priority (H, M, L): Medium

Action 12. Weed Abatement Program

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The primary function of this program is to reduce the danger of fires within the City by proactively establishing defensible space and to reduce / remove combustible materials on properties.

Project Description: The City of Folsom requires property owners to clear their property of all dry grass, weeds, dead trees, and noxious vegetation or rubbish that may constitute a fire hazard. The Fire Department is authorized to abate any potential fire hazard that has not been addressed.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Folsom Fire Department

Responsible Agency/ Department/Partners: City of Folsom Fire Department

Cost Estimate: Staff Time

Benefits (Losses Avoided): Potential losses avoided including residential, commercial, and public infrastructures.

Potential Funding: Fund is provided by the General Fund with some sources from programming revenue, and State and Federal grants.

Timeline: Ongoing

Project Priority (H, M, L): Medium

Annex D City of Galt

D.1 Introduction

This Annex details the hazard mitigation planning elements specific to the City of Galt, a previously participating jurisdiction of the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to Galt, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

D.2 Planning Process

As described above, Galt followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table D-1. Additional details on Plan participation and City representatives are included in Appendix A.

Table D-1 City of Galt – Planning Team

Name	Position/Title	How Participated
Bill Forrest	Senior Civil Engineer	Attended meetings, completed annex
Craig Hoffman	Community Development Director	Provided data
Rick Small	Interim Police Chief	Provided data

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the City integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the City incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table D-2.

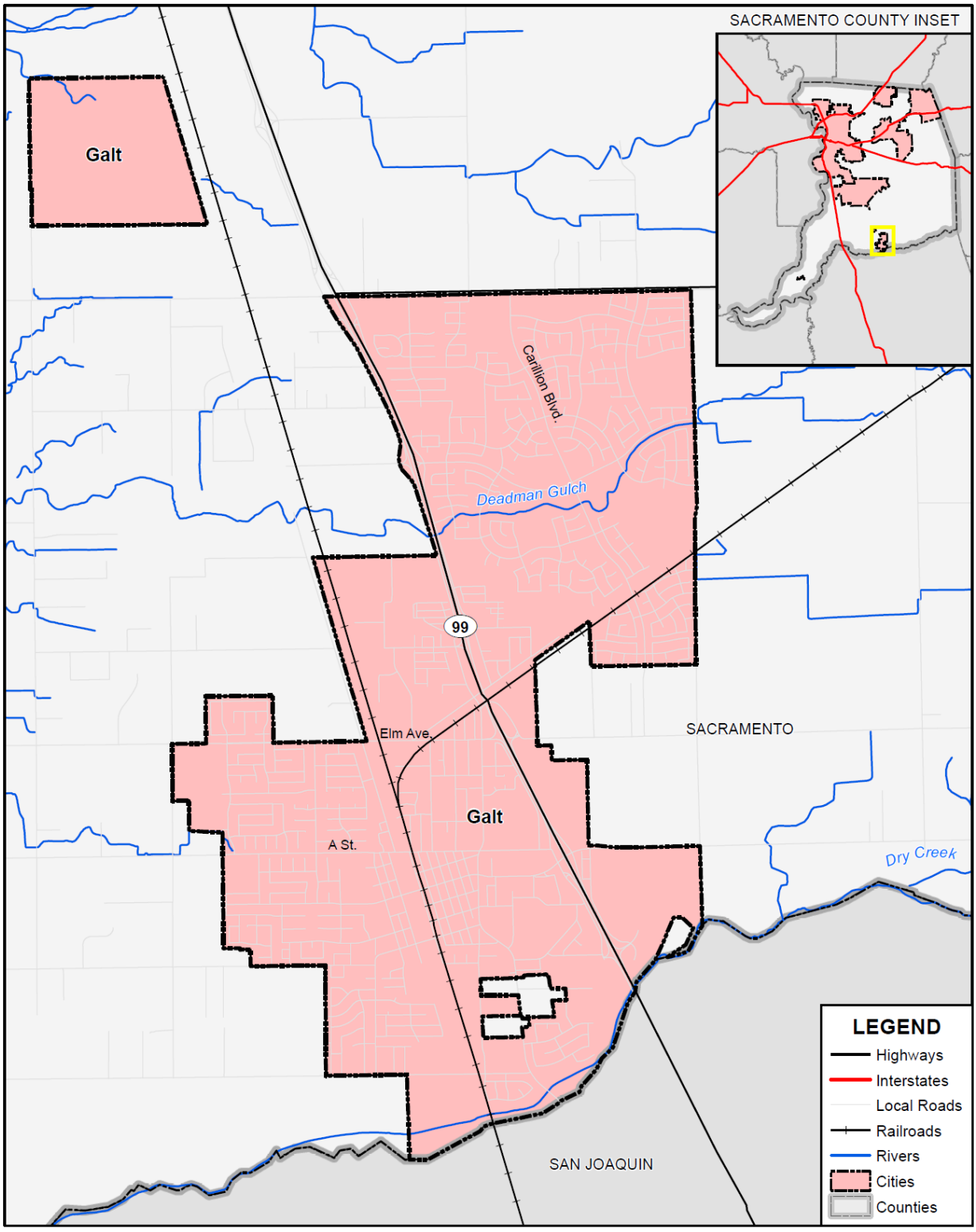
Table D-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
None.	Galt General Plan and Policies were adopted in 2009. The Galt City Council did adopt the 2016 LHMP. No hazard related planning has been completed by the City since 2016.

D.3 Community Profile

The community profile for the City of Galt is detailed in the following sections. Figure D-1 displays a City map and the location of Galt within Sacramento County.

Figure D-1 City of Galt



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

D.3.1. Geography and Climate

Galt is located on State Route 99 in southern Sacramento County between the cities of Elk Grove and Lodi. The City is located 26 miles south of the Sacramento metro area, 24 miles north of Stockton metro area, and approximately 100 miles east of the San Francisco Bay Area. The community is surrounded by agricultural lands on the north, south, and east, and the Cosumnes River Preserve on the northwest and west (approximately three miles). Galt is located at 38°15′39″N longitude and 121°18′11″W latitude (38.260842, -121.303122). The City's elevation at City Hall is 47 feet.

The City's study area is characterized by a Mediterranean-type climate with wet, cold winters, and warm, dry summers. Most of the rainfall occurs between November and April with an average annual rainfall of 17.5 inches.

D.3.2. History

Historical evidence suggests that the area around Galt has been inhabited by humans for at least 10,000 years. Plains Miwok lived primarily near the banks of major rivers, including the Cosumnes, Molekumne, and Sacramento. The Plains Miwok and other native inhabitants would relocate to the cooler foothills during the summer months to escape valley heat. The Plains Miwok first came into contact with Europeans in the latter eighteenth century when Spanish explorers entered the area. Many Plains Miwok disappeared through the combined effects of population removal to the missions and disease epidemics. Militarism, in reaction to Spanish expeditions, land seizures, and enslavement grew in the 1820s and 1830s particularly among the Plains Miwok. In the following decades, the arrival of more trappers, gold miners, and settlers exposed the Miwok to more new diseases.

The original 1850 Spanish land grant, Rancho del los Moquelumnes, was purchased in 1861 by Dr. Obed Harvey, considered today as Galt's founder. His purchase included much of the Dry Creek Township which was later established as the town of Galt in 1869 by the Western Pacific Railroad company. A prominent early settler, John McFarland, named the town after his former home in Ontario, Canada, which was named after a Scottish novelist, John Galt. The combination of favorable land for agriculture and the proximity to the railroad provided Galt with the economic support to continue to grow.

With the decline of gold mining in the Sierra Nevada foothills by the end of the eighteenth century, Galt, like many other Central Valley towns, saw the arrival of miners looking to start anew in agriculture. The City's proximity to several major rivers and the water resources of the Sacramento-San Joaquin River Delta made Galt ideal for the establishment of agriculture early in California's history.

A corollary of the vital agricultural and dairy industries was the inception of new industries in the area. With the large number of dairies in the area in need of distribution services, Fred Harvey, son of Dr. Obed Harvey, convinced the Utah Condensed Milk Company to establish a plant in Galt in 1917. In 1921, the company changed its name to the Sego Milk Products Company. After many years of prosperous service to the community, the Sego plant fell into disrepair and suffered a fire in 1992. The plant was later demolished due to the damage caused by the fire. The heritage of the dairy industry and agriculture in Galt continues to be vital to Galt's appeal and economic welfare.

America's first transcontinental highway, the Lincoln Highway, ran through Galt until it was ultimately replaced by State Route 99. Lincoln Way in central Galt is a remnant of this historic route. Galt grew around the rail depot and State Route 99 throughout the first half of the twentieth century. Improvements to State Route 99 in recent years have made Galt more accessible, which has resulted in increased population and growth to the west and northeast.

Today, Galt is at a strategic location between the growing areas of Sacramento and Stockton. The City's proximity to I-5 and SR 99 provides Galt excellent access to the rest of the Central Valley and California. Despite fast growth in the region, the City continues to maintain its small-town character while balancing the needs for housing and acknowledging its important agricultural heritage.

D.3.3. Economy and Tax Base

US Census estimates show economic characteristics for the City of Galt. These are shown in Table D-3 and Table D-4. Mean household income in the City was $89,357. Median household income in the City was $75,638.

Table D-3 City of Galt – Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	357	2.9%
Construction	1,314	10.7%
Manufacturing	1,578	12.9%
Wholesale trade	706	5.8%
Retail trade	795	6.5%
Transportation and warehousing, and utilities	877	7.2%
Information	0	0.0%
Finance and insurance, and real estate and rental and leasing	937	7.7%
Professional, scientific, and management, and administrative and waste management services	777	6.3%
Educational services, and health care and social assistance	2,264	18.5%
Arts, entertainment, and recreation, and accommodation and food services	789	6.4%
Other services, except public administration	457	3.7%
Public administration	1,370	11.2%

Source: US Census Bureau American Community Survey 2019 Estimates

Table D-4 City of Galt – Income and Benefits

Income Bracket	Percent
<$10,000	3.4%
$10,000 – $14,999	2.9%
$15,000 - $24,9999	7.3%
$25,000 – $34,999	8.8%

Income Bracket	Percent
$35,000 – $49,999	11.3%
$50,000 – $74,999	15.6%
$75,000 – $99,999	13.1%
$100,000 – $149,999	25.2%
$150,000 – $199,999	8.0%
$200,000 or more	4.3%

Source: US Census Bureau American Community Survey 2019 Estimates

Top Galt Employers include:

- Galt Elementary School District (7 schools)
- Galt High School District (2 schools)
- Walmart
- City of Galt
- Building Material Distributors
- Cal Waste
- Cardinal Glass

D.3.4. Population

The California Department of Finance estimated the January 1, 2020, total population for the City of Galt was 25,849.

D.4 Hazard Identification

Galt's identified the hazards that affect the City and summarized their location, extent, likelihood of future occurrence, potential magnitude, and significance specific to Galt (see Table D-5).

Table D-5 City of Galt—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Significant	Unlikely	Negligible	Medium	High
Earthquake	Significant	Likely	Negligible	Low	Low
Earthquake Liquefaction	Limited	Unlikely	Negligible	Low	Low
Floods: 1%/0.2% annual chance	Limited	Occasional/ Unlikely	Limited	High	Medium
Floods: Localized Stormwater	Significant	Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Limited	Unlikely	Negligible	Low	Medium
Pandemic	Extensive	Likely	Critical	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Significant	Likely	Limited	Low	Low
Subsidence	Limited	Unlikely	Negligible	Low	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Likely	Negligible	Medium	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

D.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile Galt's hazards and assess the City's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City is included in this Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards ranked of medium or high significance specific to the City (as identified in the Significance column of Table D-5) and also includes a vulnerability assessment to the three primary hazards to the State of California: earthquake, flood, and wildfire. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

the impact that the hazards listed could have on emergency response. Some examples include:

- Ability to respond to emergencies during flooding. With severe flooding, our personnel outside the City may be unable to get to work which would dramatically impact our ability to provide emergency services.
- Radio operability (as you mentioned). Severe storms, fires, etc. can damage radio towers which could impact our ability to communicate during a disaster.
- The PD is also a County EOC. As such, if the PD were damaged, the County would lose the EOC capabilities at this location.

D.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section D.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Planning Area.

D.5.2. Vulnerability Assessment and Assets at Risk

This section identifies Galt's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

Values at Risk

The following data from the Sacramento County Assessor's Office is based on the 2020 Assessor's data. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitations are created by Proposition 13 and the Williamson Act as detailed in the Base Plan. With respect to Proposition 13, instead of adjusting property values annually, the values are not

adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is most likely low and does not reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table D-6 shows the 2020 Assessor's values and content replacement values (e.g., the values at risk) broken down by property use for the City.

Table D-6 City of Galt – Total Values at Risk by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	18	11	$22,214,930	$632,535	$632,535	$23,480,000
Care/Health	10	10	$1,335,807	$5,731,483	$5,731,483	$12,798,773
Church/Welfare	21	17	$2,154,803	$17,678,088	$17,678,088	$37,510,979
Industrial	59	50	$22,128,890	$77,165,566	$115,748,352	$215,042,807
Miscellaneous	124	0	$180,046	$0	$0	$180,046
Office	30	28	$6,269,775	$0	$0	$39,558,477
Public/Utilities	102	0	$36	$0	$0	$36
Recreational	3	2	$163,644	$332,437	$332,437	$828,518
Residential	7,281	7,231	$508,341,229	$1,509,190,230	$754,595,105	$2,772,126,569
Retail/ Commercial	98	89	$41,612,139	$100,790,499	$100,790,499	$243,193,137
Unknown	1	0	$106,621	$0	$0	$106,621
Vacant	239	10	$39,949,561	$1,167,655	$0	$41,117,216
Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**

Source: Sacramento County 2020 Parcel/Assessor's Data

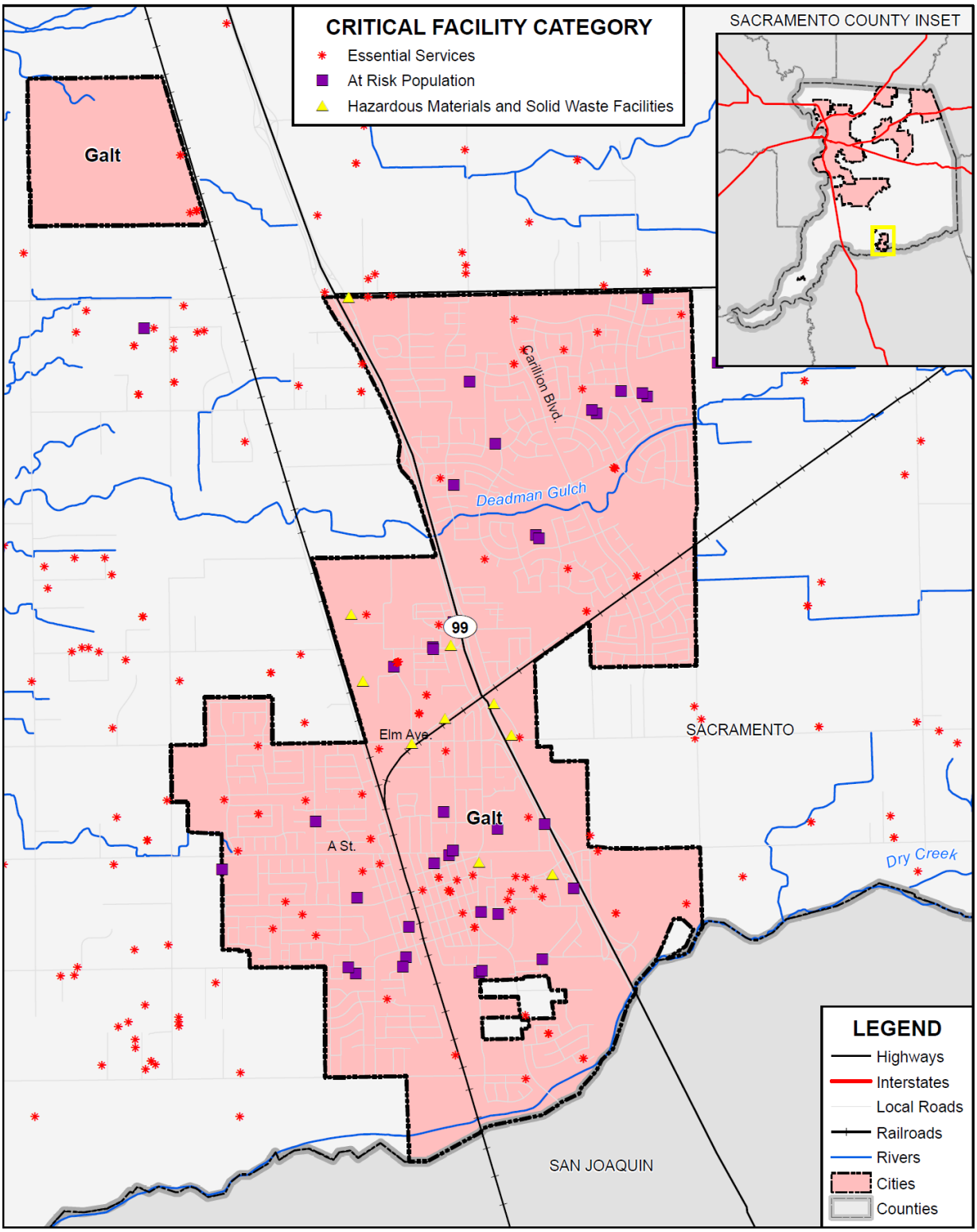
Critical Facilities and Infrastructure

Critical facilities and infrastructure are those buildings and infrastructure that are crucial to a community. Should these be damaged, it makes it more difficult for the community to respond to and recover from a disaster. For purposes of this Plan, a critical facility is defined as:

> *Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities. Critical facilities in the City are shown on Figure D-2 and detailed in Table D-7.

Figure D-2 City of Galt – Critical Facilities



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table D-7 City of Galt – Critical Facilities by Category and Type

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
Essential Services Facilities	Cellular Tower	2
	Emergency Evacuation Center	5
	EMS Stations	2
	FDIC Insured Banks	6
	Fire Station	3
	Law Enforcement	2
	Microwave Service Towers	55
	Sewage Treatment Plant	1
	Water Well	35
	Total	**111**
At Risk Population Facilities	Day Care Center	6
	Mobile Home Parks	4
	Places of Worship	14
	School	14
	Total	**38**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	3
	Leaky Underground Storage Tank	7
	Waste Transfer Station	1
	Total	**11**
Galt Total		**160**

Natural Resources

Natural resources are unique to each area and are difficult to replace. Should a natural disaster occur, these species and locations are at risk. The City of Galt has a variety of natural resources of value to the community. Habitat types are listed below, detailed in Table D-8, and depicted in Figure D-3.

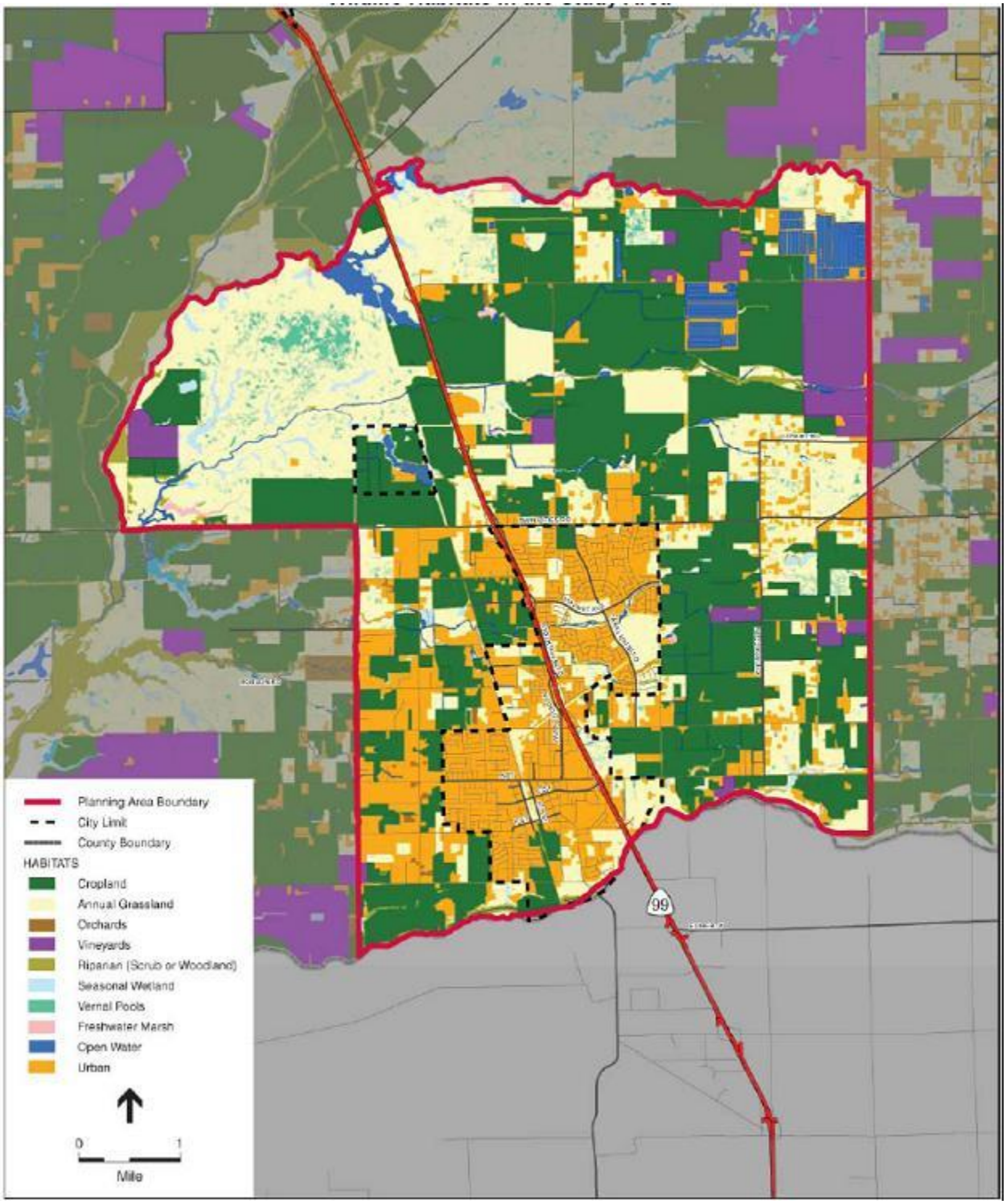
- Annual Grassland (including both disturbed and vernal pool grasslands)
- Cropland
- Orchard
- Freshwater Marsh
- Open Water (including both lacustrine and riverine habitats)
- Riparian (Scrub or Woodland)
- Urban/Developed Areas
- Vernal Pools
- Vineyards

Table D-8 Habitat Types within the City of Galt

Habitat Types	Acres (Approximate)	Percent Study Area
Annual Grassland	7,550	30%
Cropland	9,276	37%
Disturbed	21	<1%
Freshwater Marsh	135	<1%
Open Water	767	3%
Orchards	51	<1%
Other	10	<1%
Riparian (Scrub or Woodland)	320	1%
Seasonal Wetland	431	2%
Urban	5,232	21%
Vernal Pools	258	1%
Vineyards	954	4%
Total	**25,006**	**100%**

Note: "Other" includes those areas designated as recreational areas, the TNC Reserve, and roads.
Source: South Sacramento County Habitat Conservation Plan - 2018

Figure D-3 Riparian Habitats in the City of Galt



Source: City of Galt General Plan Environmental Impact Report (2008)

A list of special-status plant and animal species with potential to occur within the vicinity of the study area was compiled for the Environmental Impact Report for the City of Galt's General Plan. The list was based on data from the CNDDB (2007), CNPS electronic Inventory of Rare and Endangered Plants (CNPS, 2007),

the USFWS (2007), and biological literature pertaining to the region. Table D-9 lists those special-status species with at least a low likelihood for occurring within the study area. The locations of these species can be seen in Figure D-4 below.

Table D-9 Special-Status Species with Potential to Occur in the General Plan Study Area

Species/Animals/Mammals	Status: Fed/State/CNPS	General Habitat
Taxidea taxus American badger	--/CSC/--	Occurs in a wide variety of open forest, shrub, and grassland habitats that have friable soils for digging.
Birds		
Accipiter cooperii (nesting) Cooper's hawk	--/CSC/--	Nests in riparian areas and oak woodlands, forages at woodland edges.
Agelaius tricolor (nesting colony) Tricolored blackbird	---/CSC/--	Nests in dense thickets of cattails, tules, willow, blackberry, wild rose, and other tall herbs near fresh water.
Ardea alba (rookery) Great egret	--/--/--	Fresh and salt marshes, marshy ponds and tidal flats, nests in trees or shrubs
Ardea herodias (rookery) Great blue heron	--/--/--	Groves of tall trees, especially near shallow water foraging areas such as marshes, tide-flats, lakes, rivers/streams and wet meadows
Athene cunicularia hypugaea (burrow sites) Western burrowing owl	---/CSC/--	Forages in open plains, grasslands, and prairies; typically nests in abandoned small mammal burrows.
Buteo swainsoni (nesting) Swainson's hawk	--/ST/--	Forages in open plains, grasslands, and prairies; typically nests in abandoned small mammal burrows
Dendroica petechia brewsteri (nesting) Yellow warbler	--/CSC/--	Nests in dense riparian cover
Elanus leucurus (nesting) White-tailed kite	--/CFP/--	Forages in open plains, grasslands, and prairies; typically nests in trees
Nycticorax nycticorax (rookery) Black-crowned night heron	--/--/--	Forages in marshes swamps and wooded streams; nests in thickets or reedbeds.
Phalacrocorax auritus (rookery) Double-crested cormorant	--/CSC/--	Uses wide rock ledges on cliffs; rugged slopes; and live or dead trees. Feeds underwater on fish and crustaceans
Riparia (nesting) Bank swallow	--/ST/--	Banks of rivers, creeks, lakes, and seashores; nests in excavated dirt tunnels near the top of steep banks
Xanthocephalus xanthocephalus (nesting) Yellow-headed blackbird	--/--/--	Nests in freshwater emergent wetlands with dense vegetation and deep water. Often along borders of lakes or ponds. Nests only where large insects such as Odonata are abundant, nesting timed with maximum emergence of aquatic insects.
Reptiles		
Emys (=Clemmys) marmorata Western pond turtle	FSC/CSC/--	Ponds, marshes, rivers, streams, and irrigation ditches with aquatic vegetation. Requires basking sites and suitable upland habitat for egg-laying. Requires aquatic habitats with suitable basking sites. Nest sites most often characterized as having gentle slopes (<15%) with little vegetation or sandy banks

Species/Animals/Mammals	Status: Fed/State/CNPS	General Habitat
Thamnophis gigas Giant garter snake	FT/ST/--	Generally inhabits marshes, sloughs, ponds, slow-moving streams, ditches, and rice fields that have water from early spring till mid-fall. Emergent vegetation (cattails and bulrushes), open areas for sunning and high ground for hibernation and cover
Amphibians		
Ambystoma californiense California tiger salamander	FT/CSC/--	Annual grassland and grassy understory of valley-foothill hardwood habitats in central and northern California. Needs underground refuges and vernal pools or other seasonal water sources
Rana aurora draytonñ California red-legged frog	FT/CSC/--	Breeds in slow moving streams, ponds, and marshes with emergent vegetation; forages in nearby uplands within about 200 feet.
Rana boylii Foothill yellow-legged frog	--/CSC /--	Breeds in shaded stream habitats with rocky, cobble substrate, usually below 6,000 feet in elevation. Absent or infrequent when introduced predators are present
Spea hammondii Western spadefoot toad	--/CSC/--	Occurs seasonally in grasslands, prairies, chaparral, and woodlands, in and around wet sites. Breeds in shallow, temporary pools formed by winter rains. Takes refuge in burrows.
Fish		
Hypomesus transpacificus Delta smelt	FT/ST/--	Open surface waters in the Sacramento/San Joaquin Delta. Seasonally in Suisun Bay, Carquinez Strait and San Pablo Bay. Found in Delta estuaries with dense aquatic vegetation and low occurrence of predators. May be affected by downstream sedimentation
Oncorhynchus mykiss Central Valley ESU steelhead	FT/--/--	This ESU enters the Sacramento and San Joaquin Rivers and their tributaries from July to May; spawning from December to April. Young move to rearing areas in and through the Sacramento and San Joaquin Rivers, Delta, and San Pablo and San Francisco Bays
Oncorhynchus tshawytscha Central Valley spring-run chinook	FT/ST/--	This ESU enters the Sacramento and San Joaquin Rivers and tributaries March to July; spawning from late August to early October. Young move to rearing areas in and through the Sacramento and San Joaquin Rivers, Delta, and San Pablo and San Francisco Bays
Oncorhynchus tshawytscha winter-run chinook, Sacramento River	FE/SE/--	This ESU enters the Sacramento River December to May; spawning peaks May and June. Upstream movement occurs more quickly than in spring run population. Young move to rearing areas in and through the Sacramento River, Delta, and San Pablo and San Francisco Bays
Oncorhynchus tshawytscha Central Valley fall/late-fall-run Chinook	FC/CSC/--	This ESU enters the Sacramento and San Joaquin rivers and their tributaries from July to April; spawning October to February. Young move to rearing areas in and through the Sacramento and San Joaquin Rivers, Delta, and San Pablo and San Francisco Bays

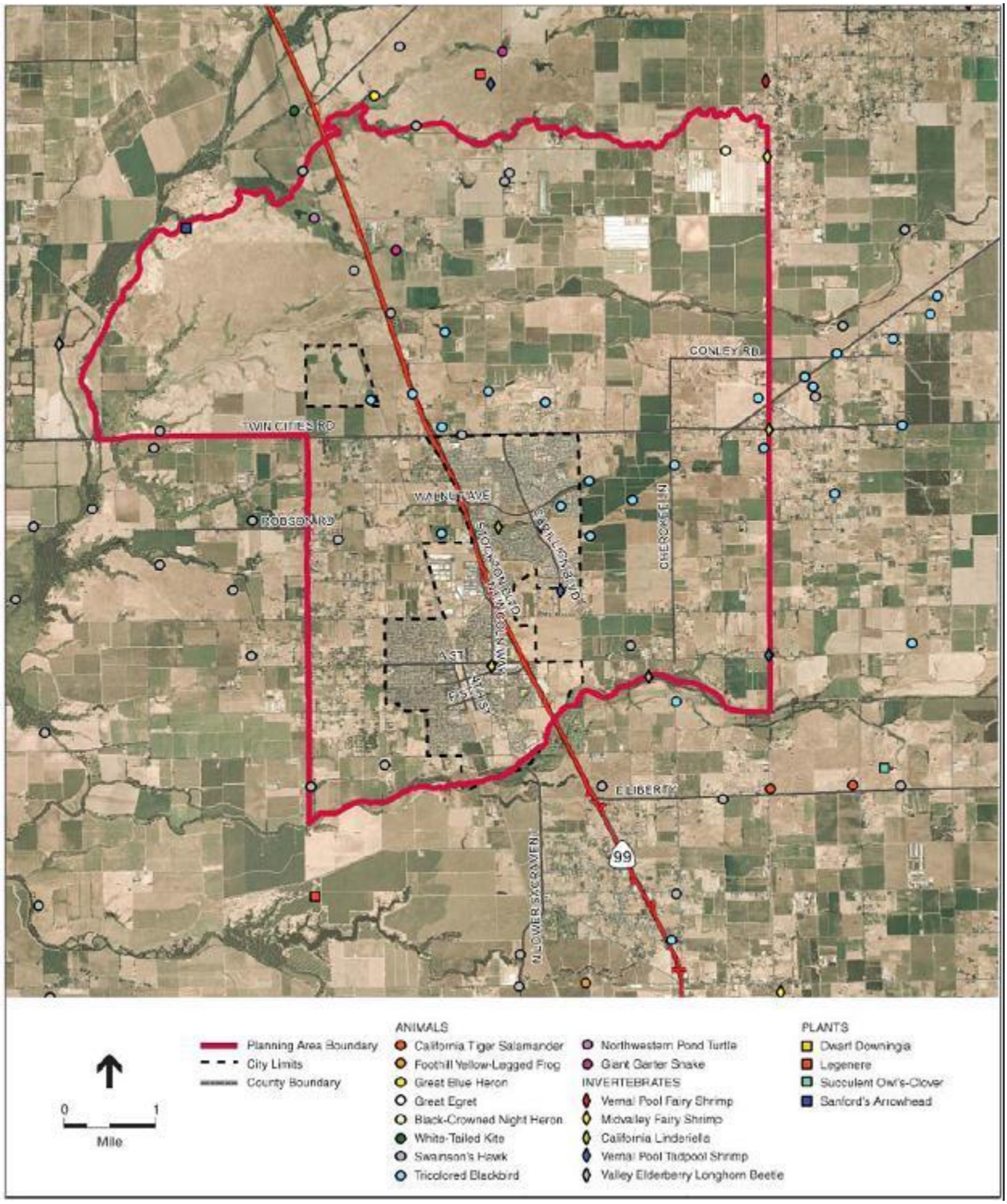
Species/Animals/Mammals	Status: Fed/State/CNPS	General Habitat
Pogonichthys macrolepidotus Sacramento splittail	FD/CSC/--	Currently known only from the Delta, Suisun Bay and associated marshes. Prefers slow moving river sections and dead end sloughs. Requires flooded vegetation for spawning and juvenile foraging habitat. Spawning occurs over flooded vegetation in tidal freshwater and euryhaline habitats of estuarine marshes and sloughs, and slow-moving reaches of large rivers
Invertebrates		
Andrena blennospermatis A vernal pool andrenid bee	--/--/--	Collects pollen from vernal pool flowers, especially Blennosperma. Bees nest in the uplands around vernal pools
Branchinecta lynchi Vernal pool fairy shrimp	--/--/--	Lifecycle restricted to vernal pools
Branchinecta mesovallensis Midvalley fairy shrimp	FSC/--/--	Lifecycle restricted to vernal pools in the Central Valley
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	FT/--/--	Breeds and forages exclusively on elderberry shrubs (Sambucus mexicana) typically associated with riparian forests, riparian woodlands, elderberry savannas, and other Central Valley habitats. Occurs only in the Central Valley of California. Prefers to lay eggs in elderberries 2–8 inches in diameter; some preference shown for "stressed" elderberries
*Hydrochara ricksecker*i Ricksecker's water scavenger beetle	--/--/--	Occurs in slow moving waters, adults and larvae are aquatic
Lepidurus packardi Vernal pool tadpole shrimp	FE/--/--	Lifecycle restricted to vernal pools
Linderiella occidentalis California linderiella	--/--/--	Lifecycle restricted to vernal pools
Vascular Plants		
Aster lentus Suisun Marsh aster	--/--/1B.2	Rhizomatous herb occurring in tidal brackish and freshwater marshes. Found at 0-10 feet in elevation. Blooms May-Nov
Carex comosa Bristly sedge	--/--/2.1	Generally found in lake-margin and edge habitats, Below 1,400 feet in elevation. Blooms May-Sept.
Castilleja campestris ssp. Succulent Succulent owl's-clover	FT/SE/1B.2	Occurs under vernally-flooded conditions in vernal-pool habitats such as valley and foothill grassland. Blooms Apr-May
Downingia pusilla Dwarf downingia	--/--/2.2	Prefers lake margins, vernal pools and wet places sometimes playas and grasslands. Blooms Mar-May
Gratiola heterosepala Boggs Lake hedge-hyssop	FSC/SE/1B.2	Marshes and swamps, lake margins, and in clay substrate in vernal pools. Blooms Apr-Aug. 30-7,800 feet in elevation
Hibiscus lasiocarpus Rose-mallow	--/--/2.2	Prefers freshwater marshes and swamps. Blooms Jun-Sep. Found below 100 feet.
Juglans hindsii Northern California black walnut	--/--/1B.1	Occurs in riparian forest and woodland, Found below 1,500 feet elevation. Blooms April-May

Species/Animals/Mammals	Status: Fed/State/CNPS	General Habitat
Lathyrus jepsonii var. jepsonii Delta tule pea	FSC/--/1B.2	Occurs in both tidal freshwater and brackish marshes in the Central and San Joaquin Valleys and in the Bay Area. Blooms May-Sept
Legenere limosa Legenere	FSC/--/1B.1	Occurs in vernal pool beds. Blooms Apr-Jun.
Lilaeopsis masonii Mason's lilaeopsis	FSC/SR/1B.1	Generally occurs in riparian scrub, freshwater-marsh and brackish-marsh habitats, Found below 33 feet in elevation. Blooms Apr-Nov.
Limosella subulata Delta mudwort	--/--/2.1	Generally occurs under wet conditions in tidal freshwater-marsh habitats, Found below 9 feet in elevation. Blooms May- Aug.
Orcuttia tenuis slender Orcutt grass	FT/SE/1B.1	Annual herb occurring in vernal pools. Found between 100 and 5,800 feet in elevation. Blooms May-October
Orcuttia viscida Sacramento Orcutt grass	FE/SE/1B.1	Occurs in vernal pools. Blooms Apr-Jul
Sagittaria sanfordii Sanford's arrowhead	FSC/--/1B.2	Found in assorted freshwater habitats including marshes, swamps and seasonal drainages. Blooms May-Oct.
Scutellaria lateriflora Blue skullcap	--/--/2.2	Meadows and seeps, marshes and swamps. Blooms Jul-Sep. Found below 1,700 feet in elevation.

STATUS CODES
Federal State CNPS
FE = Endangered
FT = Threatened
FC = Candidate
FD = Federally Delisted SE = Endangered
ST = Threatened
SR = Rare
CSC = California Special Concern species
SFP = Fully Protected Species
List 1B = Plants rare, threatened, or endangered in California and elsewhere
List 2 = Plants rare, threatened, or endangered in California, but more common elsewhere
List 3 = Plants about which we need more information--a review list
List 4 = Plants of limited distribution--a watch list

Source: CNDDB 2007, CDFG 2007, CNPS 2007, USFWS 2007

Figure D-4 California Natural Diversity Database Species in the City of Galt



Source: City of Galt 2030 General Plan Environmental Impact Report

Historic and Cultural Resources

Historic and cultural resources are difficult to replace. Should a natural disaster occur, these properties and locations can be at risk.

The City of Galt has a stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. OHP administers the National Register of Historic Places, the California Register of Historical Resources, California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the Base Plan. Table D-10 lists the historical buildings in the City.

Table D-10 City of Galt – Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Brewster Building (N2099)	X				8/16/2000	Galt
Brewster House (N638)	X				6/23/1978	Galt
Liberty Schoolhouse (P579)				X	12/21/1981	Galt
Rae House (P743)				X	5/8/1991	Galt
Utah Condensed Milk Company Plant (N650)	X				8/3/1978	Galt

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

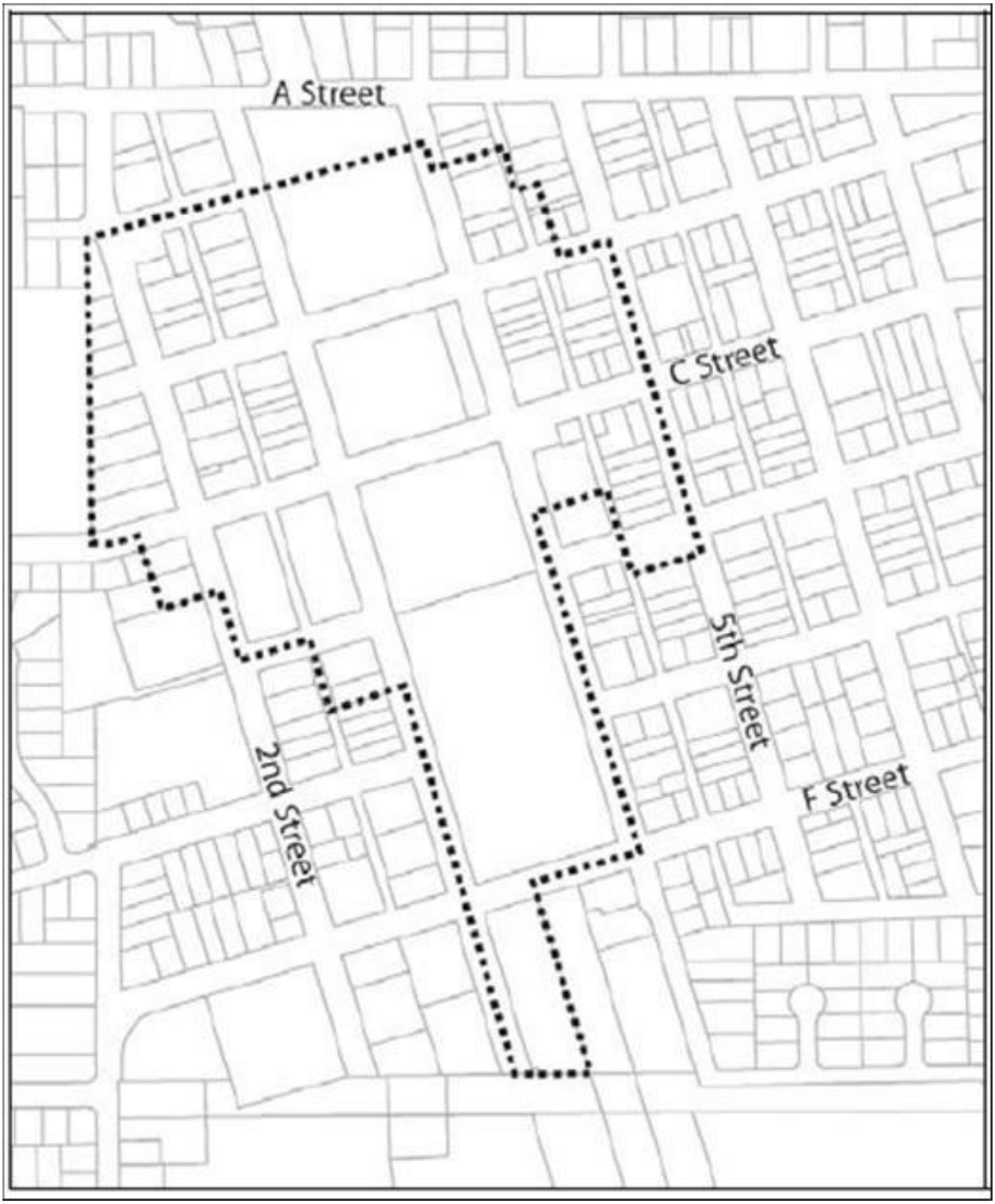
Locally Designated Historic Places

The City of Galt initiated a study in 1999 that looked at the possibility of the creation of a historic district within the downtown. In order for the district to be considered a significant resource, it would have to meet certain criteria set forth by local government and/or the National Register of Historic Places. The study focused primarily on structures that were within the boundary of the Historic Preservation District's Downtown Revitalization Historic Plan (see Figure D-5). The study was never completed, but does provide a background on potential preservation techniques that could be used in the future.

Old Town Galt has always been the heart of the community, extending from 2nd Street in the west to Lincoln Way in the east, and A Street in the north to F Street in the south. The historic commercial core is centered at the intersection of C Street and 4th Street. In the early 1900s most commercial activities fronted on 4th Street facing the railroad property where a 90-foot flagpole marked the center of town activity.

Today, the center of Galt's commercial activity is located at the intersection of C Street and Lincoln Way, with the C Street corridor (between Lincoln Way and Highway 99) providing the majority of commercial space for the Downtown area.

Figure D-5 Boundaries of the Historic Business District



Source: City of Galt 2030 General Plan Background Report

In addition to the registered sites, there are several assets within Galt that define the community and represent the City's history. Table D-11 is a listing of historic resources identified within Galt, including a description of their importance and relative condition. This information was derived from the City's 1990 General Plan and side notes have been added for more recent information, including that provided by the Galt Historical Society.

Table D-11 Historic Structures and Features in Galt

#	Street Address	Description	Importance	Condition
1&2	120 7th St	Christian Church	Early church. Architecture Galt Local. Historical Landmark #4	Good
3	236 6th St	1920's Bungalow		
4	603 C St	Residence	Eiler's Residence (1800s) (Sunny South)	Excellent
5	Corner 6th and C	1920's Bungalow w/ water tower		Removed
6	550 C St	Galt Water Tower	Galt Local Historical Landmark #1	Excellent
7	-	-	-	-
8	312 5th St	Victorian Residence	Early residence, architecture	Good
9	318 5th St	Victorian Residence	Early residence, architecture	Removed
10	324 5th St	Victorian Residence	Early residence, architecture	Good
11	340 5th St	1920's Bungalow	Early residence, architecture	Good
12	346 5th St	Victorian Cottage	Early residence, architecture	Good
13	352 5th St	Victorian Cottage	Early residence, architecture	Removed
14	113 4th St	Victorian Cottage (Sperry Res)	State Point of Historical Interest, Library-School House	Fair
15, 16,17	149 4th St	Has been almost completely obscured by additions	General Store with gun slits (currently a mortuary)	Good - Building with additions would not be eligible for National Register
18	201 4th St	2 story C. 1890's brick structure with cast iron columns and exquisite brick cornice details	National Register, Brewster Building, McFarland Building, Odd Fellows Hall	Poor
19	215 & 217 4th St	C. 1920's one story fire brick structure w/ intricate cast iron vents. Five stores possible	Early Commercial, Dr. Harm's Office, rebuilt after 1924 fire.	Fair – 2/3 of structure painted and windows covered
20,21	227 & 229 4th St	C. 1980's brick structure rebuilt in the 1930's Checkerboard brick pattern. Tile detail and vents, transom windows; interesting downspouts	Sawyer Building Telephone Exchange, Dr. Osler's Soda Fountain, Ray Arlin's Drug Store, rebuilt after1924 fire	Good – one upstairs window not original

#	Street Address	Description	Importance	Condition
22	409 C St	C. 1920's light brick building w/ intricate iron vents. Three storefronts. Currently used for Galt Activity Center	Early commercial, site of Galt Hotel and Estrellita Ballroom	Good
23	4th & C St	C. 1890's two-story Halianate Victorian commercial block building. Two storefronts, plus upstairs rooms	Early commercial, Bank of Galt 1890s and Steiner's Market	Good
24		C. 1890's two-story Victorian commercial building. Two storefronts, apartments upstairs.	Early commercial	Fair – Brick facing of lower façade detracts
25	325 4th Street	Two-story Halianate Victorian brick commercial building. Has been converted completely (upstairs and downstairs apartments)	Early commercial façade has been severely altered. Upstairs bay windows also altered	Poor – Downstairs
26	416 B Street	Old Blacksmith Shop		Removed
27	206 5th Street	Brewster Howe OHP, 1979	Winn House, Brewster Residence, Justice Court, National Register	Excellent
28	218 5th Street	First Court House/Jail		Poor
29	417 B Street	Halianate Victorian Cottage	Early residence, architecture	Excellent
30	4th Street across from Park	Old Diamond National Limber yards – typical 1 920's-40's	Example of railroad related industry frame lumber storage structure	Removed
31	3rd and F Street [destroyed by fire in1992]	Old Sego Milk Plant	Example of railroad related industry	Removed
34,35,36	128-1 40	Victorian cottages	Early residence, architecture	
37	200 3rd Street	First Congregational Church, frame church w/ prominent spire	Early church, first church built in Galt by John McFarland, architecture, Galt Local Historical Landmark #2	Excellent
38	214 3rd Street	Victorian cottage	Early residence, architecture	Good
39	530 3rd Street	St. Christopher's Church, gothic brick church w/ spire	Early church, architecture, second church built in Galt, architecture, Galt Local Historical Landmark #3	Excellent
40	119 2nd Street	1920's bungalow	Early residence, architecture	Fair
41	127 2nd Street	1920's bungalow with water tower	Early residence, architecture	Poor
42	131 2nd Street [Demolished in 2003]	Vacant frame Victorian cottage	Early residence, architecture	Removed

#	Street Address	Description	Importance	Condition
43	205 B Street	Residence	McAllister Property	Poor
44	205 2nd Street	1920's bungalow with water tower	Early residence, architecture, water tower	
45	NE corner 2nd & C	Victorian cottage	Early residence, architecture	
47	218 2nd Street	Residence	Granny McKinstry's home	Poor
48	244 2nd Street	Victorian cottage	Early residence, architecture	Fair
49	326 2nd Street	Residence	Dr. Obed Harvey's Office	Removed
50	204 Oak Avenue	Victorian residence	State Point of Historical Interest Rae Residence	Excellent
51	508 5th Street	Dutch Colonial with gambrel roof	State Historic Landmark, Leland	Good

Source: Historic Element, City of Galt General Plan, 1990. OHP, Historic Properties Data File for List Sacramento County, 2007. Galt Historical Society 2007.

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. Information from the City of Galt General Plan Housing Element, the California Department of Finance, the US Census Bureau form the basis of this discussion.

Historic Population Trends and Current Population

Galt has grown largely to the southwest and northeast over the past two decades. While the expansion of the city limits has increased substantially, buildout of the city limits has been slower than expected. In 2007, 815 acres of available vacant land existed within the city limits (468 acres zoned residential and 347 acres zones nonresidential). Population growth can increase the number of people living in hazard prone areas. Galt has generally seen periods of large growth, with recent growth being slower. Galt has seen growth rates as shown in Table D-12.

Table D-12 City of Galt – Population Changes Since 1950

Year	Population	Change	% Change
1950	1,333	–	–
1960	1,868	535	40.1%
1970	3,200	1,332	71.3%
1980	5,514	3,314	72.3%
1990	8,889	3,375	61.2%
2000	19,472	10,583	119.1%
2010[1]	23,647	4,165	21.4%
2020[2]	25,249	1,602	6.8%

Source: [1]US Census Bureau, [2]California Department of Finance

Special Populations and Disadvantaged Communities

The Galt Place (at 400 D ST) and New Hope Senior Village (at Village Run Dr) are identified as low-income active adult apartment complexes. Comfrey Senior Apartments (at 975 Lake Park Drive) is an active adult apartment complex. Golden Living Center (at F ST) and Ehimas Residential Care (at 407 Maple ST) are assisted living and nursing care facilities. There are areas of low income in the City: Mercy Housing (at 805 Elk Hills Dr), Palm Gardens (at 701 A ST), Empire Village (at 245 Palin Ave), Hudson Bay Apartments (at 100 Lake Park Ave) are identified as low-income housing/apartments. In addition, throughout the City there are handicapped and non-English speaking citizens.

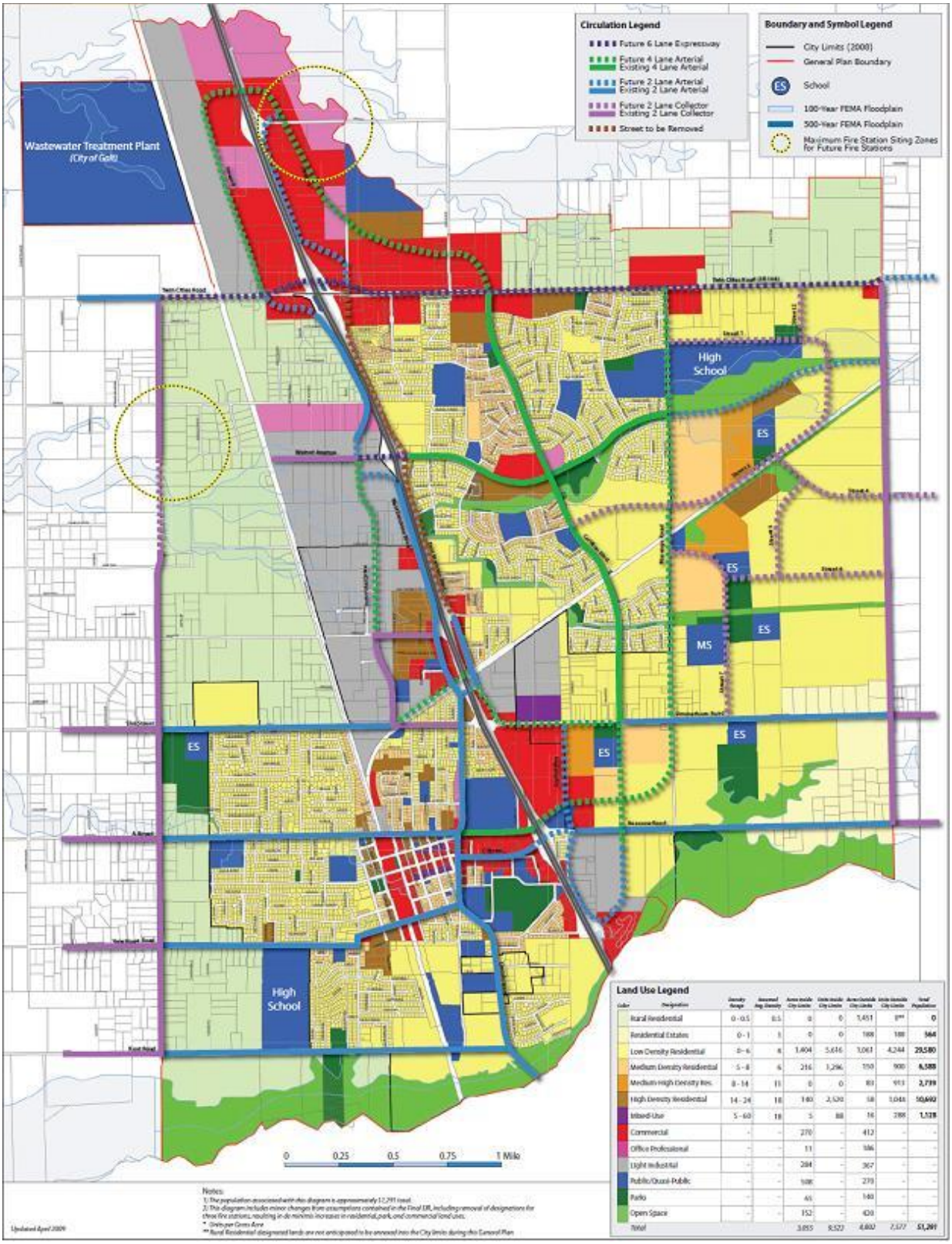
More detailed information regarding the City's special population can be found the 2021-2029 Housing Element Background Report, dated May 2021.

Land Use

State planning law requires that the land use element of a general plan include a statement of the standard population density, building intensity, and allowed uses for the various land use designations in the plan (Government Code Section 65302(a)). The City's land use designations are generally described below and mapped on the Land Use Diagram (Figure D-6). The Galt Municipal Code provides detailed land use and development standards for development.

The General Plan Area includes all land designated for or to be considered for future development as part of Galt under this General Plan. This boundary includes 13,400 acres, which is enough land for the projected residential and non-residential growth of the City to the year 2030 (see Figure D-6). The General Plan Area follows the Laguna Creek floodplain/1,500 feet north of Twin Cities Road on the north, Dry Creek on the south, Cherokee Lane on the east, and Sargent Road/Union Pacific railroad tracks on the west. This boundary is approximately 4,380 acres larger than the City's current (2007) sphere of influence (9,017 acres).

Figure D-6 City of Galt 2030 Land Use



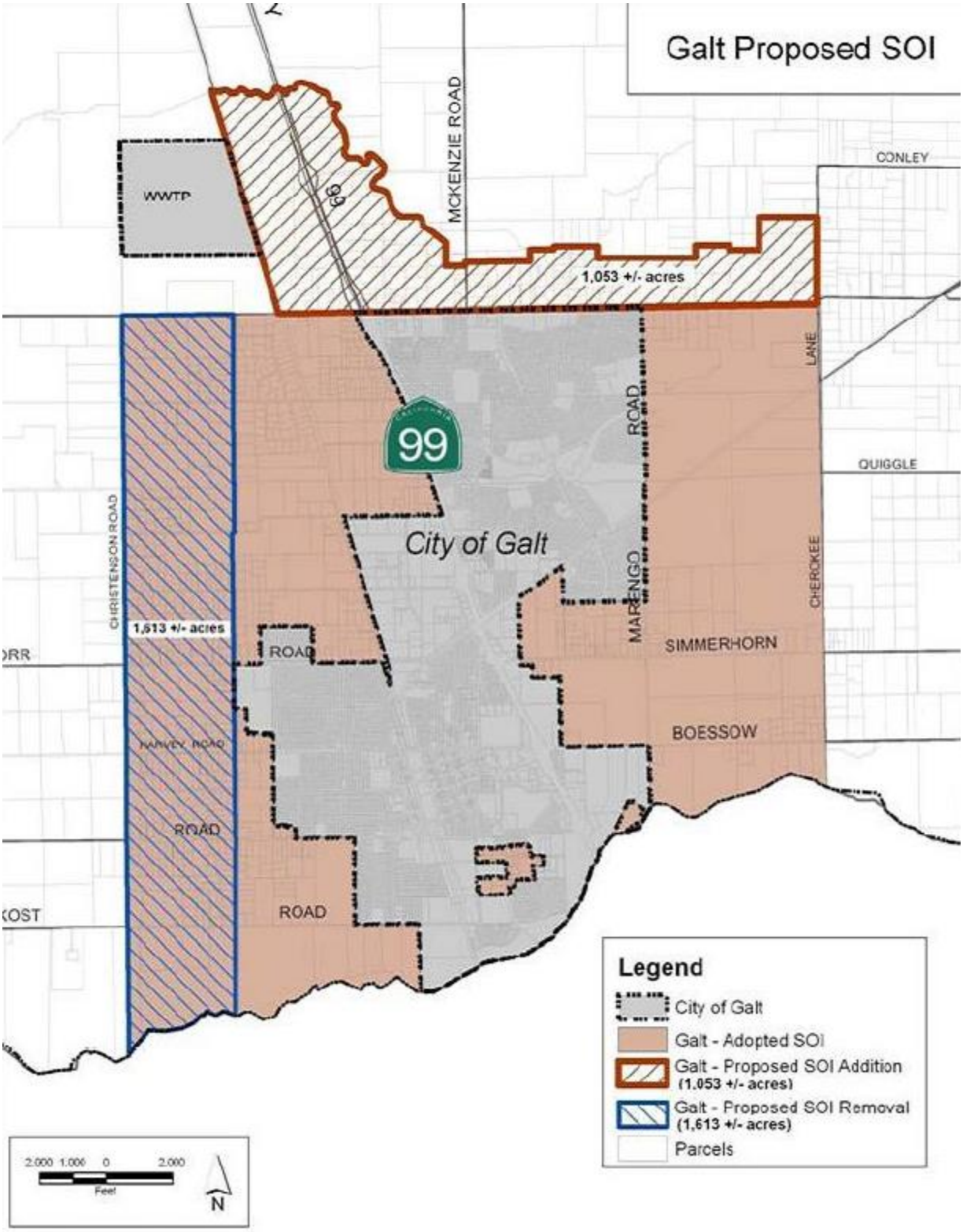
Source: City of Galt Housing Element, 2009

In addition to future land use inside current city limits, the City of Galt applied to the Sacramento Local Agency Formation Commission (LAFCo) to amend the Sphere of Influence (SOI) on July 20, 2009. The application is consistent with the newly adopted 2030 Galt General Plan. As part of this application submission, City staff prepared a Municipal Services Review (MSR), which was submitted with the SOI application.

The amended SOI application requested approximately 1,053 acres be added to the SOI on lands north of Twin Cities Road from Cherokee Road on the east to the U.P.R.R. mainline to the west. The northern boundary generally follows Skunk Creek between the eastern and western margins noted above. (see Figure D-7)

A simultaneous detachment of approximately 1,613 acres was also proposed. The detached area is located between Sargent and Christensen Roads and from Twin Cities Road south to the County boundary. The amended SOI would allow for future annexation and urbanization to the City of Galt.

Figure D-7 Proposed Sphere of Influence for the City of Galt



Source: City of Galt General Plan Environmental Impact Report (2008)

Development since 2016 Plan

As discussed in Section 4.3.1 of the Base Plan, future development has occurred in the County since the last plan. Some of this has occurred in hazard prone areas. The City Community Development Department tracked total building permits issued since 2016 for the City. These are tracked by total development, property use type, and hazard risk area. These are shown in Table D-13 and Table D-14.

Table D-13 City of Galt – Total Development Since 2016

Property Use	2016	2017	2018	2019	2020
Agricultural	0	0	0	0	0
Commercial	0	0	0	0	0
Industrial	0	0	0	0	0
Residential	0	71	38	0	82
Unknown	0	0	0	0	0
Total	**0**	**71**	**38**	**0**	**82**

Source: City of Galt Community Development Department

Table D-14 City of Galt – Development in Hazard Areas since 2016

Property Use	1% Annual Chance Flood	Levee Protected Area	Wildfire Risk Area[1]	Other
Agricultural	0	0	0	0
Commercial	0	0	0	0
Industrial	0	0	0	0
Residential	0	0	0	0
Unknown	0	0	0	0
Total	**0**	**0**	**0**	**0**

Source: City of Galt Community Development Department

[1]Moderate or higher wildfire risk area

While the data shows no changes in development in the City since the 2016, including development in mapped hazard areas, all development is subject to current building standards to include any requirements for building in hazard areas which act to mitigate hazard exposure. Further development in hazard areas is only one factor of many that contribute to an overall change in hazard vulnerability. Based on these considerations, it cannot be definitively stated as to whether the development or even lack of development contributed to an increase or decrease in vulnerability for Galt.

Future Development

The Sacramento Council on Governments (SACOG) modeled population projections for the City of Galt and other areas of the region in 2012 for a Metropolitan Transportation Plan/Sustainable Communities Strategy report. This forecast uses a 2008 base year estimate with projections to 2020 and 2035 for population, housing units, households and employment. SACOG estimated the City population in 2020 and 2035 to be 26,015 and 30,732 respectively.

More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

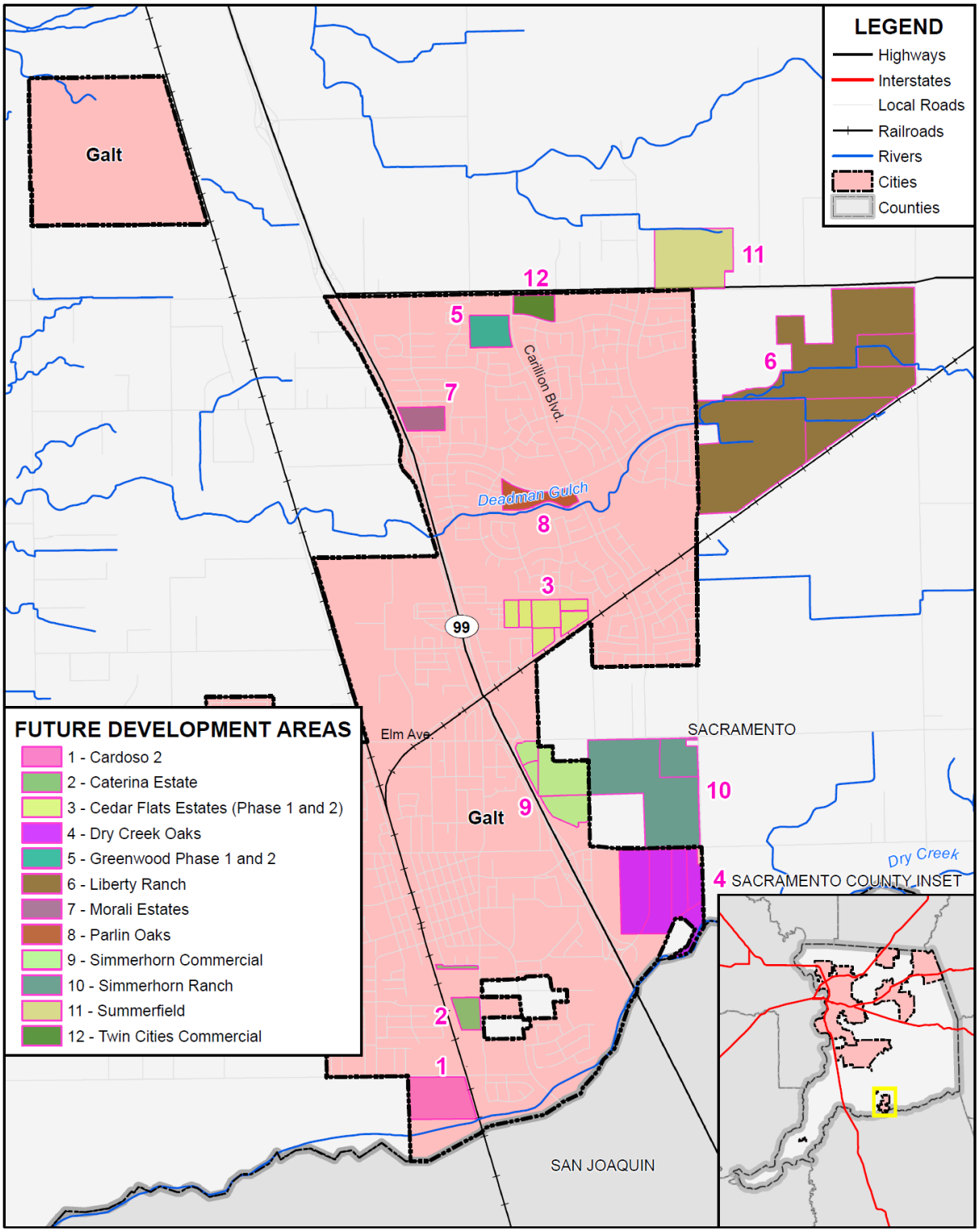
GIS Analysis

The City of Galt provided a list of projects that the City is seeing be developed:

- Cardoso 2
- Caterina Estate
- Cedar Flats Estates (Phase 1 and 2)
- Dry Creek Oaks
- Greenwood Phase 1 and 2
- Liberty Ranch
- Morali Estates
- Parlin Oaks
- Simmerhorn Commercial
- Simmerhorn Ranch
- Summerfield
- Twin Cities Commercial

Using GIS, the following methodology was used in determining parcel counts and acreages with future development projects in the City of Galt. Future development areas in the City were provided in mapped format by the City. Using the GIS parcel spatial file for each of these areas, the future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure D-8 shows the locations of future development areas the City is planning to develop. Table D-15 shows the summary of parcels and acreages of each future development area in the City

Figure D-8 City of Galt – Future Development Areas



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Table D-15 City of Galt – Future Development Parcels and Acres

Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
Cardoso 2	1	1	33.7
Caterina Estate	2	1	12.1
Cedar Flats Estates (Phase 1 and 2)	7	0	36.1
Dry Creek Oaks	5	0	86.8
Greenwood Phase 1 and 2	1	0	16.3
Liberty Ranch	4	4	333.8
Morali Estates	1	0	12.8
Parlin Oaks	1	0	16.3
Simmerhorn Commercial	4	0	48.4
Simmerhorn Ranch	2	1	115.2
Summerfield	1	1	58.8
Twin Cities Commercial	1	0	11.9
Grand Total	**30**	**8**	**782.2**

Source: City of Galt

D.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table D-5 as high or medium significance hazards. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, populations at risk, critical facilities and infrastructure, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outages and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

Galt noted that the City is provided electricity by SMUD, and no PSPS events have occurred.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the City, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the City noted that climate change is of concern, no specific impacts of climate change could be recalled. The City and HMPC members noted that the strength of storms does seem to be increasing and the temperatures are getting hotter.

Vulnerability to and Impacts from Climate Change

The 2012 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the City and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

Future Development

The City could see population fluctuations as a result of climate impacts relative to those experienced in other regions, and these fluctuations are expected to impact demand for housing and other development. The City completed a Climate Action Plan in March 2020. Future Development Projects will need to submit a Climate Action Plan Consistency Review Checklist.

Drought & Water Shortage

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

The City placed water meters on all water users in 2015, in advance of the State Mandate. In 2016. the rates were based on consumption. Since then, water consumption as relatively stable. Detailed data can be found in the Galt 2020 Urban Water Management Plan.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the City, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the City and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There have been two state and one federal disaster declaration from drought. This can be seen in Table D-16.

Table D-16 Sacramento County – State and Federal Drought Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the City are the same as those for the County and includes 4 multi-year droughts since 1950. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

The City called for Stage 3 water alert in 2015, with landscaping irrigation restricted to 2 times a week. Other years saw Stage 2 water alerts which called for water of landscaping 3 times a week. In 2021, the City is currently in a Stage 2 water alert.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the City, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users.

The City water supplies are all groundwater sources. In addition, the City Due to successful conservation efforts and response to the historic drought spanning water years 2012-2015, water demand (and thus the City's groundwater pumping volumes) were considerably lower from 2015 through 2019 (i.e., averaging 4,422 acre-feet [AF]) than they had been in the previous five years (i.e. averaging 5,502 AF). The City is one of seven Groundwater

Sustainability Agencies (GSAs) in the Cosumnes Subbasin of the San Joaquin Valley Basin (DWR Basin No. 5-022.16) who are working together to develop a single Groundwater Sustainability Plan (GSP). The GSAs have formed the Cosumnes Subbasin Sustainability Groundwater Management Act (SGMA) Working Group (Working Group) which meets at least once a month to discuss the development of the GSP including water management decisions. A more detailed discussion regarding the City's water supply can be found in the 2020 Urban water Management Plan.

The vulnerability of the City to drought is City-wide, but impacts may vary and include reduction in water supply and an increase in dry fuels. The potential for a reduction in water supply during drought conditions generally leads to both mandated and voluntary conservations measures during extended droughts. During these times, the costs of water can also increase. The increased dry fuels and fuel loads associated with drought conditions can also result in an increased fire danger. In areas of extremely dry fuels, the intensity and speed of fires can be significant. Water supply and flows for fire suppression can also be an issue during extended droughts.

Other qualitative impacts associated with drought in the City and Sacramento County Planning Area are those related to water intensive activities such as, municipal usage, commerce, tourism, recreation and agricultural use. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

With more precipitation likely falling as rain instead of snow in the Sierra's, and warmer temperatures causing decreased snowfall to melt faster and earlier, water supply is likely to become more unreliable. In

addition, drought and water shortage is predicted to become more common. This means less water available for use over the long run, and additional challenges for water supply reliability, especially during periods of extended drought.

Future Development

As the population in the area continues to grow, so will the demand for water. Ongoing planning will be needed by the City and water agencies to account for population growth and increased future water demands.

Earthquake

Likelihood of Future Occurrence–Unlikely
Vulnerability–Low

Though considered a low significance hazard by the City, due to its significance in the State of California, earthquake is discussed here. It is still considered a low significance hazard for the City of Galt for mitigation strategy purposes.

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

Since earthquakes are regional events, the whole of the City is at risk to earthquake. Galt and the surrounding area are at limited risk from significant seismic and geologic hazards. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the

Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The City is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the City fall within a low to moderate shake risk.

Past Occurrences

The City noted no past occurrences of earthquakes or that affected the City in any meaningful way.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured housing is very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. There are no URM or soft story buildings in the City.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The City of Galt is within the less hazardous Zone 3.

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

Impacts from earthquake in the City will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

Earthquake Analysis

Due to the regional effects of an earthquake, a Hazus earthquake analysis was performed on a countywide basis. This can be found in Section 4.3.11 of the Base Plan. While these runs were not done specific to the City, maps showing damage in the County show greater areas of damage near the cities in the County.

Future Development

Although new growth and development corridors would fall in the area affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in areas prone to earthquakes will continue to occur. The City enforces the state building code, which mandates construction techniques that minimize seismic hazards. Future development in the City is subject to these building codes.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

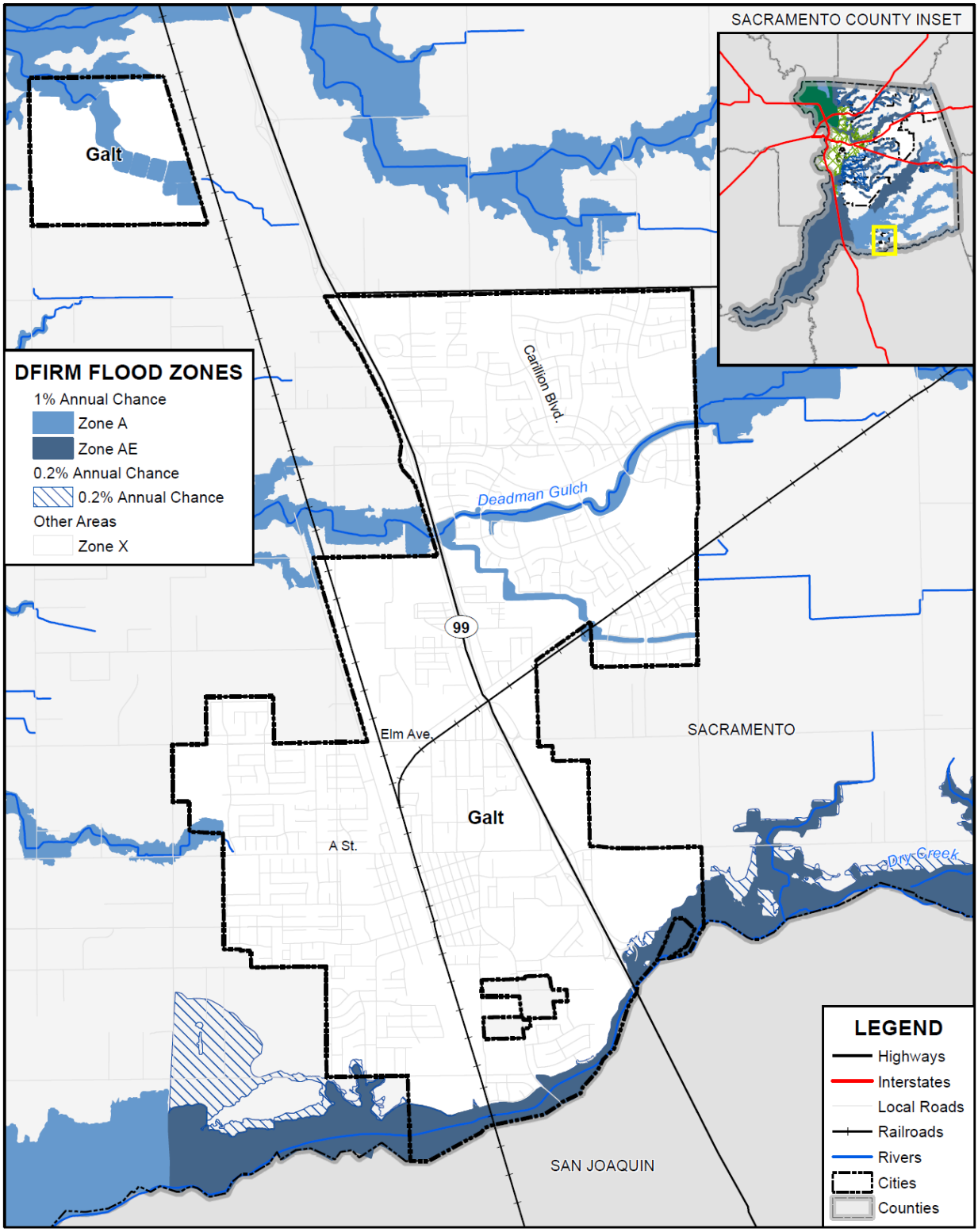
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the City, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the City. Historically, the City has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

Location and Extent

Runoff from the City's is primarily drained by a variety of local streams and creeks including Laguna Creek (south), Skunk Creek, Deadman Gulch, Hen Creek and Dry Creek, which drain to the Cosumnes River. The areas near the confluence of these smaller water courses with the Cosumnes River includes large areas of floodplain, which absorb excess flows from local watersheds during heavy rains and spring floods. Much of the stormwater of this floodplain is maintained through a complex system of levees and dikes. The City itself does not have nor need levees to provide protection.

The City of Galt has areas located in the 1% and 0.2% annual chance flood zones. This is seen in Figure D-9.

Figure D-9 City of Galt – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table D-17 details the DFIRM mapped flood zones located within the City.

Table D-17 City of Galt– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in City
A	1% annual chance flooding: No base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AE	1% annual chance flooding: Base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood. Flood insurance is not mandatory but is available.	X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	
X (unshaded)	No flood hazard	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the City vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the City tends to have a shorter speed of onset, due to the amount of water that flows through the City.

Geographical flood extents for the City from the FEMA DFIRMs are shown in Table D-18.

Table D-18 City of Galt – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance	409	10.59%	174	7.25%	235	16.02%
0.2% Annual Chance	10	0.26%	1	0.05%	9	0.60%
Other Areas	3,442	89.15%	2,218	92.69%	1,224	83.38%
Total	**3,861**	**100.00%**	**2,393**	**100.00%**	**1,467**	**100.00%**

Source: FEMA DFIRM 11/2/2018

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table D-19. These events also likely affected the City to some degree.

Table D-19 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The last known flooding event occurred in the early 2000's due to unauthorized fill and modification to the Dry Creek floodplain.

Vulnerability to and Impacts from Flood

Floods have been a part of the City's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

The main concern with flooding is disruption of transportation systems in the City and surrounding areas. For example, Twin Cities Road, a major east-west transportation corridor from Hwy 99 to Interstate 5 was closed to vehicular traffic one year due to high waters associated the Cosumnes River since the 2016 LHMP.

Assets at Risk

Based on the vulnerability of Galt to the flood hazard, the sections that follow describes significant assets at risk in the City of Galt. This section includes the values at risk, flooded acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Galt. The methodology described in Section 4.3.12 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table D-20 is a summary table for the City of Galt. Parcel counts, values, estimated contents, and total values in the City are shown for the 1% and 0.2% annual chance flood zones, as well as for those properties that fall outside of the mapped FEMA DFIRM flood zones. Table D-21 breaks down Table D-20 and shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in FEMA flood zones in the City.

Table D-20 City of Galt – Count and Value of Parcels at Risk in Summary DFIRM Flood Zones

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard	36	9	$16,234,029	$1,836,738	$2,169,686	$20,240,454
0.2% Annual Chance Flood Hazard**	2	0	$537,317	$0	$0	$537,317
Other Areas	7,948	7,439	$627,686,135	$1,727,496,106	$1,009,983,164	$3,365,165,408
City of Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table D-21 City of Galt – Count and Values of Parcels at Risk by Detailed Flood Zone and Property Use*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	2	2	$10,693,119	$31,364	$31,364	$10,755,847
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	2	2	$1,028,205	$1,020,032	$1,530,048	$3,578,286
Miscellaneous	5	0	$96	$0	$0	$96
Office	0	0	$0	$0	$0	$0
Public/Utilities	8	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	3	3	$1,697,774	$354,138	$177,070	$2,228,982
Retail/ Commercial	1	1	$217,825	$116,204	$116,204	$450,233
Unknown	0	0	$0	$0	$0	$0
Vacant	7	0	$86,865	$0	$0	$86,865
Zone A Total	**28**	**8**	**$13,723,884**	**$1,521,738**	**$1,854,686**	**$17,100,309**
Zone AE						
Agricultural	2	0	$57,735	$0	$0	$57,735
Care / Health	0	0	$0	$0	$0	$0
Church / Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	1	0	$35,700	$0	$0	$35,700
Office	0	0	$0	$0	$0	$0
Public / Utilities	2	0	$0	$0	$0	$0
Recreational	1	1	$157,500	$315,000	$315,000	$787,500
Residential	0	0	$0	$0	$0	$0
Retail / Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	2	0	$2,259,210	$0	$0	$2,259,210
Zone AE Total	**8**	**1**	**$2,510,145**	**$315,000**	**$315,000**	**$3,140,145**

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard Total	**36**	**9**	**$16,234,029**	**$1,836,738**	**$2,169,686**	**$20,240,454**
0.2% Annual Chance Flood Hazard**						
0.2% Annual Chance						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	1	0	$9	$0	$0	$9
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	0	0	$0	$0	$0	$0
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	1	0	$537,308	$0	$0	$537,308
0.2% Annual Chance Total	**2**	**0**	**$537,317**	$0	$0	**$537,317**
0.2% Annual Chance Flood Hazard Total	**2**	**0**	**$537,317**	**$0**	**$0**	**$537,317**
Other Areas						
Zone X						
Agricultural	14	9	$11,464,076	$601,171	$601,171	$12,666,418
Care/Health	10	10	$1,335,807	$5,731,483	$5,731,483	$12,798,773
Church/Welfare	21	17	$2,154,803	$17,678,088	$17,678,088	$37,510,979
Industrial	57	48	$21,100,685	$76,145,534	$114,218,304	$211,464,521
Miscellaneous	117	0	$144,241	$0	$0	$144,241
Office	30	28	$6,269,775	$16,644,351	$16,644,351	$39,558,477
Public/Utilities	92	0	$36	$0	$0	$36
Recreational	2	1	$6,144	$17,437	$17,437	$41,018
Residential	7,278	7,228	$506,643,455	$1,508,836,092	$754,418,035	$2,769,897,587
Retail/ Commercial	97	88	$41,394,314	$100,674,295	$100,674,295	$242,742,904
Unknown	1	0	$106,621	$0	$0	$106,621
Vacant	229	10	$37,066,178	$1,167,655	$0	$38,233,833

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Zone X Total	**7,948**	**7,439**	**$627,686,135**	**$1,727,496,106**	**$1,009,983,164**	**$3,365,165,408**
Other Areas Total	**7,948**	**7,439**	**$627,686,135**	**$1,727,496,106**	**$1,009,983,164**	**$3,365,165,408**
Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table D-22 summarizes Table D-21 above and shows City of Galt loss estimates and improved values at risk by FEMA 1% and 0.2% annual chance flood zones.

Table D-22 City of Galt – Flood Loss Estimates

Flood Zone	Total Parcel Count*	Improved Parcel Count*	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood Hazard	36	9	$1,836,738	$2,169,686	$4,006,424	$801,285	0.00%
0.2% Annual Chance Flood Hazard**	2	0	$0	$0	$0	$0	0.00%
Grand Total	**38**	**9**	**$1,836,738**	**$2,169,686**	**$4,006,424**	**$801,285**	**0.00%**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table D-21 and Table D-22, the City of Galt has 9 parcels and $4.0 million of structure and contents values or values in the 1% annual chance flood zone, and 0 improved parcels in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.11 of the Base Plan, there is a 1% chance in any given year of a flood event causing $0.8 million in damage in the City of Galt. The loss ratio of 0.00% indicates that flood losses for 1% and 0.2% annual chance flooding, respectively, would be minor, and the City would be able to recover quickly.

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits. The same methodology, as discussed in Section 4.3.12 of the Base Plan, was used for the City of Galt as well as for the County as a whole. Table D-23 represents a summary and Table D-24 represents a detailed analysis of total acres for each FEMA DFIRM flood zone in the City.

Table D-23 City of Galt – Flooded Acres by Flood Zone

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard	409	0.06%	174	0.05%	235	0.08%
0.2% Annual Chance Flood Hazard	10	0.00%	1	0.00%	9	0.00%
Other Areas	3,442	0.53%	2,218	0.61%	1,224	0.43%
Galt Total	**3,861**	**0.60%**	**2,393**	**0.66%**	**1,467**	**0.52%**

Source: FEMA 11/2/2018 DFIRM

Table D-24 City of Galt – Flooded Acres by Flood Zone and Property Use

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	126.1	0.02%	124.1	0.03%	2.0	0.00%
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	0	0.00%	0	0.00%	0	0.00%
Industrial	9.4	0.00%	9.4	0.00%	0	0.00%
Miscellaneous	37.6	0.01%	0	0.00%	37.6	0.01%
Office	0	0.00%	0	0.00%		
Public/Utilities	11.6	0.00%	0	0.00%	11.6	0.00%
Recreational	0	0.00%	0	0.00%	0	0.00%
Residential	27.7	0.00%	27.7	0.01%	0	0.00%
Retail/ Commercial	0.6	0.00%	0.6	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	95.5	0.01%	0	0.00%	95.5	0.03%
Zone A Total	**308.5**	**0.05%**	**161.8**	**0.04%**	**146.7**	**0.05%**
Zone AE						

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Agricultural	42.1	0.01%	7.4	0.00%	34.7	0.01%
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	0	0.00%	0	0.00%	0	0.00%
Industrial	0	0.00%	0	0.00%	0	0.00%
Miscellaneous	19.1	0.00%	0	0.00%	19.1	0.01%
Office	0	0.00%	0	0.00%	0	0.00%
Public/Utilities	2.0	0.00%	0	0.00%	2.0	0.00%
Recreational	4.4	0.00%	4.4	0.00%	0	0.00%
Residential	0	0.00%	0	0.00%	0	0.00%
Retail/ Commercial	0	0.00%	0	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	32.6	0.01%			32.6	0.01%
Zone AE Total	**100.2**	**0.02%**	**11.8**	**0.00%**	**88.4**	**0.03%**
1% Annual Chance Flood Hazard Total	**408.7**	**0.06%**	**173.6**	**0.05%**	**235.0**	**0.08%**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	0.2	0.00%	0.2	0.00%	0	0.00%
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	0	0.00%	0	0.00%	0	0.00%
Industrial	0	0.00%	0	0.00%	0	0.00%
Miscellaneous	0.6	0.00%	0	0.00%	0.6	0.00%
Office	0	0.00%	0	0.00%	0	0.00%
Public/Utilities	1.8	0.00%	0	0.00%	1.8	0.00%
Recreational	1.1	0.00%	1.1	0.00%	0	0.00%
Residential	0.0	0.00%	0.0	0.00%	0	0.00%
Retail/ Commercial	0	0.00%	0	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	6.3	0.00%	0	0.00%	6.3	0.00%
0.2% Annual Chance Total	**10.1**	**0.00%**	**1.3**	**0.00%**	**8.8**	**0.00%**
0.2% Annual Chance Flood Hazard Total	**10.1**	**0.00%**	**1.3**	**0.00%**	**8.8**	**0.00%**
Other Areas						

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Zone X						
Agricultural	380.4	0.06%	336.8	0.09%	43.7	0.02%
Care/Health	10.3	0.00%	10.3	0.00%		
Church/Welfare	77.1	0.01%	36.2	0.01%	41.0	0.01%
Industrial	173.6	0.03%	159.6	0.04%	14.0	0.00%
Miscellaneous	136.9	0.02%	0	0.00%	136.9	0.05%
Office	14.3	0.00%	11.9	0.00%	2.4	0.00%
Public/Utilities	190.5	0.03%	0	0.00%	190.5	0.07%
Recreational	0.4	0.00%	0.2	0.00%	0.3	0.00%
Residential	1,611.8	0.25%	1,580.7	0.44%	31.0	0.01%
Retail/ Commercial	86.5	0.01%	77.4	0.02%	9.0	0.00%
Unknown	0.7	0.00%	0	0.00%	0.7	0.00%
Vacant	759.4	0.12%	5.3	0.00%	754.1	0.27%
Zone X Total	**3,442.0**	**0.53%**	**2,218.4**	**0.61%**	**1,223.6**	**0.43%**
Other Areas Total	**3,442.0**	**0.53%**	**2,218.4**	**0.61%**	**1,223.6**	**0.43%**
Galt Total	**3,860.8**	**0.60%**	**2,393.3**	**0.66%**	**1,467.5**	**0.52%**

Source: FEMA 11/2/2018 DFIRM

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Galt – 3.16. According to this analysis, there is a total population of 13 and 0 residents of the City at risk to flooding in the 1% and 0.2% annual chance floodplains, respectively. This is shown in Table D-25.

Table D-25 City of Galt – Count of Improved Residential Parcels and Population by Flood Zone

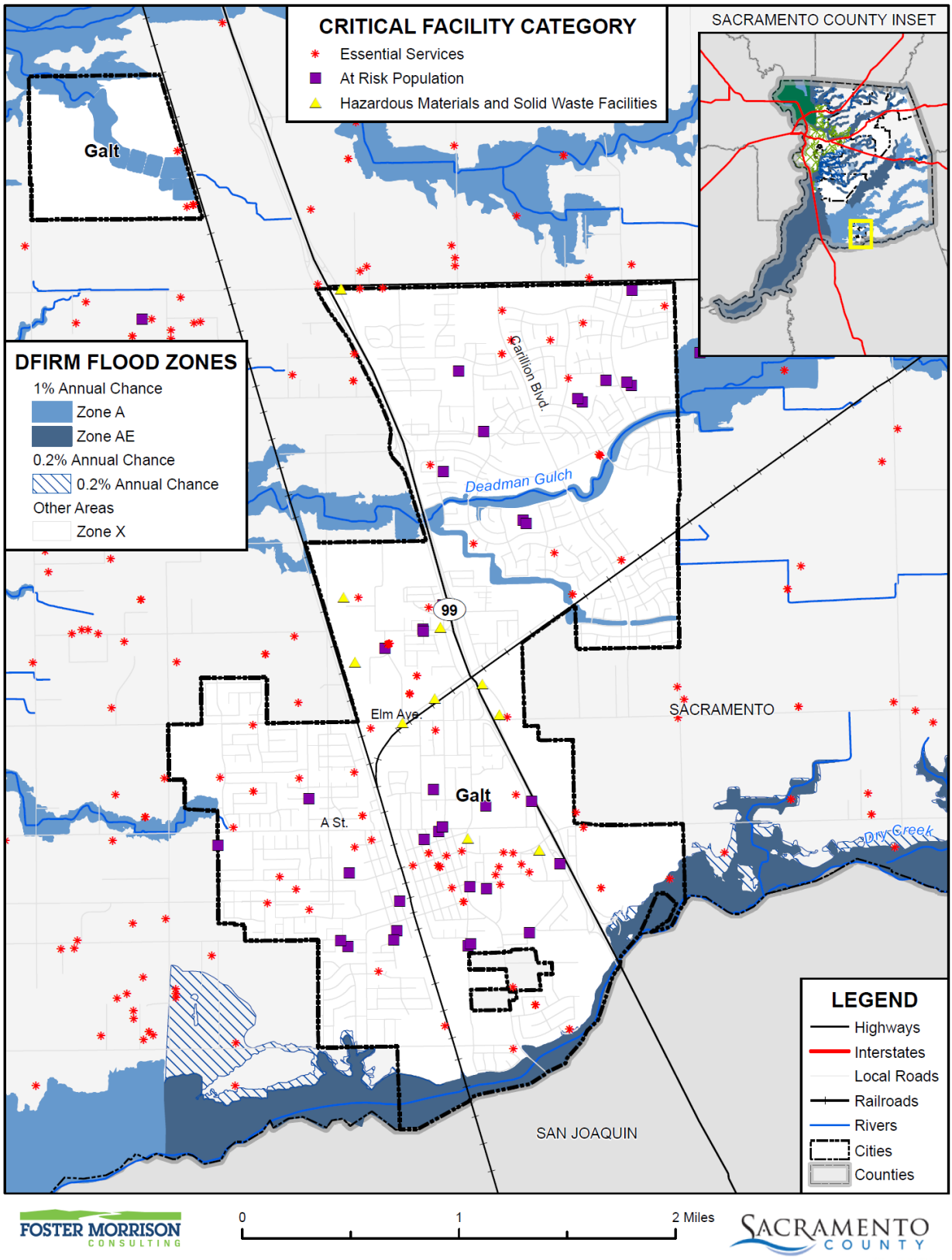
Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Galt	4	13	0	0

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Galt in identified DFIRM flood zones. GIS was used to determine whether the critical facility locations intersect a DFIRM flood zone, and if so, which flood zone they intersect. Details of critical facilities in DFIRM flood zones in the City of Galt are shown in Figure D-10 for and detailed by dam inundation in Table D-26. Details of critical facility definition, type, name, and address and jurisdiction by DFIRM flood zones are listed in Appendix F.

Figure D-10 City of Galt – Critical Facilities and DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table D-26

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
1% Annual Chance Flood Hazard		
Essential Services Facilities	Water Well	1
	Total	**1**
1% Annual Chance Flood Hazard Total		**1**
Other Areas		
Essential Services Facilities	Cellular Tower	2
	Emergency Evacuation Center	5
	EMS Stations	2
	FDIC Insured Banks	6
	Fire Station	3
	Law Enforcement	2
	Microwave Service Towers	55
	Sewage Treatment Plant	1
	Water Well	34
	Total	**110**
At Risk Population Facilities	Day Care Center	6
	Mobile Home Parks	4
	Places of Worship	14
	School	14
	Total	**38**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	3
	Leaky Underground Storage Tank	7
	Waste Transfer Station	1
	Total	**11**
Other Areas Total		**159**
Galt Total		**160**

Source: City of Galt, FEMA 7/19/2018 DFIRM

Insurance Coverage, Claims Paid, and Repetitive Losses

Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures located within a 100-year floodplain – a requirement that affects nearly all mortgages financed through commercial lending institutions. Flood insurance is also recommended for all structures protected by levees, even if not mapped within a floodplain.

The City of Galt joined the National Flood Insurance Program (NFIP) on December 1, 1981. The City does not participate in the CRS program. NFIP data indicates that as of March 24, 2020, there were 58 flood insurance policies in force in the City with $19,840,000 of coverage. Of the 58 policies, 55 were residential (single-family homes) and 3 were nonresidential properties. Of the 58 policies, 3 are in the A zones, while the other 55 are in B, C, and X zones. There have been 3 historical claims for flood losses totaling $69,338.31. NFIP data further indicates that there are no repetitive loss (RL) or severe repetitive loss (SRL) buildings in Galt. There have been no substantial damage claims since 1978 in the City.

Based on this analysis of insurance coverage, the City has values at risk to the 1% annual chance and greater floods. Of the 9 improved parcels within the 1% annual chance flood zone, only 3 (or 33.3 percent) of those parcels maintain flood insurance. This can be seen on Table D-27.

Table D-27 City of Galt – Percentage of Policy Holders to Improved Parcels in the 1% Annual Chance Floodplain

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Galt	9	3	33.3%

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, NFIP CIS data 3/2020.

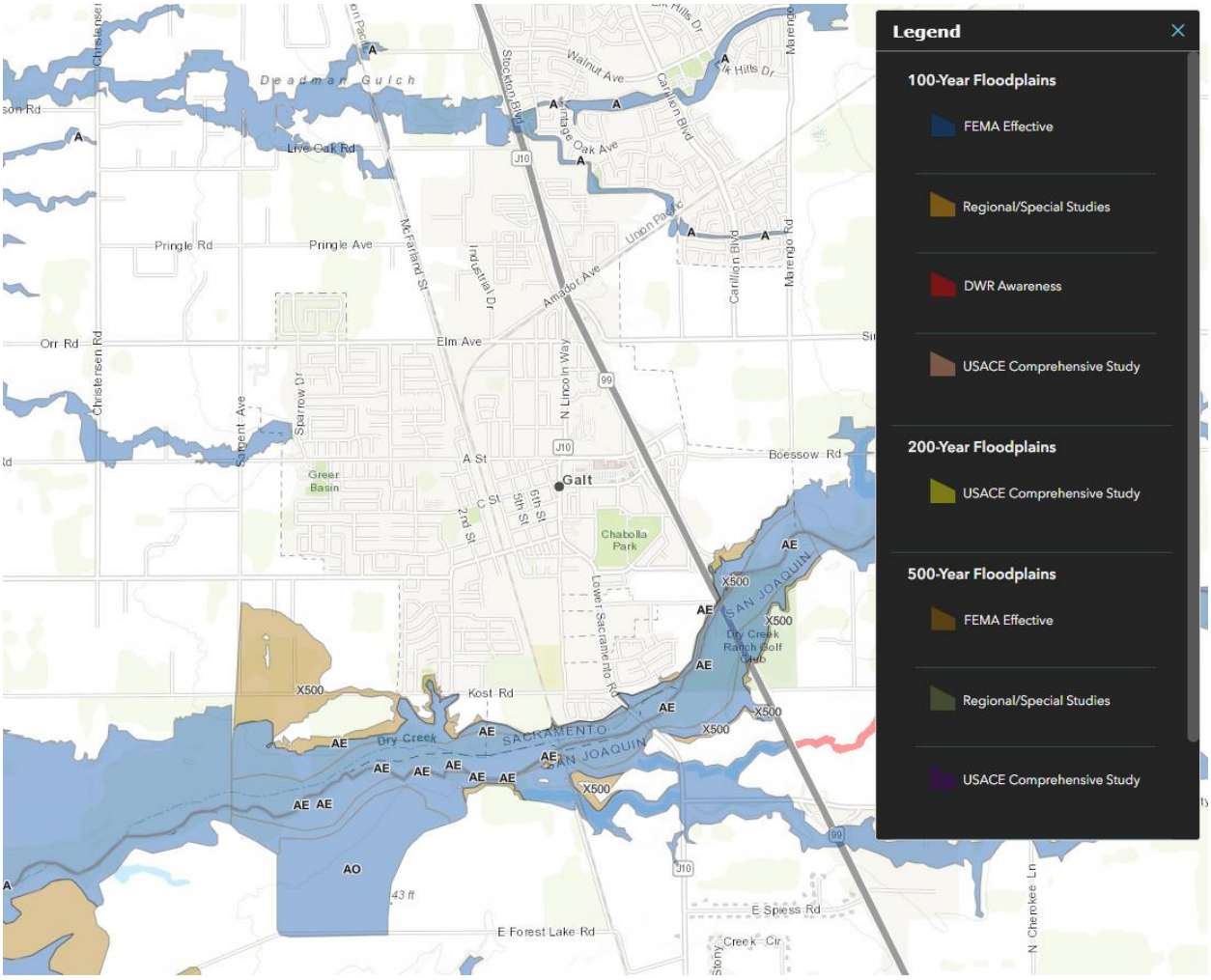
California Department of Water Resources Best Available Maps (BAM)

The FEMA regulatory maps provide just one perspective on flood risks in Sacramento County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Nevada-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-(as applicable), and 500-year event risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the City than that provided in the FEMA DFIRMs. The BAM map for Galt is shown in Figure D-11.

Figure D-11 City of Galt – Best Available Map



Source: California DWR

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1%r (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2% (2002 Sac and San Joaquin River Basins Comp Study).

Future Development

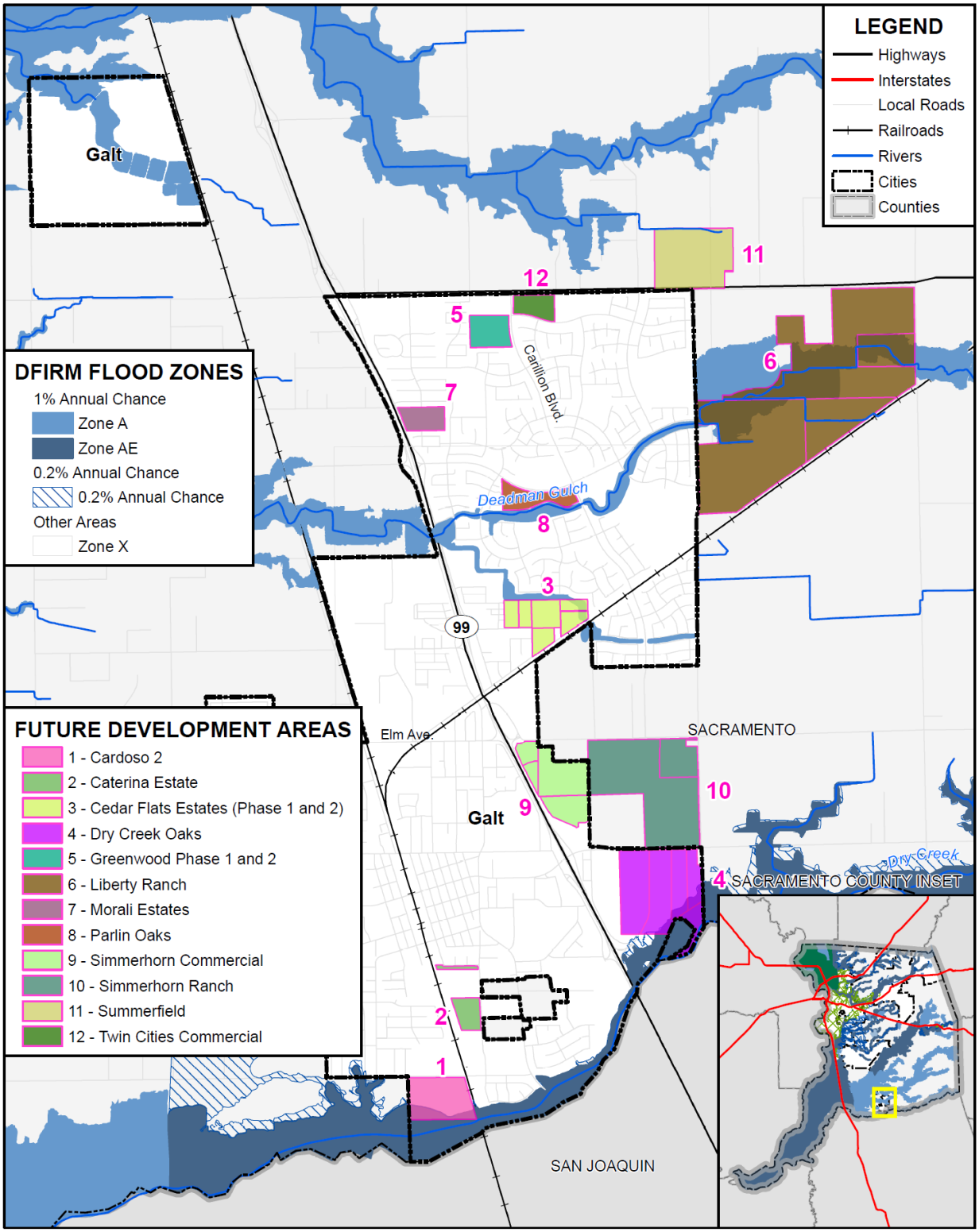
The potential for flooding may increase as floodwaters are channeled due to land development. Such changes can exacerbate flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning should be based on build out property use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the overall floodplain.

The City enforces the floodplain ordinance. If any development is to occur in the floodplain, it would have to conform to the elevation standards of the floodplain ordinance. No development is expected in the floodplain in the future.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure D-12 shows the locations of future development areas the City is planning to develop on the DFIRM flood zones. Table D-28 shows the parcels and acreages of each future development area in the City in the DFIRM flood zones.

Figure D-12 City of Galt – Future Development in DFRIM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Table D-28 City of Galt – Future Development in DFIRM Flood Zones

Flood Zone/ Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
1% Annual Chance Flood Hazard			
Dry Creek Oaks	1	0	8.1
Liberty Ranch	2	2	167.5
1% Annual Chance Flood Hazard Total	**3**	**2**	**175.6**
Other Areas			
Cardoso 2	1	1	33.7
Caterina Estate	2	1	12.1
Cedar Flats Estates (Phase 1 and 2)	7	0	36.1
Dry Creek Oaks	4	0	78.7
Greenwood Phase 1 and 2	1	0	16.3
Liberty Ranch	2	2	166.3
Morali Estates	1	0	12.8
Parlin Oaks	1	0	16.3
Simmerhorn Commercial	4	0	48.4
Simmerhorn Ranch	2	1	115.2
Summerfield	1	1	58.8
Twin Cities Commercial	1	0	11.9
Other Areas Total	**27**	**6**	**606.6**
Grand Total	**30**	**8**	**782.2**

Source: City of Galt, FEMA 7/19/2018 DFIRM

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Cloudburst storms, sometimes lasting as long as three hours, can occur any time from the late fall to early spring, and may occur as an extremely severe sequence within a general winter rainstorm. Flooding from cloudburst activity is characterized by high peak flow, short duration of flood flow, and a small volume of runoff.

Location and Extent

The City of Galt is subject to localized flooding throughout the City. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the City vary by location. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the City tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

The City tracks localized flooding areas. Affected localized flood areas identified by the City of Galt are summarized in Table D-29.

Table D-29 City of Galt – List of Localized Flooding Problem Areas

Area Name	Flooding	Pavement Deterioration	Washout	High Water	Landslide/ Mudslide	Debris	Downed Trees
Cobble Hill Way		X					
intersection Walnut Ave/Park Terrace Drive; Beeler Way				X		X	
C ST and Market St				X			
G St and H St, between UPRR tracks and Church St				X			
Park Ave/Camellia Way.				X			
Cul-de-Sac end of Crystal Way, by Dry Creek Golf Course	X			X			

Source: City of Galt

Past Occurrences

The City noted the following past occurrences of localized flooding:

- Localized flooding was observed at C/Market St, end of Crystal Way and H St since the 2016 LHMP. The City is implementing Capital Improvement Program (CIP) and Development Project improvements to address localized flooding

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the City and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also

be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Future Development

Future development in the City will add more impervious surfaces causing an increase in stormwater runoff and the continued need to drain these waters. The City will need to be proactive to ensure that increased development has proper siting and drainage for stormwaters. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding will reduce future risks of losses. The City's 2010 Storm Drainage System Master Plan identifies detention basins, pipe sizes and retrofit of existing storm drainpipes to handle future development.

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the City, County, and surrounding region is at risk, as pandemic is a regional, national, or international event. The speed of onset of pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table D-30.

Table D-30 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic flu.

- The **1918-1919 Influenza Pandemic (H1N1)**
- The **February 1957-1958 Influenza Pandemic (H2N2)**
- The **1968 Influenza Pandemic (H3N2)**

To date, the 21st century has seen two acknowledged pandemics.

- **2009 Swine Flu (H1N1**)
- **2019/2020 COVID 19**

Following Sacramento County COVID-19 guidelines, businesses in the city and the City of Galt offices were closed to the public for many months. Public meetings such as the City Council and Planning Commission shifted to a Zoom format. City Recreation programs were cancelled. Schools also shifted to an online learning format

Vulnerability to and Impacts from Pandemic

Pandemic has and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the City. Pandemic can have varying levels of impact to the citizens of the City and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently) an unemployment rose significantly. Supply chains for food can be interrupted. Prisons may need to release prisoners to comply with social distance standards. Loss of tax revenue due to closed businesses and operations were an impact of the pandemic.

Future Development

Future development is not expected to be significantly impacted by this hazard, though population growth in the City could increase exposure to a pandemic, and increase the ability of a disease to be transmitted among the population of the City. If the median age of City residents continues to increase, vulnerability to pandemic diseases may increase, due to the fact that these diseases are often more deadly to senior citizens.

Severe Weather: Extreme Cold and Freeze

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the National Weather Service), extreme cold often accompanies a winter storm or is left in its wake. Freezing temperatures can also occur without the accompanying winter storm.

Location and Extent

Extreme cold and freeze are regional issues, meaning the entire City is at risk to cold weather and freeze events. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of extreme cold and freeze, temperature data from the County from the WRCC indicates minimum temperatures fall below 32°F on 8.3 days with no days falling below 0°F. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days to weeks at a time.

Past Occurrences

There has been no federal or state disaster declarations in the County for extreme cold and freeze. The City noted that cold and freeze is a regional phenomenon; events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

Past occurrences of extreme cold and freeze in the City are shown in both Table D-31 and Table D-32.

Table D-31 Record Low Temperatures in the City of Galt

Month	Temperature	Date	Month	Temperature	Date
January	20°	1/05/1950	July	48°	7/8/1983
February	23°	2/07/1989	August	48°	8/5/1950
March	26°	3/5/1971	September	42°	9/30/2007
April	31°	4/9/1999	October	35°	10/30/1948
May	34°	5/3/1950	November	26°	11/21/1941
June	41°	6/7/1950	December	18°	12/22/1990

Source: Western Regional Climate Center, Sacramento FAA Airport Station

Table D-32 Average Number of Days in a Month Below 32°F in Galt

Month	Days Below 32°F	Month	Days Below 32°F
January	7.2	July	0
February	2.2	August	0
March	0.5	September	0
April	0	October	0
May	0	November	1.5
June	0	December	6.2

Source: Western Regional Climate Center, Sacramento FAA Airport Station

The City has no record of opening warming centers since the 2016 LHMP.

Vulnerability to and Impacts from Severe Weather: Extreme Cold and Freeze

The City experiences temperatures below 32 degrees during the winter months. The temperature moves to the low 20s in rather extreme situations. Freeze can cause injury or loss of life to residents of the City. While it is rare for buildings to be affected directly by freeze, damages to pipes that feed building can be damaged during periods of extreme cold.

Extreme cold and freeze can affect critical facilities and infrastructure, down trees, break pipes, and can be a life safety issue. When extreme cold is coupled with high winds or ice storms, power lines may be downed, resulting in an interruption of utilities and critical services. Transportation networks, communications, and utilities infrastructure are the most vulnerable physical assets in the City. The elderly and young population is most vulnerable to temperature extremes. Health impacts are the primary concern with this hazard, though economic impacts are also an issue. The residents of nursing homes and elder care facilities, as well as transient and homeless populations are especially vulnerable to extreme cold events.

Future Development

Future development built to code should be able to withstand issues associated with extreme cold and freeze events. Pipes at risk of freezing should be buried or insulated from freeze as new facilities are improved or added. Utilities should be undergrounded where possible for new developments. Vulnerability to extreme cold will increase as the average age of the population in the County shifts and homelessness becomes more of an issue.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and lasts for several weeks. Heat kills by taxing the human body

beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature. Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the City, there are risks to the built environment from extreme heat. While extreme heat on its own does not usually affect structures, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat can lead to power outages and when combined with high winds, to Public Safety Power Shutdown (PSPS) events, creating significant issues in the City. However, PSPS events in the City have been declining with PG&E's refined system for shutting power off in high wildfire risk areas.

Location and Extent

Heat is a regional phenomenon and affects the whole of the City. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

The City Planning Team noted that since extreme heat is a regional phenomenon, events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

Past average occurrences of extreme heat in the City of Galt are shown in both Table D-33 and Table D-34.

Table D-33 Record High Temperatures in the City of Galt

Month	Temperature	Date	Month	Temperature	Date
January	74°	1/12/2009	July	114°	7//1983
February	76°	2/19/1964	August	110°	8/10/1996
March	88°	3/5/1971	September	108°	9/01/1950
April	95°	4/9/1999	October	104°	10/02/2001
May	105°	5/3/1950	November	87°	11/01/1960
June	115°	6/7/1950	December	73°	12/02/2011

Source: Western Regional Climate Center, Sacramento FAA Airport Station

Table D-34 Average Number of Days in a Month Exceeding 90°F in Galt

Month	Days Exceeding 90°F	Month	Days Exceeding 90°F
January	0	July	21.4
February	0	August	19.0
March	0	September	12.6
April	0.5	October	2.5
May	5.5	November	0
June	11.6	December	0

Source: Western Regional Climate Center, Sacramento FAA Airport Station

The City has record of opening cooling centers 4 times since the 2016 LHMP.

Vulnerability to and Impacts from Extreme Heat

The City experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-115°F in rather extreme situations. During these times, drought conditions may worsen and the City may see an increase in dry fuels. Also, power outage and PSPS events may occur during these times as well. Health issues are the primary concern with this hazard, although economic impacts can also be an issue.

The elderly and individuals below the poverty level are the most vulnerable to extreme temperatures. Nursing homes and elder care facilities are especially vulnerable to extreme heat events if power outages occur and air conditioning is not available. In addition, individuals below the poverty level may be at increased risk to extreme heat if use of air conditioning is not affordable. This is especially true of homeless people and the transient population.

Days of extreme heat have been known to result in medical emergencies, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts. Extreme heat can also dry out vegetations, making it more vulnerable to wildfire ignitions. Days of extreme heat have been known to result in medical emergencies, civil unrest, and unpredictable human behavior.

Future Development

Future development of new buildings in the City will likely not be affected by extreme heat. Extreme heat is more likely to affect vulnerable populations. Vulnerability to extreme heat will increase as the average age of the population in each City shifts. It is encouraged that nursing homes and elder care facilities have emergency plans or backup power to address power failure during times of extreme heat and in the event of a PSPS. Low income residents and homeless populations are also vulnerable. Cooling centers for these populations should be utilized when necessary.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the City occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the City falls mainly in the fall, winter, and spring months. Wind often accompanies these storms; hail and lightning are rare in the City.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the City. All portions of the City are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Hail and lightning are rare in the City and Sacramento County. Duration of severe storms in California, Sacramento County, and the City can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the City. This is the cause of many of the federal disaster declarations related to flooding. More information can be found in the Localized Stormwater section above.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the City. These events can cause significant and localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the City, but also can cause damage, with lightning occasionally igniting wildfires.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Power outages may also occur. Heavy rains and storms often result in flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

Future Development

Building codes in the City ensure that new development is built to current building standards, which should reduce the risk to future development in the City from heavy rains and storms. New critical facilities should be built to withstand hail damage, lightning, and thunderstorm winds. With adherence to development standards, future losses to new development should be minimal.

Wildfire

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

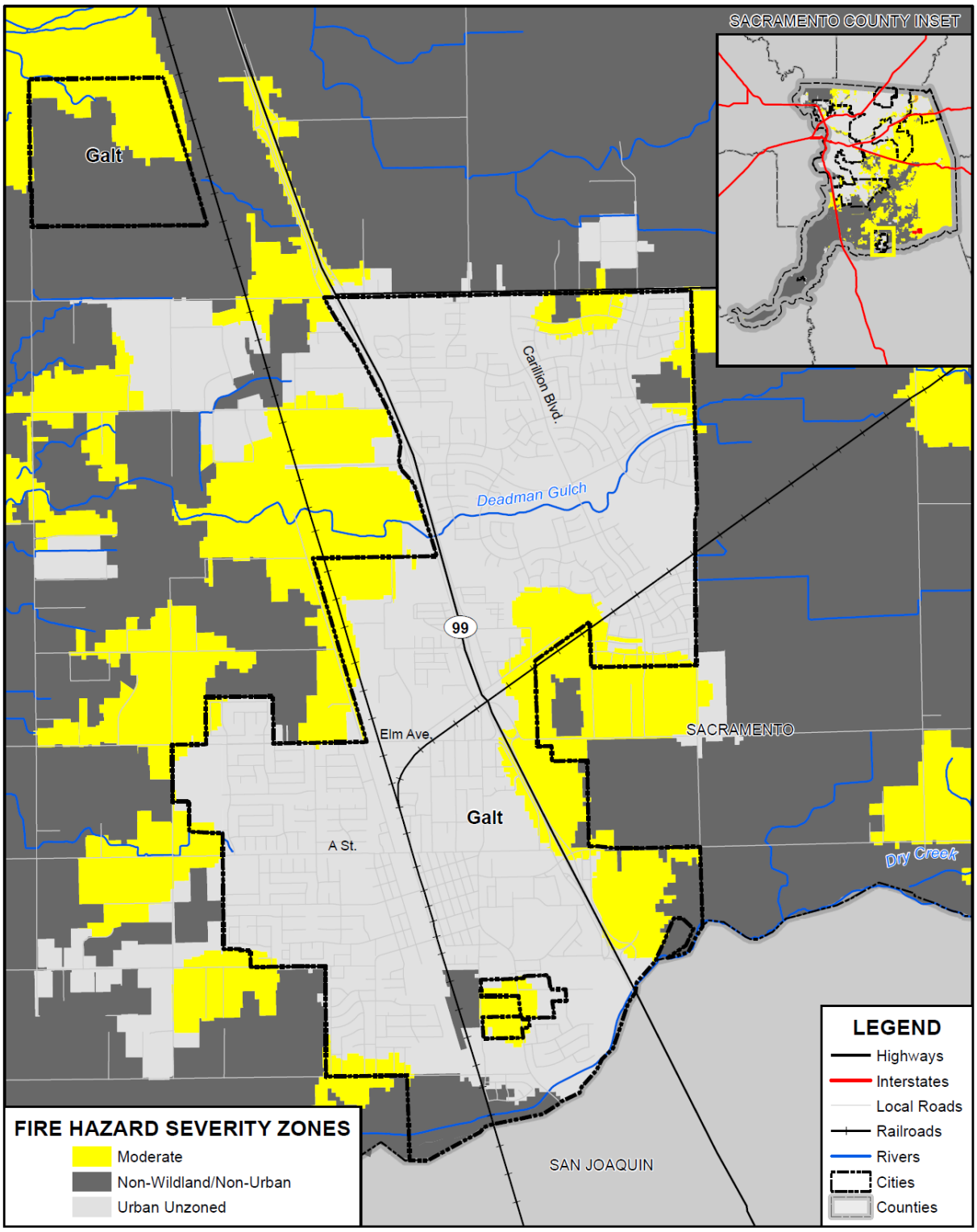
Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the City of Galt. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. These high winds can result in red flag days, and can result in PSPS events in the City. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

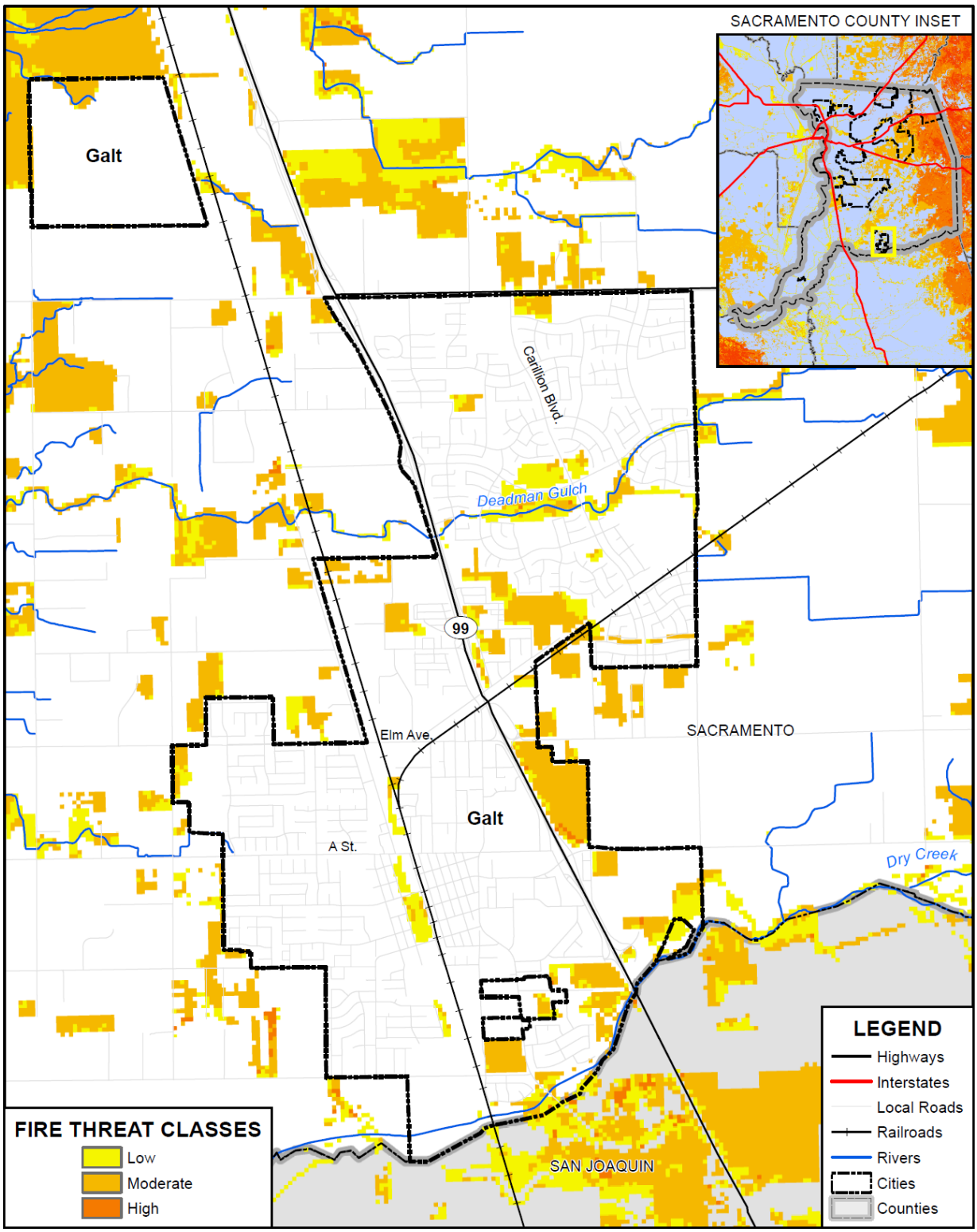
Wildfire can affect all areas of the City. CAL FIRE has estimated that the risk varies across the City and has created maps showing risk variance. Following the methodology described in Section 4.3.19 of the Base Plan, wildfire maps for the City of Galt were created. Figure D-13 shows the CAL FIRE Fire Hazard Severity Zone (FHSZ) in the City. As shown on the maps, FHSZs within the City range from urban unzoned to moderate. Figure D-14 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, fire threat within the City ranges from low to moderate.

Figure D-13 City of Galt – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure D-14 City of Galt – Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more. Geographical FHSZ extent from CAL FIRE is shown in Table D-35. Geographical Fire Threat Area extents from CAL FIRE are shown on Table D-36.

Table D-35 City of Galt – Geographical FHSZ Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	0	0.00%	0	0.00%	0	0.00%
Moderate	757.6	19.62%	345.6	14.44%	412.0	28.08%
Non-Wildland/non-Urban	815.2	21.11%	449.3	18.77%	365.9	24.94%
Urban Unzoned	2,288.0	59.26%	1,598.4	66.79%	689.5	46.99%
Total	**3,860.8**	**100.00%**	**2,393.3**	**100.00%**	**1,467.5**	**100.00%**

Source: CAL FIRE

Table D-36 City of Galt – Geographical Fire Threat Area Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	2.0	0.05%	0	0.00%	2.0	0.14%
Moderate	258.0	6.68%	45.9	1.92%	212.1	14.45%
Low	150.0	3.88%	23.5	0.98%	126.5	8.62%
No Threat	3,450.8	89.38%	2,323.9	97.10%	1,126.9	76.79%
Total	**3,860.8**	**100.00%**	**2,393.3**	**100.00%**	**1,467.5**	**100.00%**

Source: CAL FIRE

Past Occurrences

There has been no state and one federal disaster declaration due to fire, as shown in Table D-37. It should be noted that this fire disaster was from an explosion in Roseville, and not from an actual wildfire.

Table D-37 Sacramento County – State and Federal Wildfire Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

The City experienced significant smoke and air quality issues from wildfires in 2018 and 2019.

Vulnerability to and Impacts from Wildfire

Fuel loads in the County and Cities, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. The more urbanized areas within the County are not immune from fire. The dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and City, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Galt is not immune to numerous types of grass and brush fires and any one of them may accelerate into an urban interface wildfire. Such a situation could lead to evacuation of large portions of the population and the potential for significant loss of personal property, structures, and rangeland. The natural fuels available in or near the City vary greatly in the rate and intensity of burning. Fires in heavy brush and stands of trees burn with great intensity but more slowly than in dry grass and leaves. Dense fuels will propagate fire better than sparse fuels.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and timber; and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the City. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the City by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the City; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate a PSPS which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Air quality, economic losses due to impacted structure. Wildfire impacts to urban development has been heightened since the 2017 Santa Rosa and 2018 Paradise wildfires.

Assets at Risk

Based on the vulnerability of Galt to the wildfire hazard, the sections that follow describes significant assets at risk in the City of Galt. This section includes the values at risk, population at risk, and critical facilities at risk.

Values at Risk in Fire Hazard Severity Zones

GIS was used to determine the possible impacts of wildfire within the City of Galt. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire hazard severity zones. Summary analysis results for Galt are shown in Table D-38, which summarizes total parcel counts, improved parcel counts and their structure values by fire hazard severity zone. Table D-39 breaks out the Table D-38 by adding the property use details by fire hazard severity zone for the City.

Table D-38 City of Galt – Count and Value of Parcels by Fire Hazard Severity Zone

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate	515	450	$55,943,481	$153,171,395	$118,098,793	$327,213,685
Non-Wildland/Non-Urban	60	39	$27,392,033	$13,676,004	$6,986,499	$48,054,537
Urban Unzoned	7,411	6,959	$561,121,967	$1,562,485,445	$887,067,558	$3,010,674,957
Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table D-39 City of Galt – Count and Value of Parcels by Fire Hazard Severity Zone and Property Use

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate						
Agricultural	10	6	$266,368	$335,547	$335,547	$937,462
Care/Health	2	2	$240,433	$488,628	$488,628	$1,217,689
Church/Welfare	2	2	$803,126	$8,344,196	$8,344,196	$17,491,518
Industrial	11	8	$7,712,554	$35,654,513	$53,481,769	$96,848,837
Miscellaneous	14	0	$1,419	$0	$0	$1,419
Office	0	0	$0	$0	$0	$0
Public/Utilities	7	0	$18	$0	$0	$18
Recreational	0	0	$0	$0	$0	$0
Residential	436	430	$35,124,382	$105,799,697	$52,899,839	$193,823,933
Retail / Commercial	2	2	$1,527,822	$2,548,814	$2,548,814	$6,625,450

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unknown	1	0	$106,621	$0	$0	$106,621
Vacant	30	0	$10,160,738	$0	$0	$10,160,738
Moderate Total	**515**	**450**	**$55,943,481**	**$153,171,395**	**$118,098,793**	**$327,213,685**
Non-Wildland/Non-Urban						
Agricultural	8	5	$21,948,562	$296,988	$296,988	$22,542,538
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	1	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	4	0	$35,727	$0	$0	$35,727
Office	0	0	$0	$0	$0	$0
Public/Utilities	6	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	35	34	$5,217,661	$13,379,016	$6,689,511	$25,286,189
Retail / Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	6	0	$190,083	$0	$0	$190,083
Non-Wildland/Non-Urban Total	**60**	**39**	**$27,392,033**	**$13,676,004**	**$6,986,499**	**$48,054,537**
Urban Unzoned						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	8	8	$1,095,374	$5,242,855	$5,242,855	$11,581,084
Church/Welfare	18	15	$1,351,677	$9,333,892	$9,333,892	$20,019,461
Industrial	48	42	$14,416,336	$41,511,053	$62,266,583	$118,193,970
Miscellaneous	106	0	$142,900	$0	$0	$142,900
Office	30	28	$6,269,775	$16,644,351	$16,644,351	$39,558,477
Public/Utilities	89	0	$18	$0	$0	$18
Recreational	3	2	$163,644	$332,437	$332,437	$828,518
Residential	6,810	6,767	$467,999,186	$1,390,011,517	$695,005,755	$2,553,016,447
Retail / Commercial	96	87	$40,084,317	$98,241,685	$98,241,685	$236,567,687
Unknown	0	0	$0	$0	$0	$0
Vacant	203	10	$29,598,740	$1,167,655	$0	$30,766,395
Urban Unzoned Total	**7,411**	**6,959**	**$561,121,967**	**$1,562,485,445**	**$887,067,558**	**$3,010,674,957**
Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Values at Risk in Fire Threat Areas

GIS was used to determine the possible impacts of wildfire within the City of Galt. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire threat area. Summary analysis results for Galt are shown in Table D-40, which summarizes total parcel counts, improved parcel counts and their structure values by fire threat area. Table D-41 breaks out the Table D-40 by adding the property use details by threat areas for the City.

Table D-40 City of Galt – Count and Value of Parcels by Fire Threat Area

Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	0	0	$0	$0	$0	$0
High	0	0	$0	$0	$0	$0
Moderate	117	76	$19,244,497	$26,116,639	$14,330,175	$59,691,317
Low	83	7	$9,060,926	$1,236,367	$618,184	$10,915,477
No Threat	7,786	7,365	$616,152,058	$1,701,979,838	$997,204,491	$3,315,336,385
Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table D-41 City of Galt – Count and Value of Parcels by Fire Threat Area and Property Use

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	2	0	$20	$0	$0	$20
Office	0	0	$0	$0	$0	$0
Public/Utilities	1	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	77	75	$8,648,795	$23,572,925	$11,786,461	$44,008,187
Retail/ Commercial	1	1	$906,622	$2,543,714	$2,543,714	$5,994,050
Unknown	1	0	$106,621	$0	$0	$106,621
Vacant	35	0	$9,582,439	$0	$0	$9,582,439
Moderate Total	**117**	**76**	**$19,244,497**	**$26,116,639**	**$14,330,175**	**$59,691,317**
Low						
Agricultural	0	0	$0	$0	$0	$0

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	10	0	$90,161	$0	$0	$90,161
Office	0	0	$0	$0	$0	$0
Public/Utilities	8	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	8	7	$865,573	$1,236,367	$618,184	$2,720,124
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	57	0	$8,105,192	$0	$0	$8,105,192
Low Total	**83**	**7**	**$9,060,926**	**$1,236,367**	**$618,184**	**$10,915,477**
No Threat						
Agricultural	18	11	$22,214,930	$632,535	$632,535	$23,480,000
Care/Health	10	10	$1,335,807	$5,731,483	$5,731,483	$12,798,773
Church/Welfare	21	17	$2,154,803	$17,678,088	$17,678,088	$37,510,979
Industrial	59	50	$22,128,890	$77,165,566	$115,748,352	$215,042,807
Miscellaneous	112	0	$89,865	$0	$0	$89,865
Office	30	28	$6,269,775	$16,644,351	$16,644,351	$39,558,477
Public/Utilities	93	0	$36	$0	$0	$36
Recreational	3	2	$163,644	$332,437	$332,437	$828,518
Residential	7,196	7,149	$498,826,861	$1,484,380,938	$742,190,460	$2,725,398,258
Retail/ Commercial	97	88	$40,705,517	$98,246,785	$98,246,785	$237,199,087
Unknown	0	0	$0	$0	$0	$0
Vacant	147	10	$22,261,930	$1,167,655	$0	$23,429,585
No Threat Total	**7,786**	**7,365**	**$616,152,058**	**$1,701,979,838**	**$997,204,491**	**$3,315,336,385**
Galt Total	**7,986**	**7,448**	**$644,457,481**	**$1,729,332,844**	**$1,012,152,850**	**$3,385,943,179**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Population at Risk

The FHSZ dataset was overlayed on the parcel layer. Those residential parcel centroids that intersect the FHSZs were counted and multiplied by the 2010 Census Bureau average household factors for the City of Galt – 3.16. According to this analysis, there is a total population of 1,359 residents of Galt at risk to

moderate or higher FHSZs, while there is a total of 237 in the moderate or higher fire threat areas. This is shown in Table D-42 and Table D-43, respectively.

Table D-42 City of Galt – Count of Improved Residential Parcels and Population by Fire Hazard Severity Zone

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Galt	0	0	0	0	430	1,359

Source: CAL FIRE, US Census Bureau Average Household Sizes: Galt (3.16);

Table D-43 City of Galt – Count of Improved Residential Parcels and Population by Fire Threat Area

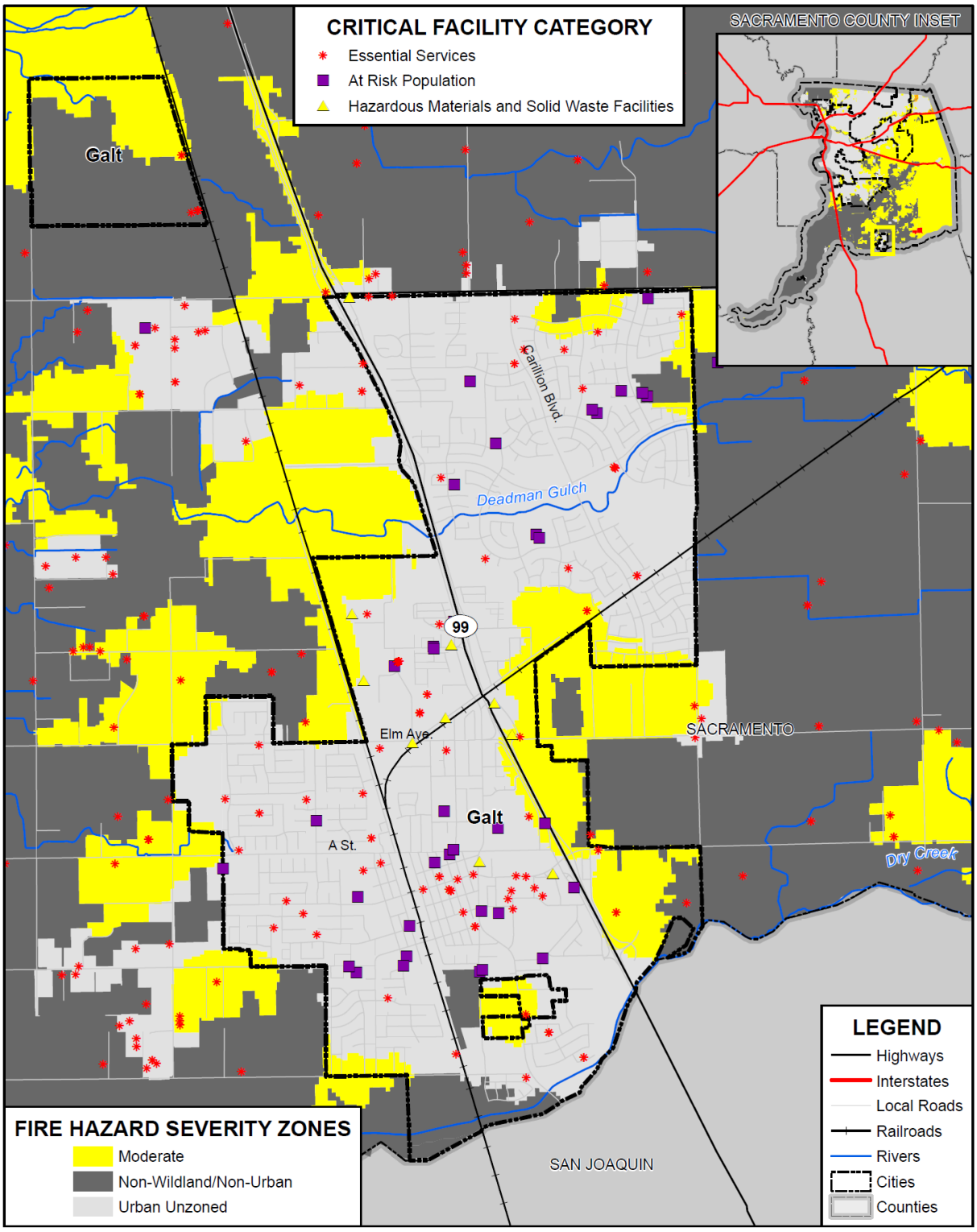
Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Galt	0	0	0	0	75	237

Source: CAL FIRE, US Census Bureau Average Household Sizes: Galt (3.16)

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Galt in identified FHSZs. Critical facilities in a FHSZ in the City of Galt are shown in Figure D-15 and detailed in Table D-44. Critical facilities in a fire threat area in the City of Galt are shown in Figure D-16 and detailed in Table D-45. Details of critical facility definition, type, name and address and jurisdiction by fire hazard severity zone are listed in Appendix F.

Figure D-15 City of Galt – Critical Facilities in Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

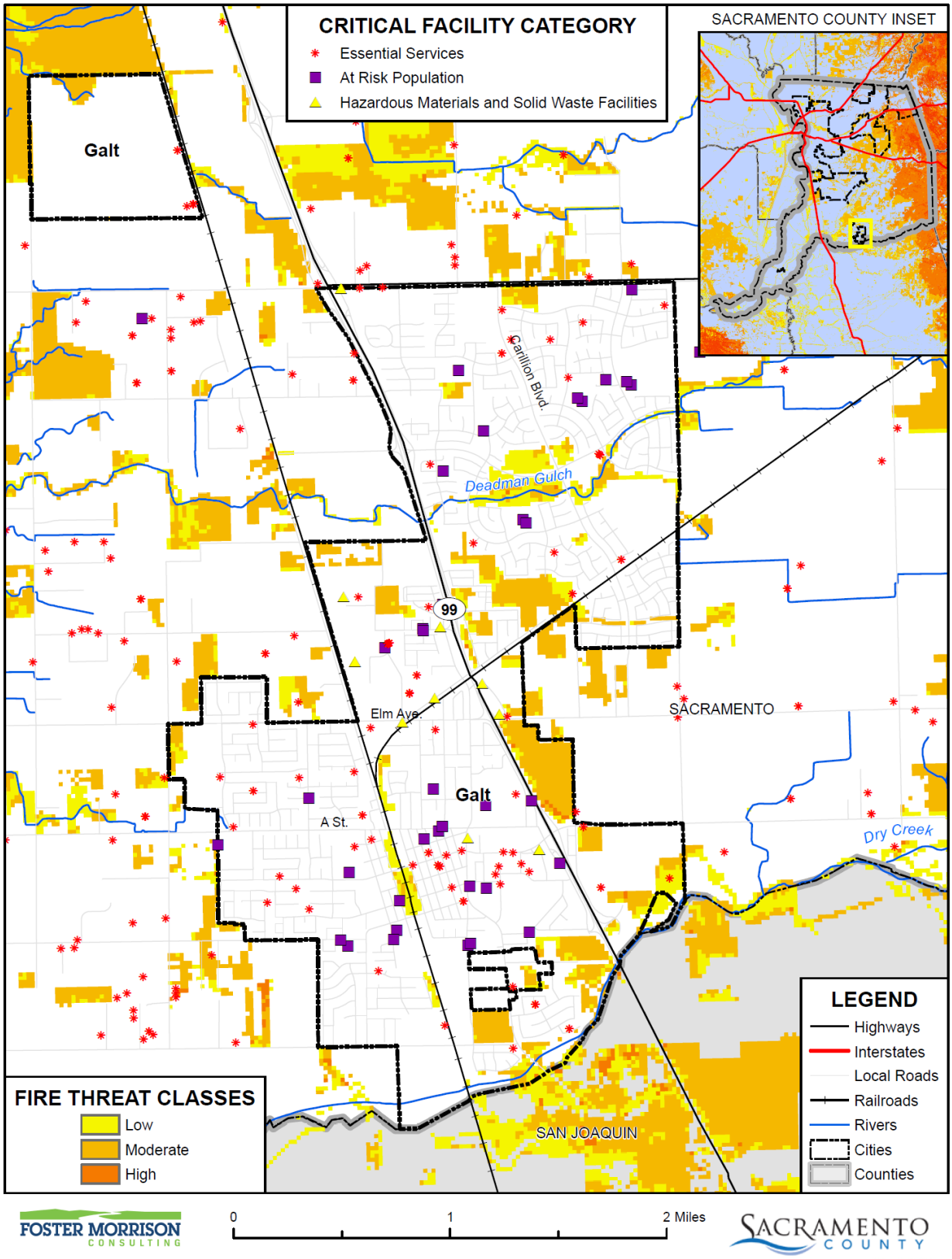
Table D-44 City of Galt – Critical Facilities by Fire Hazard Severity Zone

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
Moderate		
Essential Services Facilities	Microwave Service Towers	2
	Water Well	6
	Total	**8**
At Risk Population Facilities	School	1
	Total	**1**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	1
	Total	**1**
Moderate Total		**10**
Non-Wildland/Non-Urban		
Essential Services Facilities	Cellular Tower	1
	Microwave Service Towers	6
	Water Well	1
	Total	**8**
At Risk Population Facilities	School	2
	Total	**2**
Non-Wildland/Non-Urban Total		**10**
Urban Unzoned		
Essential Services Facilities	Cellular Tower	1
	Emergency Evacuation Center	5
	EMS Stations	2
	FDIC Insured Banks	6
	Fire Station	3
	Law Enforcement	2
	Microwave Service Towers	47
	Sewage Treatment Plant	1
	Water Well	28
	Total	**95**
At Risk Population Facilities	Day Care Center	6
	Mobile Home Parks	4
	Places of Worship	14
	School	11
	Total	**35**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	3
	Leaky Underground Storage Tank	6

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
	Waste Transfer Station	1
	Total	**10**
Urban Unzoned Total		**140**
Galt Total		**160**

Source: CAL FIRE, Sacramento County

Figure D-16 City of Galt – Critical Facilities in Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table D-45 City of Galt – Critical Facilities by Fire Threat Areas

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
Low		
Essential Services Facilities	Water Well	1
	Total	**1**
Low Total		**1**
No Threat		
Essential Services Facilities	Cellular Tower	2
	Emergency Evacuation Center	5
	EMS Stations	2
	FDIC Insured Banks	6
	Fire Station	3
	Law Enforcement	2
	Microwave Service Towers	55
	Sewage Treatment Plant	1
	Water Well	34
	Total	**110**
At Risk Population Facilities	Day Care Center	6
	Mobile Home Parks	4
	Places of Worship	14
	School	14
	Total	**38**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	3
	Leaky Underground Storage Tank	7
	Waste Transfer Station	1
	Total	**11**
No Threat Total		**159**
Galt Total		**160**

Source: CAL FIRE, Sacramento County

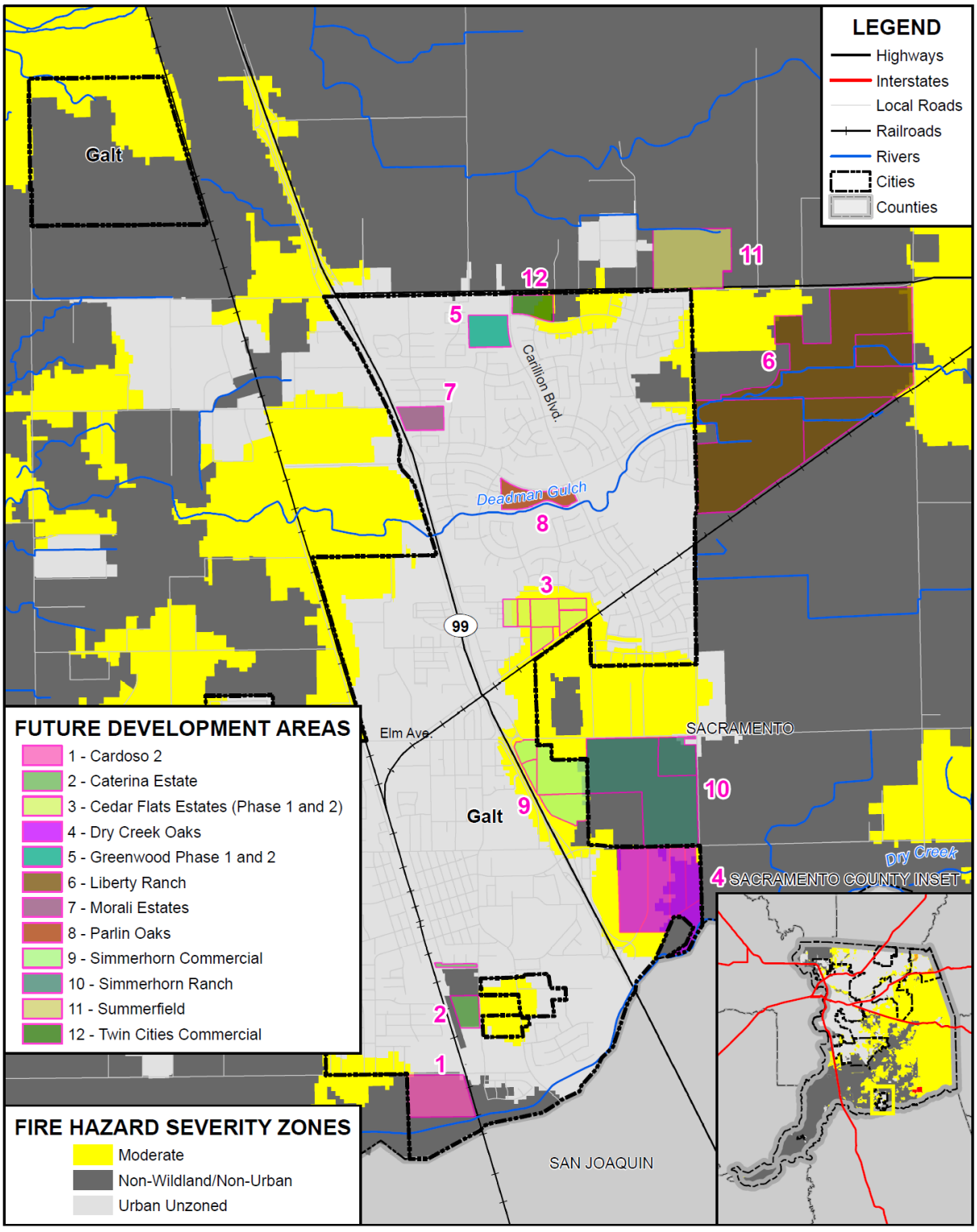
Future Development

Additional growth and development within moderate or higher fire hazard severity zones in the City would place additional values at risk to wildfire. City building codes are in effect and should continue to be updated as appropriate to reduce this risk. The City has required new residential development to have fire sprinklers since the 2016 LHMP.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure D-17 shows the locations of future development areas the City is planning to develop on the FHSZs. Table D-46 shows the parcels and acreages of each future development area in the City in each FHSZ. Figure D-18 shows the locations of future development areas the City is planning to develop on the Fire Threat Area. Table D-47 shows the parcels and acreages of each future development area in the City in each Fire Threat Area.

Figure D-17 City of Galt – Future Development in Fire Hazard Severity Zones



FOSTER MORRISON CONSULTING

SACRAMENTO COUNTY

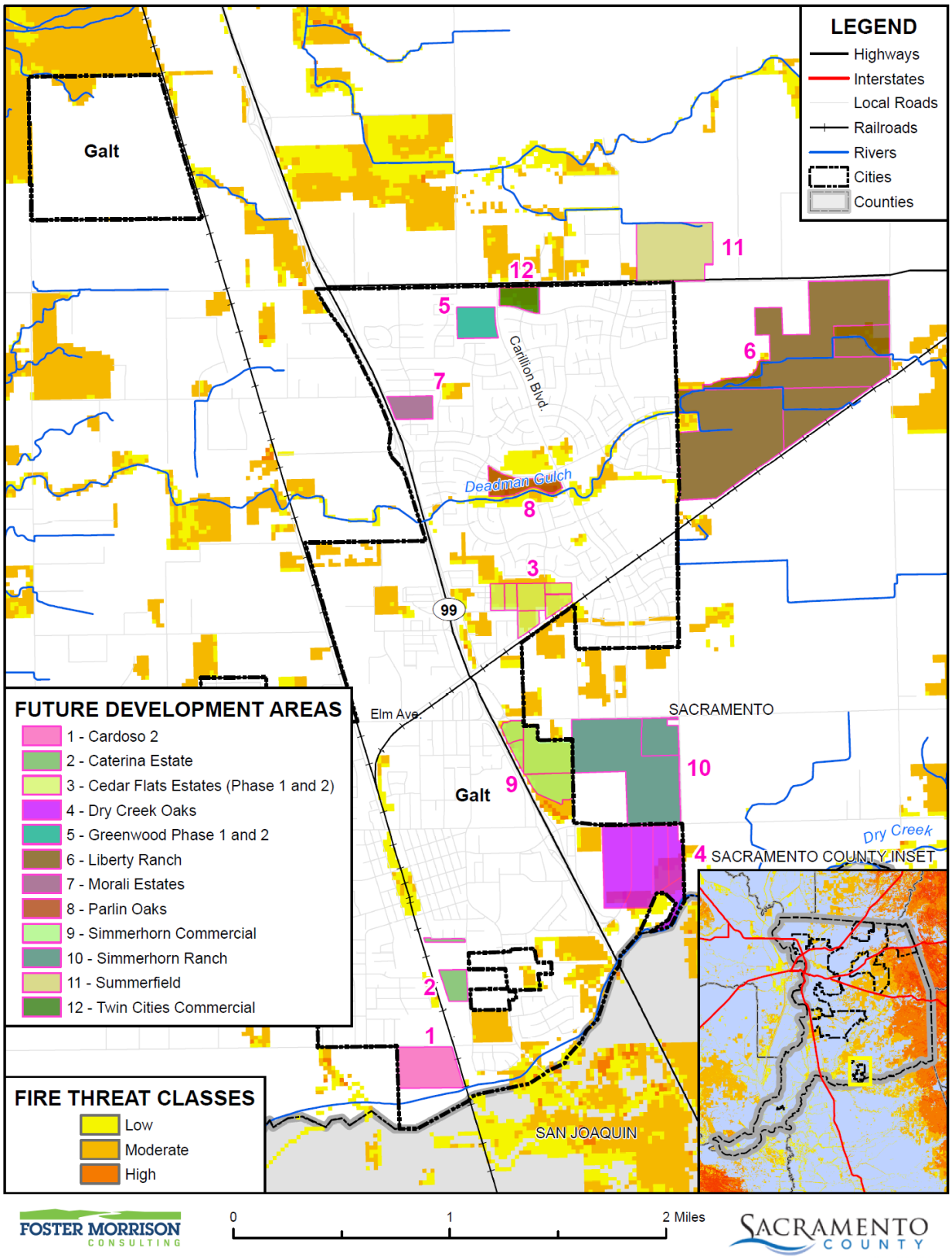
Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Table D-46 City of Galt – Future Development by Fire Hazard Severity Zone

Fire Hazard Severity Zone/ Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
Moderate			
Cedar Flats Estates (Phase 1 and 2)	6	0	31.0
Dry Creek Oaks	2	0	55.4
Simmerhorn Commercial	4	0	48.4
Twin Cities Commercial	1	0	11.9
Moderate Total	**13**	**0**	**146.7**
Non-Wildland/Non-Urban			
Cardoso 2	1	1	33.7
Caterina Estate	1	0	10.3
Dry Creek Oaks	3	0	31.4
Liberty Ranch	4	4	333.8
Simmerhorn Ranch	2	1	115.2
Summerfield	1	1	58.8
Non-Wildland/Non-Urban Total	**12**	**7**	**583.1**
Urban Unzoned			
Caterina Estate	1	1	1.9
Cedar Flats Estates (Phase 1 and 2)	1	0	5.0
Greenwood Phase 1 and 2	1	0	16.3
Morali Estates	1	0	12.8
Parlin Oaks	1	0	16.3
Urban Unzoned Total	**5**	**1**	**52.4**
Grand Total	**30**	**8**	**782.2**

Source: City of Galt, CAL FIRE

Figure D-18 City of Galt – Future Development in Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Table D-47 City of Galt – Future Development in Fire Threat Areas

Fire Threat/Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
Moderate			
Cedar Flats Estates (Phase 1 and 2)	5	0	31.8
Simmerhorn Commercial	3	0	44.8
Twin Cities Commercial	1	0	11.9
Moderate Total	**9**	**0**	**88.5**
Low			
Cedar Flats Estates (Phase 1 and 2)	2	0	4.2
Parlin Oaks	1	0	16.3
Simmerhorn Commercial	1	0	3.6
Low Total	**4**	**0**	**24.1**
No Threat			
Cardoso 2	1	1	33.7
Caterina Estate	2	1	12.1
Dry Creek Oaks	5	0	86.8
Greenwood Phase 1 and 2	1	0	16.3
Liberty Ranch	4	4	333.8
Morali Estates	1	0	12.8
Simmerhorn Ranch	2	1	115.2
Summerfield	1	1	58.8
No Threat Total	**17**	**8**	**669.5**
Grand Total	**30**	**8**	**782.2**

Source: City of Galt, CAL FIRE

D.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, and mitigation education, outreach, and partnerships.

D.6.1. Regulatory Mitigation Capabilities

Table D-48 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Galt.

Table D-48 City of Galt Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2009	
Capital Improvements Plan	Y	CIP is updated with every two-year budget cycle
Economic Development Plan	Y 2015	
Local Emergency Operations Plan	Y	
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	Y	
Engineering Studies for Streams	Y	FEMA adopted modified floodplain maps for portions of the City on October 20, 2016, based upon more detailed study of Dry Creek.
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: 2020 CBC
Building Code Effectiveness Grading Schedule (BCEGS) Score		Score:
Fire department ISO rating:		Rating:
Site plan review requirements	Y	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	Revised/Combined with subdivision ordinance 6/2015
Subdivision ordinance	Y	Revised/Combined with zoning ordinance 6/2015
Floodplain ordinance	Y 2012	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y 2002	Stormwater Protection
Flood insurance rate maps	Y 2012/2016	
Elevation Certificates		
Acquisition of land for open space and public recreation uses		
Erosion or sediment control program	Y 2002	

Other
How can these capabilities be expanded and improved to reduce risk?
Expand use of GIS systems to geographically locate issues in the City would help to expand capabilities and reduce risk. As any plans are updated, the City will review how those plans can help reduce hazards in the City, reduction risk.

Source: City of Galt

General Plan

The City Council adopted the City of Galt's General Plan on April 7, 2009. Adoption of the General Plan in 2009 culminated a five-year period during which the City worked with the General Plan Advisory Committee, Planning Commission, and the City Council to update the General Plan.

The General Plan sets out a long-term vision for Galt's growth and outlines policies, standards, and programs to guide day-to-day decisions concerning Galt's development through the year 2030. Designed to meet the State planning requirements, the General Plan consists of two documents: The Existing Conditions Report and the Policy Document. The Existing Conditions Report inventories and analyzes the existing conditions and trends in Galt and provides the formal supporting documentation for general plan policies. The Policy Document is divided into two main parts. Part I is a summary of the General Plan, describing the nature and purpose of the plan, highlighting the guiding principles of the plan, and outlining the plan's main proposals. Part II contains explicit statements of goals, policies, standards, implementation programs, and quantified objectives that constitute the formal policy of the City of Galt for land use, development and environmental quality.

In addition to the General Plan Existing Conditions Report and General Plan Policy Document, an Environmental Impact Report (EIR) analyzing the impacts and implications of the General Plan was prepared. The EIR, which is not formerly part of the General Plan, was prepared to meet the requirements of the California Environmental Quality Act.

D.6.2. Administrative/Technical Mitigation Capabilities

Table D-49 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Galt.

Table D-49 City of Galt's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	Y	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	
Mutual aid agreements	Y	
Other		

Staff	Y/N FT/PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	Y PT	Staffing is adequate and well trained.
Floodplain Administrator	Y FT	Staffing is adequate and well trained.
Emergency Manager	Y	Staffing is adequate and well trained.
Community Planner	Y	Staffing is adequate and well trained.
Civil Engineer	Y	Staffing is adequate and well trained.
GIS Coordinator	N	
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	N	
Hazard data and information	Y	
Grant writing	N	
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Expand use of GIS systems to geographically locate issues in the City. The City is seeking to hire a GIS coordinator, which would expand capabilities and reduce risk.		

Source: City of Galt

D.6.3. Fiscal Mitigation Capabilities

Table D-50 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table D-50 City of Galt's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	Y	Water, sewer, storm drainage
Impact fees for new development	Y	
Storm water utility fee	Y	Only adequate to fund minor maintenance projects
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	Y	

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Community Development Block Grant	Y	
Other federal funding programs	Y	Federal transportation grants thru SACOG, COVID relief funding
State funding programs	Y	State Revolving Loan Fund, grants thru State Legislature actions, Parks and rec Fund programs, State grants thru SACOG, COVID relief funding
Other		
How can these capabilities be expanded and improved to reduce risk?		
Assistance in developing a viable storm drainage utility fee would expand capabilities and reduce risk. Expansion of Community Facilities Districts (CFD) or other financial programs to cover maintenance costs beyond just new developments. This would expand capabilities and reduce risks from hazards.		

Source: City of Galt

D.6.4. Mitigation Education, Outreach, and Partnerships

Table D-51 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table D-51 City of Galt's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	City provides space for a community garden next to a City Park. City has a beautification committee also. Both entities assist the City with environmental protection education and outreach.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Quarterly newsletter mailed to every City Utility Account
Natural disaster or safety related school programs	Y	Safe Routes to Schools
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	Y	Community Emergency Response Team (CERT)
Other		
How can these capabilities be expanded and improved to reduce risk?		
The City may increase public outreach in other areas if funding is available. The City is weighing StormReady certification. Both of these could expand capability and reduce risk.		

Source: City of Galt

D.7 Mitigation Strategy

D.7.1. Mitigation Goals and Objectives

The City of Galt adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

D.7.2. NFIP Mitigation Strategy

The City of Galt joined the National Flood Insurance Program (NFIP) on December 1, 1981. As a participant of the NFIP, the City of Galt has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the City. The City of Galt will continue to comply with the requirements of the NFIP in the future.

In addition, the City of Galt actively participates with Sacramento County to address local NFIP issues through a regional approach. Many of the program activities are the same for the City of Galt as for Sacramento County since participation at the County level includes all local jurisdictions.

The City of Galt Community Development and Public Works Departments provides public outreach activities which include map information services, public awareness, public hazard disclosure, and flood protection information. This information is readily available to the public and consists of current and accurate flood mapping. In addition, the Community Development and Public Works Departments provides information about our stormwater management program and up-to-date information related to the maintenance of our drainage system.

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS which are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The City of Galt is not a current participant in the CRS program.

More information about the floodplain administration in the City of Galt can be found in Table D-52.

Table D-52 City of Galt Compliance with NFIP

NFIP Topic	Comments
Insurance Summary	
How many NFIP policies are in the community? What is the total premium and coverage?	58 policies $25,251 in premiums $19,840,000 in coverage
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	3 claims $69,338.31 in claims paid 0 substantial damage claims
How many structures are exposed to flood risk within the community?	9 in 1% annual chance 0 in 0.2% annual chance

NFIP Topic	Comments
Repetitive Loss (RL) and Severe Repetitive Loss Properties (SRL)	0 RL properties 0 SRL properties
Describe any areas of flood risk with limited NFIP policy coverage	There are no areas with limited NFIP coverage.
Staff Resources	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	No
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	Permit review, engineering capabilities
What are the barriers to running an effective NFIP program in the community, if any?	None
Compliance History	
Is the community in good standing with the NFIP?	Y
Are there any outstanding compliance issues (i.e., current violations)?	N
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	CAV 7/27/2010 CAC 5/20/2016
Is a CAV or CAC scheduled or needed?	No
Regulation	
When did the community enter the NFIP?	12/1/1981
Are the FIRMs digital or paper?	Digital
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Minimum floor elevation is one foot above BFE
Provide an explanation of the permitting process.	All building permits over $20,000 in value are reviewed
Community Rating System	
Does the community participate in CRS?	N
What is the community's CRS Class Ranking?	N/A
What categories and activities provide CRS points and how can the class be improved?	N/A
Does the plan include CRS planning requirements?	N/A

D.7.3. Mitigation Actions

The planning team for the City of Galt identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Drought & Water Shortage
- Floods: 1%/0.2% annual chance

- Floods: Localized Stormwater
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Wildfire

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Hazards Addressed: Multi-hazard (Climate Change, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140).

Project Description: Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Safety Element of General Plan

Responsible Office: City of Galt Community Development Department

Cost Estimate: Jurisdictional board/staff time

Potential Funding: Local budgets

Benefits (avoided Losses): Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

Schedule: As soon as possible

Priority (H, M, L): High

Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness

Hazards Addressed: Multi-hazard (Climate Change, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City and County play a key role in public outreach/education efforts to communicate the potential risk and vulnerability of their community to the effects of natural hazards. A comprehensive multi-hazard public education program will better inform the community of natural hazards of concern and actions the public can take to be better prepared for the next natural disaster event.

Project Description: A comprehensive multi-hazard outreach program will ascertain both broad and targeted educational needs throughout the community. The City will work with the County and other agencies as appropriate to develop timely and consistent annual outreach messages in order to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event.

Other Alternatives: Continue public information activities currently in place.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing County outreach programs will be reviewed for effectiveness and leveraged and expanded upon to reach the broader region.

Responsible Office: City of Galt in partnership with the County

Cost Estimate: Annual costs to be determined, and will depend on the scope and frequency of activities and events as well as volunteer participation

Benefits (Losses Avoided): Increase residents' knowledge of potential hazards and activities required to mitigate hazards and be better prepared. Protect lives and reduce damages, relatively low cost to implement.

Potential Funding: Local budgets, grant funds

Timeline: Ongoing/Annual public awareness campaign

Priority (H, M, L): High

Action 3. Future Development Projects shall complete a Climate Action Plan Consistency Review Checklist

Hazards Addressed: Climate Change, Drought, Extreme Heat, Flooding, Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing. Climate change is a global phenomenon. It is expected to affect the whole of the City, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others.

Project Description: Future Development Projects will need to submit a Climate Action Plan Consistency Review Checklist.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: The City completed a Climate Action Plan in March 2020, from which the Climate Action Plan Consistency Review Checklist was developed

Responsible Agency/ Department/Partners: City of Galt Community Development Department

Cost Estimate: $0- Part of development application so cost for this mitigation measure is included in the expected costs on the part of the development as well as City staff time.

Benefits (Losses Avoided): Mitigate the impacts of greenhouse gas emissions and its global effect on climate change

Potential Funding: Development application fees

Timeline: Started in 2021, on-going thereafter

Project Priority (H, M, L): M

Action 4. Develop a Robust Geographic Based System (GIS) to Geographically Locate Issues/Actions/Mitigation in the City

Hazards Addressed: Multi-hazard (Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Severe Weather: Heavy Rains and Storms, Wildfire, Pandemic)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City does not have a robust coordinated GIS to be used by City staff to catalog geographic based information about the City, its infrastructure, maintenance activities/actions/mitigations.

Project Description: Use consultants and City staff to develop and enhance existing GIS based information into a robust and usable data system.

Other Alternatives: Continue to use "paper", anecdotal and other data collection methods.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Local Budgets and Capital Improvement Programs

Responsible Agency/ Department/Partners: City of Galt Public Works

Cost Estimate: Annual costs to be determined by budget process.

Benefits (Losses Avoided): Maintain City assets, reduce damages and mitigate hazard impacts to the residents of the City.

Potential Funding: Local Budgets, grant funds

Timeline: Ongoing

Project Priority (H, M, L): H

Action 5. Perform Vegetative Control of City Drainages and Channels by Natural Methods

Hazards Addressed: Multi-hazard (Drought and Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City does not have permits from US Army Corps of Engineers (Regulatory Branch- Nationwide Permit) and California State Department of Fish and Wildlife (Streambed Alternation Agreement) for "mechanical" maintenance (e.g. use of excavators) of its drainages, channels and open space areas, that the use has a potential to discharge fill and/or dredged material in the waters of the US and State of California. The City has had past success utilizing natural methods (specifically goats) to maintain and control vegetation within these areas. This also aids in reduction of wildfire risk.

Project Description: A coordinated plan to use natural methods to control vegetation in the City's drainages, channels and open space areas on a regular basis would mitigate the potential impacts on multiple hazards as identified.

Other Alternatives: Obtain necessary permits to do more "traditional" maintenance.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Local Budgets and Capital Improvement Programs and

Responsible Agency/ Department/Partners: City of Galt Public Works

Cost Estimate: Annual costs to be determined by budget process.

Benefits (Losses Avoided): Protect lives, structures and reduce damages, relatively low cost to implement.

Potential Funding: Local Budgets, grant funds

Timeline: Ongoing

Project Priority (H, M, L): H

Action 6. Continue Work with the Other Groundwater Sustainability Agencies (GSAs) in the Cosumnes Subbasin of the San Joaquin Valley Basin (DWR Basin No. 5-022.16) who are Working Together to Develop a Single Groundwater Sustainability Plan (GSP).

Hazards Addressed: Drought & Water Shortage

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City water supplies are all groundwater sources. The City is one of seven Groundwater Sustainability Agencies (GSAs) in the Cosumnes Subbasin of the San Joaquin Valley Basin (DWR Basin No. 5-022.16) who are working together to develop a single Groundwater Sustainability Plan (GSP). The GSAs have formed the Cosumnes Subbasin Sustainability Groundwater Management Act (SGMA) Working Group (Working Group) which meets at least once a month to discuss the development of the GSP including water management decisions for the groundwater basin.

Project Description: Continue work with the Cosumnes Subbasin Sustainability Groundwater Management Act (SGMA) Working Group (Working Group) who are working together to develop a single Groundwater Sustainability Plan (GSP).

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Local budgets

Responsible Agency/ Department/Partners: City of Galt Public Works Departments

Cost Estimate: Jurisdictional board/staff (and consultant) time.

Benefits (Losses Avoided): To have the Cosumnes Subbasin of the San Joaquin Valley Basin provide a sustainable and long-term groundwater supply for all basin users.

Potential Funding: Local Budgets, grants

Timeline: On-going

Project Priority (H, M, L): M

Action 7. Increase Resiliency of City Critical Infrastructure and Emergency Operations and Against Hazards

Hazards Addressed: Multi-hazard (Climate Change, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Impacts of natural hazards events could affect the ability of City staff to responds effectively to emergency events and provide critical infrastructure needs.

Project Description: Evaluate city critical facilities such as police and public works assets such as buildings, communication systems, and infrastructure (e.g. wells, wastewater facilities, roads) to determine necessary improvements for increasing resiliency against natural hazard events and operations during natural hazard events.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Local Operation and Maintenance budgets and Capital Improvement Program

Responsible Agency/ Department/Partners: City of Galt Police and Public Works Departments

Cost Estimate: Jurisdictional board/staff time.

Benefits (Losses Avoided): Protect lives, reduce damages and operational downtimes.

Potential Funding: Local Budgets, grants

Timeline: As needed

Project Priority (H, M, L): M

Action 8. Maintain City Drainages, Channels and Open Spaces

Hazards Addressed: Multi-hazard (Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Severe Weather: Heavy Rains and Storms, Wildfire, Pandemic)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City does not have permits from US Army Corps of Engineers (Regulatory Branch- Nationwide Permit) and California State Department of Fish and Wildlife (Streambed Alternation Agreement) for "mechanical" maintenance (e.g. use of excavators) of its drainages, channels and open space areas, that the use has a potential to discharge fill and/or dredged material in the waters of the US and State of California. Initiate the permit process (and associated studies) for the regulatory agencies and obtain said permits.

Project Description: A coordinated plan to develop a maintenance program to address vegetation, sediment, erosion and vectors in the City's drainages, channels and open space areas on a regular basis would mitigate the potential impacts of multiple hazards as identified.

Other Alternatives: Continue to use other natural methods to do maintenance.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Local Budgets and Capital Improvement Programs

Responsible Agency/ Department/Partners: City of Galt Public Works

Cost Estimate: Annual costs to be determined by budget process.

Benefits (Losses Avoided): Protect lives, structures and reduce damages, Improve flow capacity of drainages

Potential Funding: Local Budgets, grant funds

Timeline: Ongoing

Project Priority (H, M, L): H

Annex E City of Rancho Cordova

E.1 Introduction

This Annex details the hazard mitigation planning elements specific to the City of Rancho Cordova, a previously participating jurisdiction of the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to Rancho Cordova, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

E.2 Planning Process

As described above, Rancho Cordova followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table E-1. Additional details on Plan participation and City representatives are included in Appendix A.

Table E-1 City of Rancho Cordova – Planning Team

Name	Position/Title	How Participated
June Cowles	Senior Planner	Attended Hazard Mitigation Plan meetings, reviewed and revised the document. Proposed Mitigation Planning Action items. Provides Hazard Mitigation Plan annual report to City Council.
Darcy Goulart	Planning Manager	Reviewed and revised the plan document. Provided information for the update.
Elizabeth Sparkman	Community Development Director	Reviewed and revised the plan document. Provided information for the update.
Joe Cuffe	Chief Building Official	Reviewed the plan document and provided updates related to the Building & Safety Division.
Amanda Norton	Economic Development Manager	Reviewed the plan document and provided updates related to Economic Development data.
Laura Fickle	Economic Development Analyst	Reviewed the plan document and provided updates related to Economic Development data.
Albert Stricker	Public Works Director	Provided information related to Public Works data and general oversight.

Name	Position/Title	How Participated
Dalia Fadl	Senior Civil Engineer	Attended Hazard Mitigation Plan meetings, reviewed and revised the document. Proposed Mitigation Planning Action items. Provide general oversight of the plan update.
Margarita Dronov	Assistant Engineer	Reviewed the plan document and provided updates related to local flooding.
Maria Lopez	Management Technician	Reviewed the plan document and provided updates related to local flooding.
Laurel Bane	Facilities Services Representative	Reviewed the plan document and provided updates related to City facilities, cooling, and heating centers.
Ryan Gonzalez	GIS	Reviewed the plan document and provided updates related to GIS data and critical City facilities.
James FitzGibbon	GIS	Reviewed the plan document and provided updates related to GIS data and critical City facilities.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the City integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the City incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table E-2.

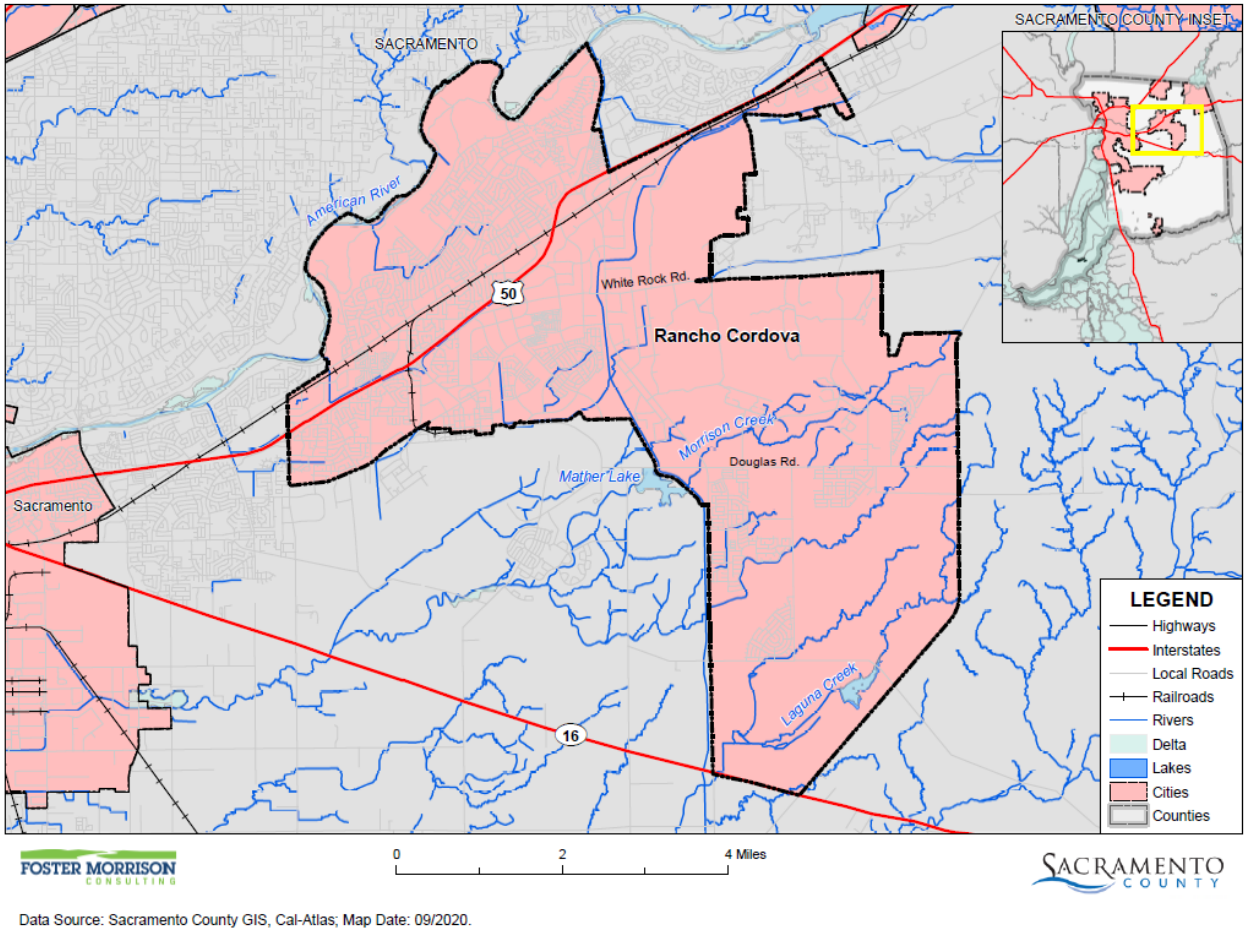
Table E-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Adoption of the LHMP into the Safety Element of the General Plan by reference or incorporation	The Hazard Mitigation Plan was adopted within the General Plan under the Safety Element in December 2018
Transportation interconnectivity: ensure interconnectivity and road standards are maintained for disaster preparedness/evacuations	On-going action. Provided during subdivision review. Interconnectivity is a Goal within the General Plan Circulation Element
Land Use: as the City grows towards the south and east, cluster development and open space will be encouraged	On-going action. Open space land provided in environmental sensitive areas. (preserves). Provided through environmental review during Specific Plan and Special Area Plan. In addition, a Goal within the General Plan Open Space Element.
Post disaster training for staff	On-going action. Staff Supervisors have attended and are scheduled to attend training classes
Landscape Ordinance (update and maintain proper landscaping practices)	On-going action. All development is reviewed by a landscape reviewer that checks for water efficient sprinklers and drip for drought tolerant plants. Water efficient requirements are adopted within the city municipal code.
Restrict impervious surface	On-going action. City zoning code restricts Impervious surface area for residential front yard area.
Porous pavement and vegetative buffers	On-going action. Increase use due to LID standards and 2020 drainage requirements for on-site retention.
Roundabouts (encourage roundabouts in place of traffic signals where appropriate)	On-going action. Encourage developer to utilize roundabouts during Specific Plan, Special Area Plans, and subdivision reviews.

E.3 Community Profile

The community profile for the City of Rancho Cordova is detailed in the following sections. Figure E-1 displays a City map and the location of Rancho Cordova within Sacramento County.

Figure E-1 City of Rancho Cordova



E.3.1. Geography and Climate

The City of Rancho Cordova is located in northern Sacramento County, California within the Highway 50 corridor between the cities of Sacramento to the west, Folsom to the northeast, Elk Grove to the southwest and the unincorporated community of Fair Oaks to the north. Rancho Cordova covers approximately 34.8 square miles of land, the majority of which historically consisted of flat grassland and oak woodlands. The City is generally bordered by the American River to the north, Hazel Ave and the boundary of the 100-year floodplain for the Consumnes River on the east, Jackson Highway on the south, and Bradshaw Road on the west.

The City of Rancho Cordova contains a wide range of existing land uses, including approximately 3,582 acres of residential developments, 441 acres of commercial/retail uses, 894 acres of office uses, and approximately 837 acres of industrial uses within the City limits. In addition, there are approximately 9,746

acres of agricultural (vacant) uses, and over 2,198 acres of public/private recreation and natural preserve uses. Mather Airport is located along the southwest boundary of the City, and the Aerojet Rocket Testing Facility is located to the east.

Located within the City are various creeks, tributaries, drainage basins and surface waterways including: the American River, Cordova Creek, Morrison Creek and its tributaries, Laguna Creek, Buffalo Creek and the Folsom South Canal. The American River parkway on the City's northern boundary is a portion of a 29 mile open space greenbelt that provides flood protection and recreational opportunities within the City limits. The floodplain of the Cosumnes River is located to the southeast of the City's boundary.

Rancho Cordova, like much of the California Central Valley has a Mediterranean climate characterized by damp to wet, mild winters and hot, dry summers. The wet season runs from October through April, though there is occasional light rainfall in the summer months. The annual temperature mean is 61.1 °F, with monthly means ranging from 45.8°F in December to 75.4 °F in July. Summer high temperatures are often moderated by an ocean breeze known as the "delta breeze": which comes through the Sacramento-San Joaquin River Delta from the San Francisco Bay.

E.3.2. History

The earliest evidence of human occupation in the Rancho Cordova area is archaeological explorations of the Windmiller Pattern which dates from 4,500-2,500 Before Present (B.P.). Evidence suggests populations during this early horizon probably emphasized hunting and fishing, with seed collecting as a supplement to the diet. Later occupations during the Middle (2,500 B.P.-A.D. 500) and Late Horizons (A.D. 500-to Euroamerican contact) show similarities to the Early horizon culture, though local innovation or cultural blending seems to have resulted in intensive fishing, acorn use, and elaborate social and ceremonial customs.

Rancho Cordova and the surrounding area are in Valley Nisenan territory, one of a large population of Native Americans groups that inhabited a variety of ecological settings California prior to the arrival of Euroamericans. The Nisenan historically lived in permanent villages that were usually located on raised areas to avoid flooding. Organized around household family or household units that combined to form tribelets, the Valley Nisenan fostered trading relationships with surrounding groups for commodities such as salt, marine shells, and basketry.

Spanish exploration of the Central Valley dates to the late 1700s, but exploration of the Northern section of the Central Valley and contact with its Native American population did not begin until the early 1800s when Spanish missionaries moved in from the coastal areas. In 1833, the missions were secularized and their lands divided among the Californians as land grants called ranchos. These ranchos, such as the 35,000-acre Rancho Rio de los Americanos, part of which is located within the City, facilitated the growth of a semi-aristocratic group that controlled the large ranchos.

During the middle of the 19th century trails were being blazed across the plains and mountains facilitating the westward migration of Euroamericans. Rancho Rio de los Americanos however remained largely undeveloped until the discovery of gold in 1848 which resulted in a flood of Euroamericans in the region and caused a dramatic alteration of both Native American and Euroamerican cultural patterns. The second

half of the nineteenth century witnessed an ongoing and growing immigration of Euroamericans into the area, an influx also accompanied by regional cultural and economic changes. These changes are highlighted by the development of the Rancho Cordova area associated with expanding business opportunities related to gold mining, agriculture, and/or ranching.

On July 1, 2003, after more than 20 years of advocacy, the City of Rancho Cordova officially incorporated, becoming the 478th city in the State of California. Located in the eastern part of Sacramento County, Rancho Cordova is a community with a rich history including the first 12 miles of railroad in California, a thriving military base in its time, and the home of a successful aerospace company.

E.3.3. Economy and Tax Base

US Census estimates show economic characteristics for the City of Rancho Cordova. These are shown in Table E-3 and Table E-4. Mean household income in the City was $81,548. Median household income in the City was $71,655.

Table E-3 City of Rancho Cordova – Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	214	0.6%
Construction	2,748	7.7%
Manufacturing	2,195	6.1%
Wholesale trade	470	1.3%
Retail trade	4,651	13.0%
Transportation and warehousing, and utilities	2,778	7.8%
Information	270	0.8%
Finance and insurance, and real estate and rental and leasing	3,407	9.5%
Professional, scientific, and management, and administrative and waste management services	4,583	12.8%
Educational services, and health care and social assistance	6,101	17.0%
Arts, entertainment, and recreation, and accommodation and food services	3,881	10.8%
Other services, except public administration	1,554	4.3%
Public administration	2,991	8.3%

Source: US Census Bureau American Community Survey 2019 Estimates

Table E-4 City of Rancho Cordova – Income and Benefits

Income Bracket	Percent
<$10,000	4.8%
$10,000 – $14,999	4.5%
$15,000 - $24,9999	9.2%
$25,000 – $34,999	6.1%

Income Bracket	Percent
$35,000 – $49,999	8.3%
$50,000 – $74,999	20.4%
$75,000 – $99,999	15.8%
$100,000 – $149,999	19.4%
$150,000 – $199,999	6.3%
$200,000 or more	5.2%

Source: US Census Bureau American Community Survey 2019 Estimates

The largest employers with the City of Rancho Cordova are shown in Table E-5.

Table E-5 Largest Employers in the City of Rancho Cordova

Employer	Employer
75 to 99 Employees	
Michael Baker International	Simply Fresh Fruit
Raley's	Urata & Sons Concrete, LLC
RCI Electric, Inc.	California Highway Patrol
Corelogic, Inc.	Wells Fargo Commercial Distribution Finance, LLC
Orba Insurance Services, Inc.	Premier Pools and Spas, Lp
Russel Mechanical, Inc.	Fireman's Fund Insurance Company
Kleinfelder, Inc.	California Department of General Services
Folsom Cordova Unified School District	North State Electric Contractors, Inc.
Bissell Brothers Janitorial	Maximus, Inc.
Internal Revenue Service	Health Net Pharmaceutical Services
Moss Adams LLP	Federal Aviation Administration
Sierra Pacific Home & Comfort	Alessandro Electric, Inc.
Ricoh USA, Inc.	Outback Steakhouse
100–299 Employees	
Educational Credit Management Corporation	Volcano Corporation
Judson Enterprises, Inc.	National University
Infor (US), LLC	Verizon Business Network Services
PCBP Properties, Inc.	USI Insurance Services National, Inc.
Dignity Health Medical Foundation	California Department of Fish and Wildlife
Teledyne Defense Electronics, LLC	California Department of Technology Services
Cellco Partnership	Loanpal, LLC
California Department of Justice	Target Stores, Inc.
AT&T Services, Inc.	Perspecta Enterprise Solutions LLC
California Department of Corrections & Rehabilitation	Federal Home Loan Bank of San Francisco
Plexus Optix, Inc.	California Physicians' Service

Employer	Employer
Costco Wholesale Corporation	Infor Public Sector, Inc.
Walmart Inc.	Lowe's Home Centers, LLC
Safeway Stores, Inc.	Home Depot USA, Inc.
Dignity Health	Nevada Republic Electric North, Inc.
Callisonrtkl Inc.	Vander-Bend Manufacturing, Inc.
JL Haley Enterprises, Inc.	County of Sacramento
The Permanente Medical Group Inc.	Pacific Coast Building Products, Inc.
Bel Air Mart	Ehealthinsurance Services, Inc.
Centene Corporation	General Electric Company
Boot Barn Holdings	County of Sacramento
ELS Investments	Presidio Hotel Group, LLC
ABCD Associates	California Department of Transporation
California Fire & Rescue Training Authority	Franklin Templeton Investor Services, LLC
Lennar Homes, Inc.	Student Aid Commission, California
Scott Silva Concrete Inc.	Sacramento Spaghetti Restaurant Inc.
Landcare USA LLC	Bergelectric Corp.
Department of Health Care Services	Robert J McGarvey Elementary Parent Faculty Org
California Department of Finance	Pick-N-Pull
300+ Employees	
Folsom-Cordova Unified School District	Vision Service Plan, Inc.
Franklin Templeton Investor Services, LLC	Tetra Tech Ec, Inc.
Dignity Health Medical Foundation	Perspecta Enterprise Solutions LLC
Health Net Federal Services LLC	Alorica Customer Care, Inc.
Renaissance Food Group	Fine Chemicals Holdings Corp.
Nidec Motor Corporation	United States Postal Service
Northwestern Mutual	Pacific Motor Club
Aerojet Rocketdyne, Inc.	Automotive Importing Manufacturing, Inc.
Health Net of California, Inc.	

Source: City of Rancho Cordova Economic Development Department, May 2016

E.3.4. Population

The California Department of Finance estimated the January 1, 2020, total population for the City of Rancho Cordova was 78,381.

E.4 Hazard Identification

Rancho Cordova's identified the hazards that affect the City and summarized their location, extent, likelihood of future occurrence, potential magnitude, and significance specific to Rancho Cordova (see Table E-6).

Table E-6 City of Rancho Cordova—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Significant	Unlikely	Critical	High	Medium
Drought & Water Shortage	Limited	Likely	Critical	Medium	High
Earthquake	Extensive	Unlikely	Negligible	Medium	Low
Earthquake Liquefaction	Significant	Unlikely	Negligible	Medium	Low
Floods: 1%/0.2% annual chance	Significant	Occasional	Critical	Medium	Medium
Floods: Localized Stormwater	Significant	Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Limited	Unlikely	Negligible	Low	Medium
Pandemic	Extensive	Likely	Critical	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Significant	Likely	Negligible	Low	Medium
Severe Weather: Extreme Heat	Significant	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Significant	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Significant	Likely	Limited	Medium	Low
Subsidence	Limited	Occasional	Limited	Low	Medium
Volcano	Significant	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Critical	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

E.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile Rancho Cordova's hazards and assess the City's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City is included in this Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards ranked of medium or high significance specific to the City (as identified in the Significance column of Table E-6) and also includes a vulnerability assessment to the three primary hazards to the State of California: earthquake, flood, and wildfire. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

E.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section E.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Planning Area.

E.5.2. Vulnerability Assessment and Assets at Risk

This section identifies Rancho Cordova's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

Values at Risk

The following data from the Sacramento County Assessor's Office is based on the 2020 Assessor's data. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitations are created by Proposition 13 and the Williamson Act as detailed in the Base Plan. With respect to Proposition 13, instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is most likely low and does not reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table E-7 shows the 2020 Assessor's values and content replacement values (e.g., the values at risk) broken down by property use for the City.

Table E-7 City of Rancho Cordova – Total Values at Risk by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	24	3	$22,818,860	$142,065	$142,065	$23,102,990
Care/Health	13	11	$3,130,790	$21,931,121	$21,931,121	$46,993,032
Church/Welfare	33	32	$19,175,437	$58,389,789	$58,389,789	$135,955,015
Industrial	743	706	$304,286,152	$758,045,202	$1,137,067,811	$2,199,399,156
Miscellaneous	525	1	$745,525	$1,085	$1,085	$747,695
Office	292	263	$270,296,128	$1,139,859,175	$1,139,859,175	$2,550,014,478
Public/Utilities	59	0	$19	$0	$0	$19
Recreational	16	10	$8,063,755	$22,999,996	$22,999,996	$54,063,747
Residential	20,431	20,239	$1,609,451,961	$4,412,647,326	$2,206,323,655	$8,228,422,830
Retail/ Commercial	266	250	$211,231,179	$411,906,471	$411,906,471	$1,035,044,121
Unknown	3	3	$0	$311,254	$0	$311,254
Vacant	1,380	14	$247,756,808	$1,915,120	$0	$249,671,928
Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**

Source: Sacramento County 2020 Parcel/Assessor's Data

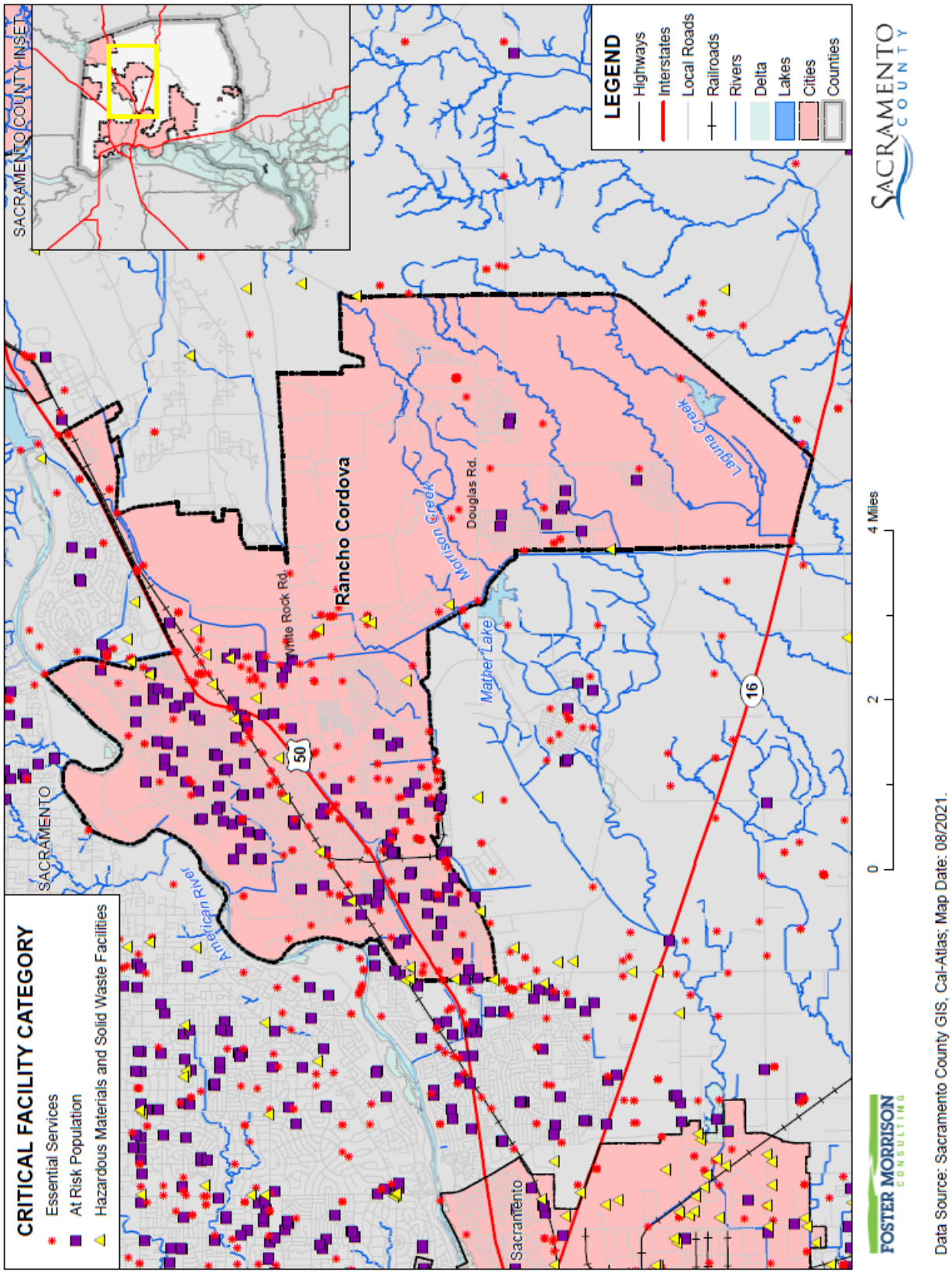
Critical Facilities and Infrastructure

Critical facilities and infrastructure are those buildings and infrastructure that are crucial to a community. Should these be damaged, it makes it more difficult for the community to respond to and recover from a disaster. For purposes of this Plan, a critical facility is defined as:

> *Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Figure E-2 City of Rancho Cordova – Critical Facilities



Natural Resources

Natural resources are unique to each area and are difficult to replace. Should a natural disaster occur, these species and locations are at risk. On the basis of origin, natural resources (economically referred to as raw materials) can be grouped into abiotic (non-living) and biotic (living) resources. Soils, mineral and surface waters comprise the main abiotic natural resources considered here while plant and animal communities comprise the biotic natural resources.

The majority of the soils in the City are the result of alluvial deposits, or river and lake deposits on various geomorphic surfaces. In terms of soil characteristics, surface runoff, soil erosion, and expansive soils can create potential problems for engineering designs and land use activities. The majority of the area soils are characterized by slight to moderate erosion potential, and very low to medium runoff rates.

Historic mineral production in the region has included construction aggregate, kaolin clay, common clay, pumice, and gold. Construction aggregate consists of sand, gravel, and crushed stone. Existing mineral extraction activities that occur in and around the Rancho Cordova Planning Area consist primarily of fine sand and coarse gravel construction aggregates, as well as clay. Construction aggregates come from two different sources: hardbed rock sources and river channel (alluvial) sources. Generally, sand, gravel, and clay are used as fill and for the construction of highways and roads, streets, urban and suburban development, canals, aqueducts, and pond linings, among other uses.

The City of Rancho Cordova has a variety of natural resources of value to the community. A variety of unique and valuable habitats are found within the City, including, but not limited to, oak and cottonwood woodlands, various grasslands, vernal pool areas, and open water and rivers. Major surface waters in the vicinity of the Rancho Cordova include the American River to the north and other surface waters within the City limits include the Folsom South Canal as well as Laguna and Morrison Creeks. There are approximately 609 acres of vernal pools and approximately 73 acres of freshwater marshes, 37 seasonal marshes and 30,873 acres of valley grassland within the larger Rancho Cordova Planning Area that surrounds and includes the City.

Vernal pools are primary biological natural resource within the City. They are described as seasonal pools that exhibit a four-stage life cycle providing critical habitat to several species of plants and animals, including some species of concern. Many animal species found in the grassland cover type are also found in the vernal pool grassland cover type. Some species found in vernal pool and vernal pool grassland cover types have adapted to specific conditions and are, thus, only found in those cover types. Of those types, some of these species may utilize the vernal pool and vernal pool grassland habitats only during specific stages of vernal pools, and others can be found year-round. Animals that utilize the vernal pool grassland habitat include aquatic crustaceans (branchiopods), amphibians, nesting birds, raptors, and small mammals. The habitats of the City contain numerous special status plant and animal species. A comprehensive list of the habitats and species in the Planning Area is provided in Table E-8. Areas these species reside in are shown in both Figure E-3 and Figure E-4.

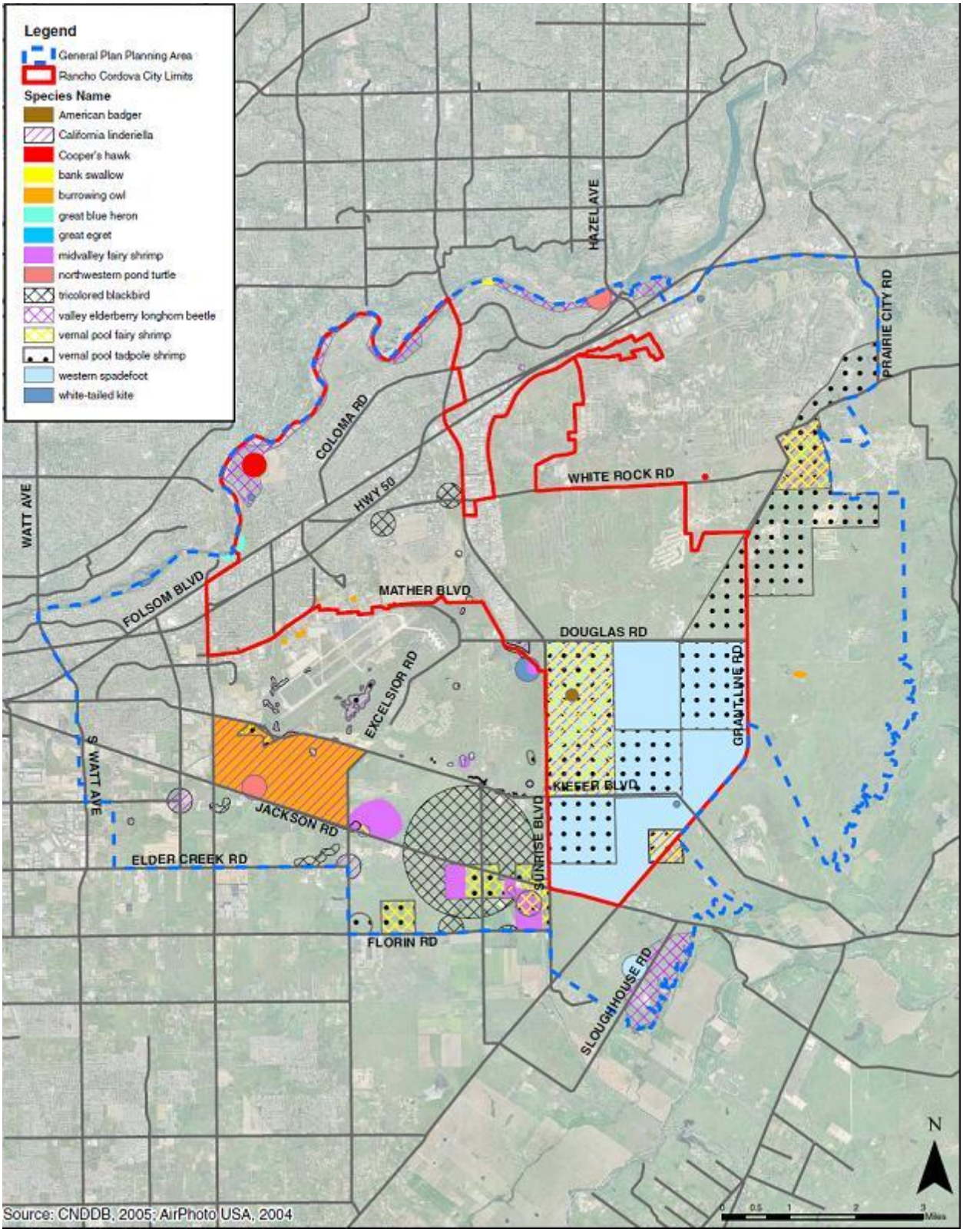
Table E-8 Special Status Species Occurring in the Rancho Cordova Planning Area

Scientific Name	Common Name	State Listing Status	Federal Listing Status	Other Status
Plant Species				
Downingia pusilla	Dwarf downingia	None	None	CNPS:2 R-E-D: 1-2-1
Gratiola heterosepala	Boggs Lake hedge-hyssop	Endangered	None	CNPS: 1B R-E-D: 1-2-2 USFWS: SC
Juncus Leiospermus	Ahart's dwarf rush	None	None	CNPS: 1B R-E-D: 3-2-3 USFWS: SC
Legenere limosa	Legenere	None	None	CNPS: 1B R-E-D: 2-3-3 USFWS: SC
Narvarretia myersii ssp. myersi	Pincushion navarretia	None	None	CNPS: 1B R-E-D: 3-3-3 USFWS: SC
Orcuttia tenuis	Slender orcutt grass	Endangered	Threatened	CNPS: 1B R-E-D: 2-3-3
Orcuttia viscida	Sacramento orcutt grass	Endangered	Endangered	CNPS: 1B R-E-D: 3-3-3
Sagittaria sanfordii	Sanford's arrowhead	None	None	CNPS: 1B R-E-D: 2-2-3 USFWS: SC
Amphibian Species				
Spea (Scaphiopus) hammondii	Western spadefoot	None	None	CDFG: CSC USFWS: SC
Bird Species				
Accipiter cooperii	Cooper's hawk	None	None	CDFG: CSC
Agelaius tricolor	Tricolored blackbird	None	None	CDFG: CSC USFWS: SC
Ardea alba	Great egret	None	None	
Ardea herodias	Great blue heron	None	None	
Asio flammeus (nesting)	Short-eared Owl	None	None	CDFG: CSC
Athene Cunicularia (burrow sites)	Burrowing owl	None	None	CDFG: CSC USFWS: SC
Buteo swainsoni	Swainson's hawk	Threatened	None	
Circus cyaneus (nesting)	Northern harrier	None	None	CDFG: CSC
Elanus leucurus	White-tailed kite	None	None	CDFG: fully protected
Eremophila alpestris actia	California horned lark	None	None	CDFG: CSC
Icteria virens (nesting)	Yellow-breasted chat	None	None	CDFG: CSC
Lanius ludovicianus (nesting)	Loggerhead shrike	None	None	CDFG: CSC USFWS: SC
Plegadis chihi (rookery site)	White-faced ibis	None	None	CDFG: CSC USFWS: SC
Riparia riparia	Bank swallow	Threatened	None	
Invertebrate Species				
Branchinecta lynchi	Vernal pool fairy shrimp	None	Threatened	

Scientific Name	Common Name	State Listing Status	Federal Listing Status	Other Status
Branchinecta mesovallensis	Midvalley fairy shrimp	None	None	USFWS: SC
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	None	Threatened	
Lepidurus packardi	Vernal pool tadpole shrimp	None	Endangered	
Linderiella occidentalis	California linderiella (fairy shrimp)	None	Endangered	USFWS: SC
Mammal Species				
Antrozous pallidus	Pallid bat	None	None	CDFG: CSC
Bassariscus astutus	Ringtail	None	None	CDFG: CFP
Myotis ciliolabrum	Western smallfooted myotis	None	None	USFWS: SC
Myotis evotis	Long-eared myotis	None	None	USFWS: SC
Myotis thysanodes	Fringed myotis	None	None	USFWS: SC
Myotis volans	Long-legged myotis	None	None	USFWS: SC
Myotis yumaensis	Yuma myotis	None	None	USFWS: SC
Taxidea taxus	American badger	None	None	CDFG: CSC
Reptile Species				
Emys (=Clemmys) marmorata marmorata	North-western pond turtle	None	None	CDFG: CSC USFWS: SC

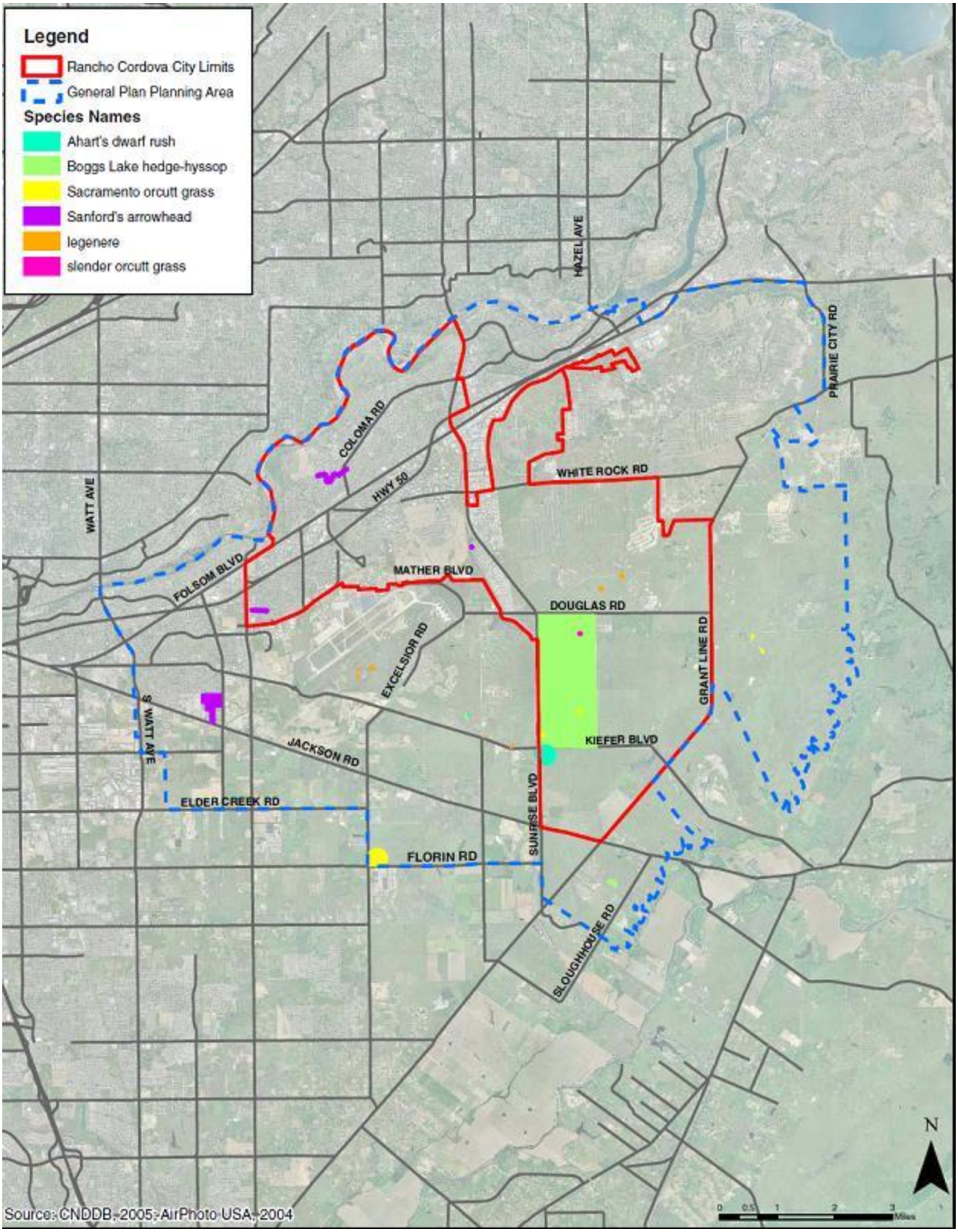
Source: City of Rancho Cordova General Plan Natural Resources Element (2016)
Key to Ranks and Lists
CDFG: CSC California Species of Special Concern
CDFG: CFP California Fully Protected
USFWS: SC USFWS Species of Concern
CNPS Lists:
List 1A: Plants Presumed Extinct in California
List 1B: Plants Rare, Threatened or Endangered in California or Elsewhere
List 2: Plants Rare, Threatened or Endangered in California, But More Common Elsewhere
List 3: Plants About Which We Need More Information – A Review List
List 4: Plants of Limited Distribution – A Watch List

Figure E-3 Location of Special Status Animal Species in Rancho Cordova



City of Rancho Cordova General Plan Natural Resources Element (2006)

Figure E-4 Location of Special Status Plant Species in Rancho Cordova



City of Rancho Cordova General Plan Natural Resources Element (2006)

The City of Rancho Cordova assisted in local efforts to adopt the South Sacramento Habitat Conservation Plan (SSHCP or Plan). The SSHCP encompasses a 317,000 acre area in south Sacramento County and streamlines federal and state permitting for development and infrastructure projects while conserving habitat. An interconnected regional preserve system of over 36,000 acres - roughly 1.2 times the total size of San Francisco - will be created over the next 50 years to protect twenty-eight plant and wildlife species and their natural habitats. The Plan is the first in the nation to include Clean Water Act (CWA) permits issued by the Army Corps of Engineers (USACE) and Endangered Species Act (ESA) permits issued by the U.S. Fish and Wildlife Service (USFWS). Instead of permitting through several separate state and federal agencies, most actions in the Plan area can be permitted through the City of Rancho Cordova Planning Department.

The Plan Area is located in the southern portion of Sacramento County. It is divided into two components: inside and outside the Urban Development Area (UDA). All proposed urbanization and some preserves will occur inside the UDA. Most preservation will occur outside of the UDA and help protect agricultural lands as well as habitat.

SSHCP Covered Activities may be carried out by the Permittee Agencies or by Third Party Project Proponents. The Conservation Strategy and process for Covered Activity project authorization is described in the SSHCP and associated permits. In all cases language in the permit(s) prevail when different than the SSHCP. The Plan will be made consistent with the permit conditions and language.

Historic and Cultural Resources

Historic and cultural resources are difficult to replace. Should a natural disaster occur, these properties and locations can be at risk.

The City of Rancho Cordova has a stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. OHP administers the National Register of Historic Places, the California Register of Historical Resources, California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the Base Plan. Table E-9 lists the historical buildings in the City.

Table E-9 City of Rancho Cordova – Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
American River Grange Hall #172 (P823)	X			X	5/15/1996	Rancho Cordova
Fifteen Mile House-Overland Pony Express Route in California (698)		X			9/11/1959	Rancho Cordova

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality

Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

In addition to the registered sites, there are several assets within Rancho Cordova that define the community and represent the City's history. A records search at the North Central Information Center at California State University, Sacramento identified eight prehistoric sites and one prehistoric/historic site within the larger Rancho Cordova Planning Area. Most of the prehistoric sites are located along the American River and creeks and some of the sites are known to contain human remains. The prehistoric and historic Native American occupation of the Rancho Cordova area is generally related to the Middle and Late Horizon.

A records search, shown in Table E-10 at the North Central Information Center at California State University, Sacramento identified twenty-three historic resources (e.g., historical archaeological sites, historic buildings, and artifacts) and one prehistoric/historic site within the larger Rancho Cordova Planning Area. These sites are distributed across the area and are generally related to the development of transportation networks and agriculture. Historic archaeological site CA-SAC-428-H, prehistoric/historic archaeological site CA-SAC-320/H, the Pfingst Realty building, and the American River Grange Hall are eligible for inclusion in the NRHP and the CRHR.

Table E-10 Known Cultural Resources in the City of Rancho Cordova

Trinomial/Address	Description	Eligibility for the National Register of Historic Places
CA-Sac-155/156	Prehistoric site with fire-affected rock and debitage; historic refuse (Shields and Williamson Mounds)	Evaluated 1988; eligible
CA-Sac-157	Prehistoric midden site with fire-affected rock and debitage; historic refuse (Wamser Mound #1)	Not Evaluated
CA-Sac-158	Prehistoric habitation site with artifacts (Wamser Mound #2)	Not Evaluated
CA-Sac-159	Prehistoric habitation site with fire-affected rocks and debitage (Wamser Mound #3)	Not Evaluated
CA-Sac-205	Prehistoric village with groundstone tools and debitage	Not Evaluated
CA-Sac-308-H	Dredge mine tailings (P-34-335)	Not Evaluated
CA-Sac-319	Prehistoric village with groundstone tools and debitage	Evaluated 1995; eligible
CA-Sac-320/H	Prehistoric village with groundstone tools and debitage; historic Chinese occupation site	Evaluated 2001; eligible
CA-Sac-428-H	Sacramento Valley Railroad (P-34-455)	Evaluated 1993; eligible; Reaffirmed 1997
CA-Sac-435-H	Historic refuse scatter	Evaluated 1994; ineligible
CA-Sac-469	Prehistoric midden with fire-affected rock and debitage	Not evaluated
CA-Sac-480-H	Southern Pacific Railroad, Fair Oaks spur	Evaluated 1995; ineligible
PA-99-63	Historic well	Evaluated 1999; ineligible

Trinomial/Address	Description	Eligibility for the National Register of Historic Places
PA-99-64	Possible historic cellar	Evaluated 1999; ineligible
—	Folsom Boulevard	Recognized as historically significant to local government
9878 Folsom Blvd	Pfingst Realty Company building	Evaluated 1993; eligible
Dawes Street and Folsom Blvd	Mills Station Building	Evaluated 1993; ineligible
9857 Horn Road	Silva Brothers Winery (Currently Rascals Restaurant)	Evaluated 1993; ineligible
2720 Kilgore Road	American River Grange Hall	Evaluated 1996; eligible
—	Aerojet Site 5: Military Personnel Dump	Not evaluated
—	Air Force Plant 70	Ineligible
Rio del Oro Planning Area	Sigma Test Area (Nike Hercules Rocket Test Area)	Evaluated in 2005; potentially eligible
10595 Folsom Blvd	Fire Station 61	Ineligible
12395 Folsom Blvd	Fire Station 63	Ineligible
12401 Folsom Blvd	Retail/Restaurants	Ineligible
12415 Folsom Blvd	Demolished	Ineligible
—	Hazel Ave/Nimbus Dam	Not evaluated
2909 Mather Field Rd	Domino's Pizza/Vacant	Ineligible
2919 Mather Field Rd	Residence	Ineligible
10298 McCracken Dr	Residence	Ineligible
State Route 16	Highway	Ineligible
White Rock Road	Road	Not evaluated
Whiterock Road; 0.2 miles east of Whiterock Road/Sunrise Blvd	15 Mile House (Demolished)	State Historic Landmark #698
Kilgore Road between Trade Center and Sun Center Drive	Kilgore Cemetery	Not evaluated

Source: City of Rancho Cordova General Plan Background Report

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. Information from the City of Rancho Cordova General Plan Housing Element, the California Department of Finance, the US Census Bureau form the basis of this discussion.

Historic Population Trends and Current Population

Population growth can increase the number of people living in hazard prone areas. Growth within the City of Rancho Cordova has been slow and steady. Rancho Cordova became an incorporated city on July 1, 2003. It is the seventh community in Sacramento County to incorporate and is also California's 478th city. Rancho Cordova has generally seen steady growth. Rancho Cordova has seen growth rates as shown in Table E-11.

Table E-11 City of Rancho Cordova – Population Changes Since 1950

Year	Population	Change	% Change
2000	51,322	–	–
2010[1]	53,605	2,283	4.4%
2020[2]	78,381	24,676	46.2%

Source: [1]US Census Bureau, [2]California Department of Finance

Special Populations and Disadvantaged Communities

According to the 2014–2018 ACS, 8,428 persons in Rancho Cordova are 65 years and older, and these seniors account for approximately 12 percent of the City's total population. Approximately 77 percent own their own homes, and 23 percent rent their homes. Rancho Cordova has one major skilled nursing facility and nine smaller licensed residential care homes that provide care and assistance to elderly residents who are partially self-sufficient. Assisted living is provided mainly in smaller facilities of six persons or less

Data from the Alta Regional Center, one of the 21 regional centers in California serving as an entry point to services for people with developmental disabilities, shows that there are approximately 644 developmentally disabled persons within the largest zip codes covering the City. 76.2% of these persons are located in the 95670 zip code.

Single-parent and female-headed households may also have special needs involving the availability of daycare or childcare, health care, and other supportive services. According to data from the 2014–2018 ACS, 4,217 households, or 24.4 percent of all family households in Rancho Cordova, are female-headed households. Female-headed households comprise the overwhelming majority of all single-parent households. Of households headed by a female, 51.2 percent (2,159 households) have related children under 18 present. Of the 2,448 female-headed households with related children under 18, 36.1 percent are classified as below the poverty level.

Homeless individuals and families are more at risk of being severely impacted by hazards. Due to the transitional nature of homelessness, it is difficult to get a concrete count of homeless persons in the City of Rancho Cordova. Every two years, Sacramento County's Continuum of Care does a point-in-time (PIT) count of homeless persons. While this number fluctuates over the year, the count provides some basis for evaluating the needs for homelessness services in Sacramento County. As of the 2019 PIT count, 249 of the Sacramento County's 3,900 unsheltered residents experiencing homelessness were in Rancho Cordova, representing approximately 6 percent of the unsheltered homeless population in Sacramento County.

Manufactured homes are often a source of affordable housing in communities where stickbuilt homes are beyond the price range of low- and moderate-income households. Very inexpensive manufactured homes are generally those built before 1980, some of which may have structural problems. Newer manufactured home models can be quite large, with more than 2,500 square feet and four bedrooms. Rancho Cordova has nine manufactured home parks with just over 1,400 manufactured home spaces and 15 RV spaces. There is one large park located on Sunrise Blvd, most of the other parks are concentrated around Routier Rd.

The City of Rancho Cordova has one census tract that is considered a Racially/Ethnically Concentrated Area of Poverty (R/ECAP), as defined by HUD. The tract is in the Cordova Meadows area surrounded by La Loma Dr, W La Loma Drive, and Folsom Blvd. A R/ECAP, as defined by HUD, is any area with a non-white population of more than 50 percent and either a poverty rate of 40 percent or more or a poverty rate of more than three times the average poverty rate for the county. As of the 2014–2018 ACS, the population of this R/ECAP tract was estimated to be 2,445. A disproportionately high percentage of Black residents in Rancho Cordova live in this area, including a majority of project-based Section 8 housing and Housing Choice Voucher recipients. Poorer residents in this area have fewer resources to turn to in the event of an emergency, and may rely on other public resources, such as transit, that may also be impacted by an emergency.

Land Use

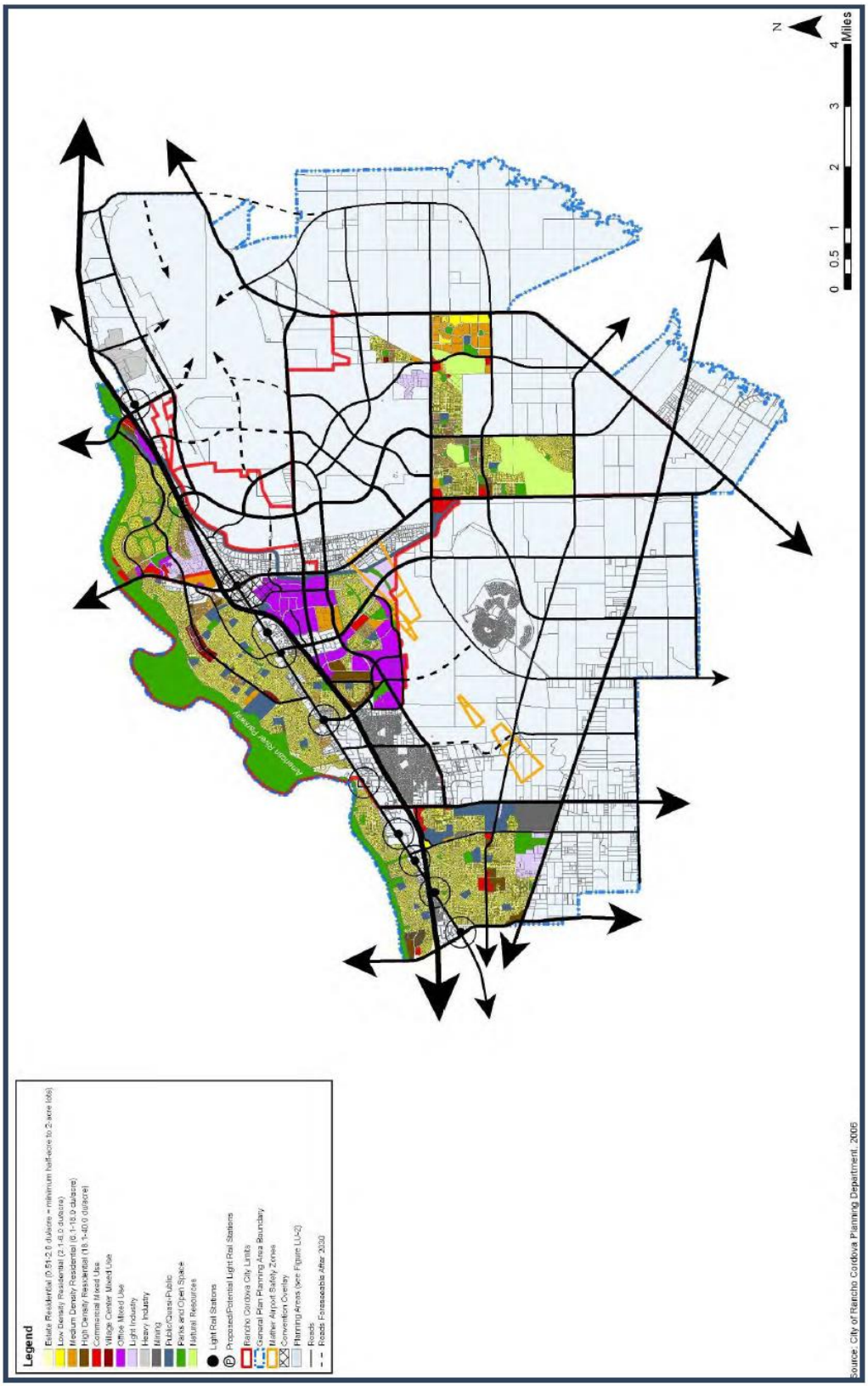
State planning law requires that the land use element of a general plan include a statement of the standard population density, building intensity, and allowed uses for the various land use designations in the plan (Government Code Section 65302(a)). The City's land use designations are generally described below and mapped on the Land Use Diagram. The Rancho Cordova Municipal Code provides detailed land use and development standards for development.

Existing land use patterns in Rancho Cordova began during the Gold Rush and expanded with the development of Mather Air Force Base and Aerojet. Regional growth patterns, geography, and circulation have impacted the land uses that comprise the City's current development pattern.

The first figure (Figure E-5) illustrates the General Plan land use designations for most of the General Plan Planning Area developed prior to the City's Incorporation in 2003. This map is parcel based with a specific land use category applied to each parcel. Subsequent zoning and new development/redevelopment must comply with the General Plan land use designation.

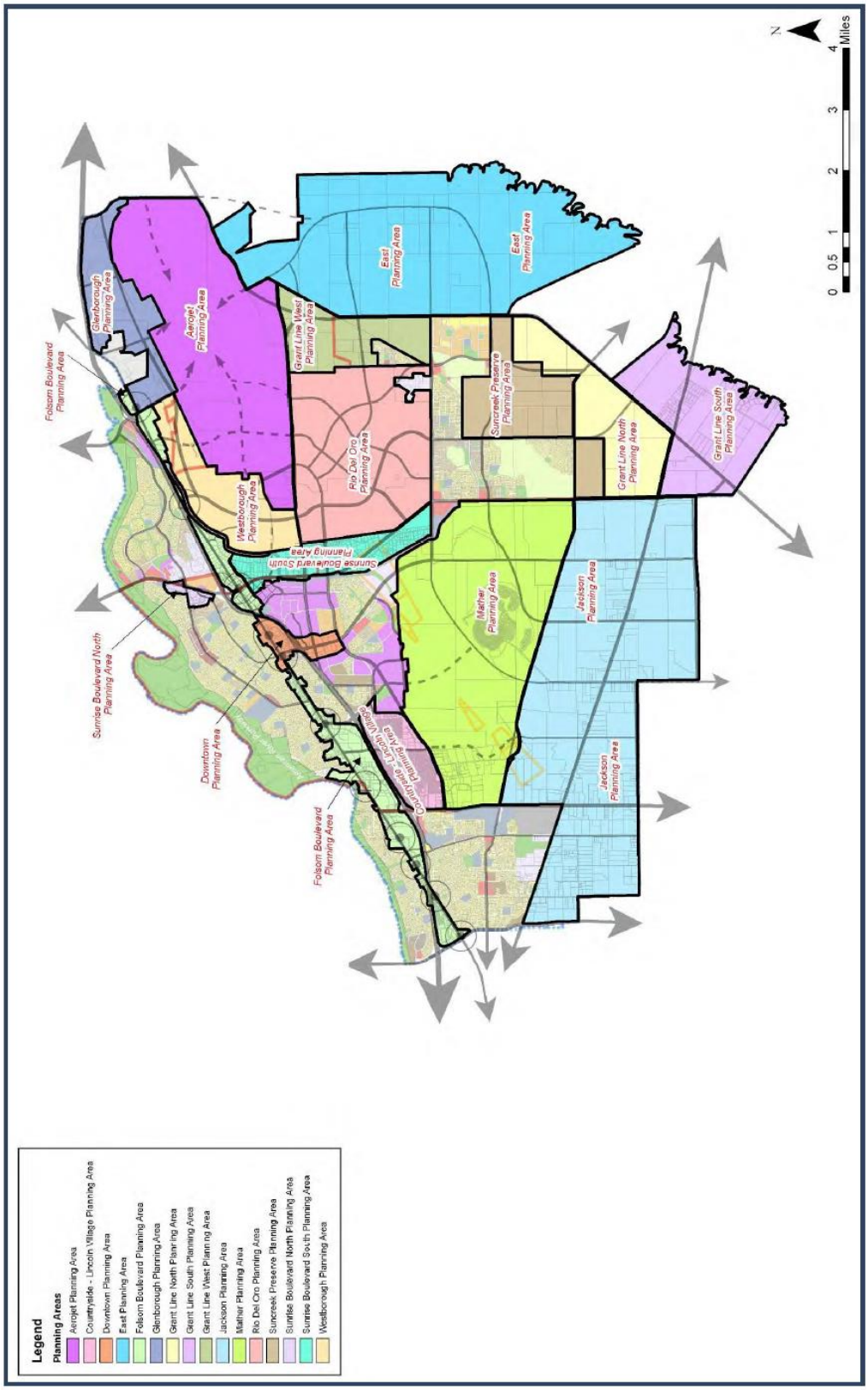
Figure E-6 identifies 16 individual planning areas within the General Plan Planning Area with unique characteristics/features that warrant more detailed planning efforts. Each of the 16 Planning Areas is listed in the Land Use Element with a description of land uses, environmental conditions, and target residential and employment populations. A few of the Planning Areas include parcel specific land use designations (Land Plans), but the majority of Planning Areas include Conceptual Land Plans and require subsequent master planning prior to development (e.g., Specific Plan, Special Planning Area). Conceptual Land Plans are not discrete land uses like the land use categories plotted in Figure E-5; rather, they reflect the City's Building Block concepts and relevant goals, policies, and actions applied to known constraints/opportunities and act as place holders for more detailed land planning.

Figure E-5 City of Rancho Cordova Land Use Map



Source: City of Rancho Cordova General Plan Land Use Element (2015)

Figure E-6 City of Rancho Cordova Land Use Map Planning Areas



Source: City of Rancho Cordova General Plan Land Use Element (2015)

Development since 2016 Plan

As discussed in Section 4.3.1 of the Base Plan, future development has occurred in the County since the last plan. Some of this has occurred in hazard prone areas. The City Building & Safety Division tracked total building permits issued since 2016 for the City. These are tracked by total development, permit type, and hazard risk area. These are shown in Table E-12 and Table E-13.

Table E-12 City of Rancho Cordova – Total Development Since 2016

Permit Type	2016	2017	2018	2019	2020
Commercial/Industrial New/Rep/TI	146	154	156	167	138
Commercial/Industrial Misc.	134	181	168	144	106
Exterior Signage	71	79	89	48	46
Demolition (Commercial/Industrial /Residential)	61	41	47	39	32
New Homes	173	140	229	550	572
Plumbing, Mechanical, Electrical (Commercial/Industrial /Residential)	1468	1290	1199	1324	1234
Pools (Commercial/Industrial /Residential)	52	51	66	68	82
Residential Remodels/Repairs/Additions	51	80	140	140	100
Residential Misc.	576	514	451	488	616
Re-Roofing (Commercial/Industrial /Residential)	267	405	301	365	351
Total:	**2,999**	**2,935**	**2,846**	**3,333**	**3,417**

Source: City of Rancho Cordova Building & Safety Division

Table E-13 City of Rancho Cordova – Development in Hazard Areas since 2016

Permit Type	1% Annual Chance Flood	Levee Protected Area	Wildfire Risk Area [1]
Commercial/Industrial New/Rep/TI	1	4	69
Commercial/Industrial Misc.	6	24	49
Exterior Signage	2	3	26
Demolition (Commercial/Industrial /Residential)	0	7	10
New Homes	0	0	1,508
Plumbing, Mechanical, Electrical (Commercial/Industrial /Residential)	18	421	561
Pools (Commercial/Industrial /Residential)	2	4	236
Residential Remodels/Repairs/Additions	7	21	71
Residential Misc.	5	92	881

Permit Type	1% Annual Chance Flood	Levee Protected Area	Wildfire Risk Area [1]
Re-Roofing (Commercial/Industrial /Residential)	6	95	48
Total	**47**	**671**	**3,459**

Source: City of Rancho Cordova Building & Safety Division

[1]Moderate or higher wildfire risk area

In Ranch Cordova, development occurred in the flood, levee, and wildfire risk areas. While the data shows changes in development in the City since the 2016, including development in mapped hazard areas, all development is subject to current building standards to include any requirements for building in hazard areas which act to mitigate hazard exposure. Further development in hazard areas is only one factor of many that contribute to an overall change in hazard vulnerability. Based on these considerations, it cannot be definitively stated as to whether the development or even lack of development contributed to an increase or decrease in vulnerability for Rancho Cordova.

Future Development

The Sacramento Council on (of) Governments (SACOG) modeled population projections for the City of Rancho Cordova and other areas of the region in 2012 for a Metropolitan Transportation Plan/Sustainable Communities Strategy report. This forecast uses a 2008 base year estimate with projections to 2020 and 2035 for population, housing units, households and employment. SACOG estimated the City population in 2020 and 2035 to be 79,305 and 126,112 respectively.

More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

The City provided areas which it plans on growing in the upcoming years. The City provided the following future development zones, zoning descriptions, specific plan or special plan area, and parcel counts for analysis. Table E-14 serves as the basis for the GIS analysis for future development in this document.

Table E-14 City of Rancho Cordova – Future Development Area Parcel Counts and Specific or Special Plan Areas

Zone	Zoning Description	Specific Plan or Special Planning Area	Parcel Count
BP (RDOSP)	Business Park	Rio Del Oro	6
BP (ZSPA)	Business and Professional Office	Zinfandel	16
GC	General Commercial	(blank)	12
LI (ZSPA)	Light Industrial	Zinfandel	27
LTC (RDOSP)	Local Town Center	Rio Del Oro	1
M-1	Light Industrial/Manufacturing	(blank)	12
MP (RDOSP)	Industrial Park	Rio Del Oro	3

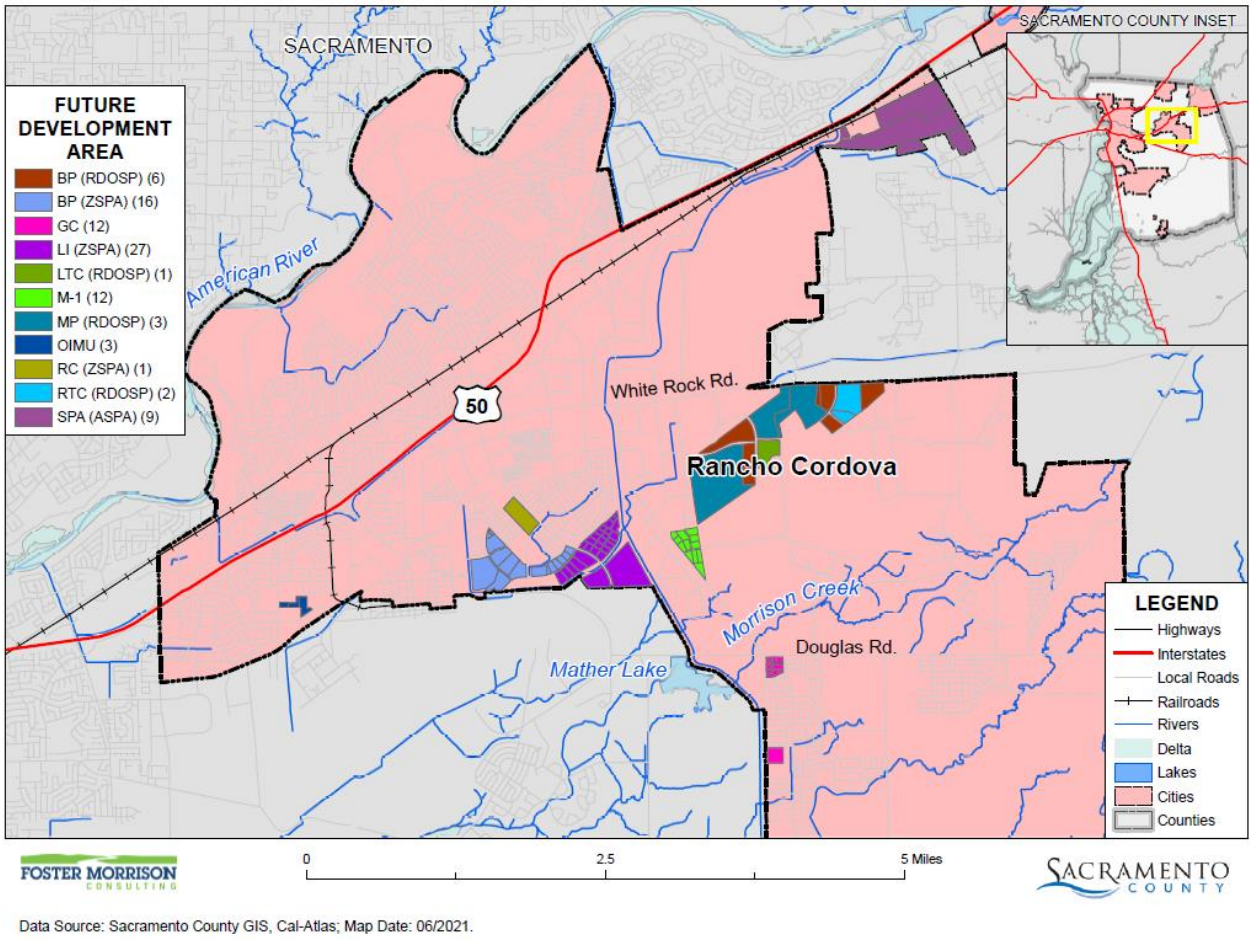
Zone	Zoning Description	Specific Plan or Special Planning Area	Parcel Count
BP (RDOSP)	Business Park	Rio Del Oro	6
OIMU	Office Industrial Mixed Use	(blank)	3
RC (ZSPA)	Retail Commercial	Zinfandel	1
RTC (RDOSP)	Regional Town Center	Rio Del Oro	2
SPA (ASPA)	AeroJet Special Planning Area	AeroJet	9
Grand Total			**92**

Source: City of Rancho Cordova

GIS Analysis

The City of Rancho Cordova provided a list of projects that the City is seeing be developed. Using GIS, the following methodology was used in determining parcel counts and acreages with future development projects in the City. Future development areas in the City were provided in mapped format by the City. Using the GIS parcel spatial file for each of these areas, the areas associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure E-7 shows the locations of future development areas the City is planning to develop. Table E-15 shows the summary of parcels and acreages of each future development area in the City. More information as to the names and specific and special plan areas these fall into can be found in Table E-14.

Figure E-7 City of Rancho Cordova – Future Development Areas



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Table E-15 City of Rancho Cordova – Future Development Areas with Acre and Parcel Counts

Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
BP (ZSPA)	16	3	105
GC	12	0	25
LI (ZSPA)	27	0	141
M-1	12	1	33
MP (RDOSP)	12	0	390
OIMU	3	0	11
RC (ZSPA)	1	0	25
SPA (ASPA)	9	2	213
Grand Total	**92**	**6**	**944**

Source: City of Rancho Cordova

E.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table E-6 as high or medium significance hazards. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, populations at risk, critical facilities and infrastructure, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outages and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power shortage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

There has been zero PSPS events impacting the City of Rancho Cordova in the last five years.

SMUD's Power System Operators (PSO) have the authority to de-energize portions or all of the Valley and Upper American River Project (UARP) transmission line(s) for safety, reliability, conditions beyond design criteria, threat of wildfires and during emergency conditions when requested by local law enforcement or fire officials. Per existing protocols, planned de-energizations are coordinated with interconnected agencies.

During active fire season as declared by CAL FIRE the PSO is authorized to de-energize portions or all of the Valley and UARP transmission line(s) when there is imminent fire danger, mandatory fire orders are in effect, and/or the transmission system is experiencing conditions beyond design criteria. The PSO will take a combination of many factors into consideration when implementing de-energization procedures, which include the triggers listed below, as well as power system knowledge and potential community impacts. De-energization decisions require a balancing of all these factors as well as a knowledge of the area and operation of the power system; no single element is determinative. These factors include:

- Extreme fire danger threat levels, as classified by the National Fire Danger Rating System
- A RFW declaration by the National Weather Service
- Low humidity levels lower than what is required for a Red Flag Warning (RFW)
- Sustained winds exceeding design standards
- Site-specific conditions such as temperature, terrain and local climate
- Critically dry vegetation that could serve as fuel for a wildfire
- On-the-ground, real-time observation from SMUD or other agency field staff

The PSO utilizes various operational and situational awareness tools to determine when de-energization is appropriate. The tools are listed below:

- Weather data telemetered into SMUD's Energy Management System; such as wind speed, wind direction, air temperature, barometric pressure, relative humidity
- US Forest Service – Wildland Fire Assessment System, https://www.wfas.net/
- CAL FIRE Incidents Information, http://cdfdata.fire.ca.gov/incidents/incidents_statsevents
- CAL FIRE California Statewide Fire Map, http://www.fire.ca.gov/general/firemaps
- National Weather Service, https://www.weather.gov/
- Indji Watch real time operational tool
- Geographic Information System (GIS) based tools
- ALERTWildfire, http://www.alertwildfire.org/tahoe/index.html

Transmission line inspections

SMUD's transmission lines are grouped in two inspection areas. The UARP region includes all lines east of Folsom going up to the hydro-electric facilities in the Sierras. The Valley region comprises of all transmission lines in SMUD's service territory.

Distribution line inspections

SMUD performs various inspections on distribution lines to ensure safety, reliability and consistency with standards in California Public Utility Commission (CPUC) General Order (GO) 95, GO 128 and GO 165.

Distribution substation inspections

SMUD performs various inspections on substations to ensure safety and reliability. SMUD inspections meet or exceed standards in CPUC GO 174.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the City, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the City noted that climate change is of concern, no specific impacts of climate change could be recalled. The City and HMPC members noted that the strength of storms does seem to be increasing and the temperatures are getting hotter. The City Planning Tam noted that they had not noticed any notable changes or issues associated with climate change.

Vulnerability to and Impacts from Climate Change

The California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the City and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

Future Development

The City could see population fluctuations as a result of climate impacts relative to those experienced in other regions, and these fluctuations are expected to impact demand for housing and other development.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most

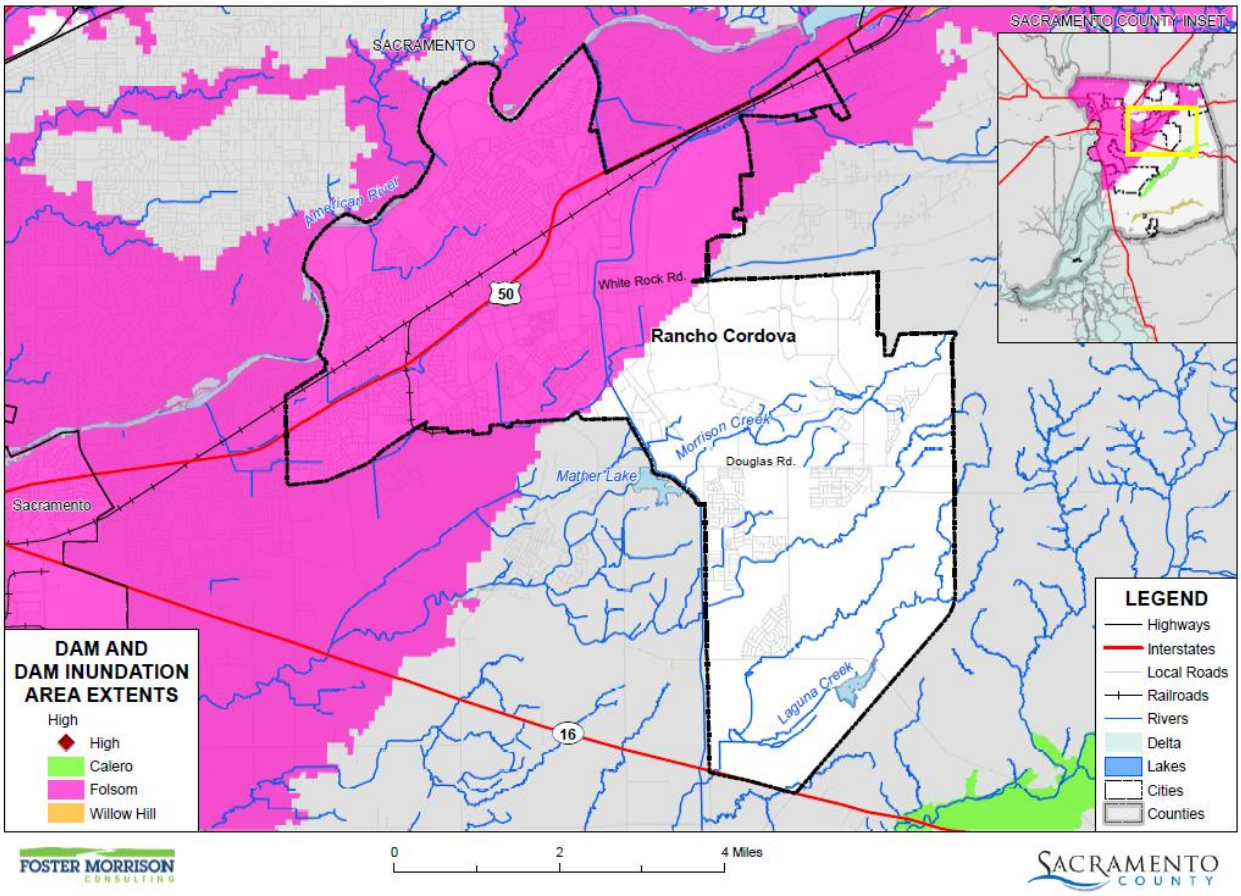
probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The City would be affected for as long as the flood waters from the dam failure took to drain downstream.

Based on available data, the City falls within the inundation areas of Folsom and Oroville dams. The City also falls in the Folsom Dam 235,000 cfs scenario, as discussed in Section 4.3.7 of the Base Plan. Geographic flood extent from the DWR DSOD and Cal OES dam inundation areas is shown on Figure E-8 for dams inside the County, Figure E-9 for dams outside the County, Figure E-10 for the Folsom Dam 235,000 scenario, and summarized for all these dams in Table E-16.

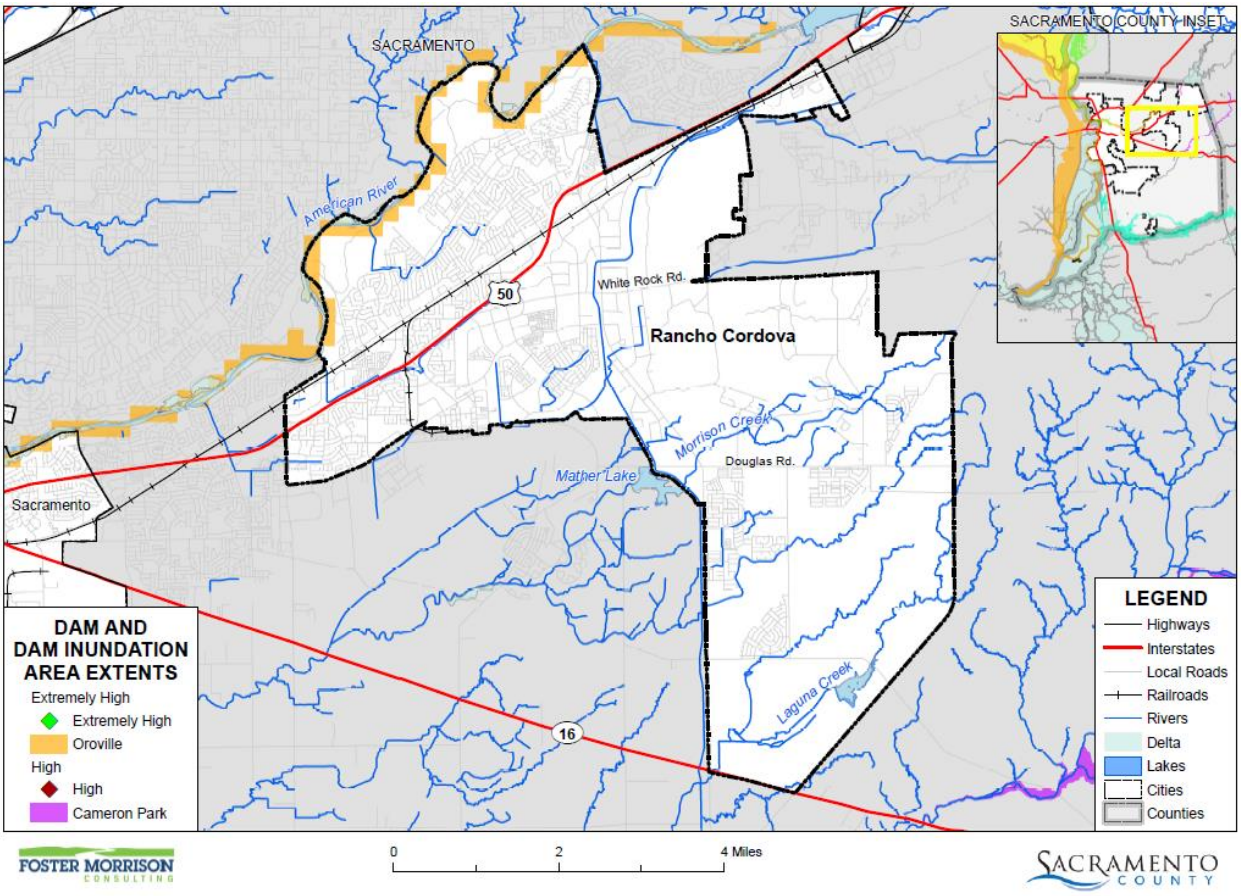
Note: the Cal OES and DSOD dam inundation data did not include inundation mapping of all dams that could affect the Sacramento County Planning Area and the City; thus, the below analysis reflects information based on available data. Other dams may be identified as a concern to the City.

Figure E-8 City of Rancho Cordova – Dam Inundation Areas from Dams Inside the County



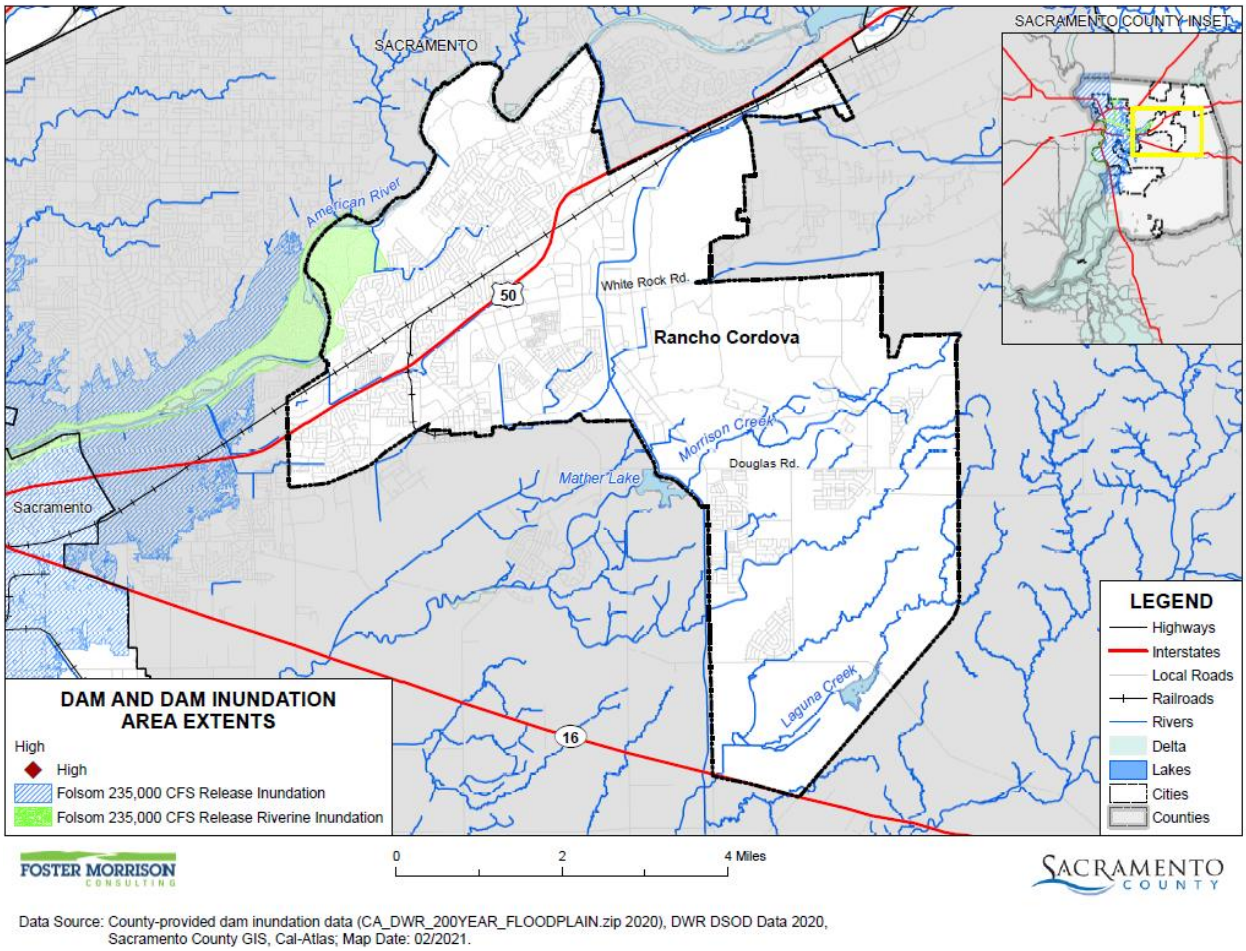
Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 2/2021.

Figure E-9 City of Rancho Cordova – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Figure E-10 City of Rancho Cordova – Dam Inundation Areas from Folsom Dam 235,000 cfs Scenario



Data Source: County-provided dam inundation data (CA_DWR_200YEAR_FLOODPLAIN.zip 2020), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 02/2021.

Table E-16 City of Rancho Cordova – Geographical Dam Inundation Extents

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
High Hazard Dams Inside the County							
Folsom	Rancho Cordova	10,507.97	49.14%	6,010.88	59.80%	4,497.09	39.68%
Folsom 235,000 cfs scenario	Rancho Cordova	429.60	2.01%	7.18	0.07%	422.42	3.73%
Extremely High Hazard Dams Outside the County							
Oroville	Rancho Cordova	477.28	2.23%	11.22	0.11%	466.06	4.11%

Source: Cal OES, DSOD

Past Occurrences

There has been no state or federal disaster declarations for dam failure in the County. The City noted no other dam failure occurrences that have affected the City.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Warning ability is generally determined by the frequency of inspections for structural integrity, the flood wave arrival time (the time it takes for the flood wave to reach its maximum distance of inundation), or the ability to notify persons downstream and their ability to evacuate. The existence and frequency of updating and exercising an evacuation plan that is site-specific assists in warning and evacuation functions. A failure of the Folsom Dam would leave little time for evacuation of the certain parts of City of Rancho Cordova.

Impacts to the City from a dam failure flood include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

Assets at Risk

Based on the vulnerability of Rancho Cordova to the dam failure hazard, the sections that follow describes significant assets at risk in the City of Rancho Cordova. This section includes the values at risk, inundated acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Rancho Cordova. The methodology described in Section 4.3.9 of the Base Plan was followed in determining structures and values at risk to dam failure. Table E-17 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in dam inundation areas in the City.

Table E-17 City of Rancho Cordova – Count and Values of Parcels at Risk by Dam Inundation Area and Property Use

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Folsom Dam – High Hazard Dam Inside of County						
Care / Health	13	11	$3,130,790	$21,931,121	$21,931,121	$46,993,032
Church / Welfare	32	32	$19,175,428	$58,389,789	$58,389,789	$135,955,006
Industrial	602	575	$238,902,969	$663,580,942	$995,371,417	$1,897,855,320
Miscellaneous	358	1	$478,654	$1,085	$1,085	$480,824
Office	290	261	$269,893,286	$1,139,339,333	$1,139,339,333	$2,548,571,952

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Public / Utilities	58		$9			$9
Recreational	14	9	$7,894,394	$22,417,303	$22,417,303	$52,729,000
Residential	15,624	15,558	$1,089,919,980	$3,041,404,859	$1,520,702,439	$5,652,027,147
Retail / Commercial	256	240	$201,079,581	$375,766,578	$375,766,578	$952,612,737
Unknown	3	3		$311,254		$311,254
Vacant	289	7	$89,218,177	$716,294		$89,934,471
Rancho Cordova Total	**17,539**	**16,697**	**$1,919,693,268**	**$5,323,858,558**	**$4,133,919,065**	**$11,377,470,752**
Folsom Dam 235,000 cfs Scenario– High Hazard Dam Inside of County						
Miscellaneous	12	0	$4	$0	$0	$4
Recreational	1	0	$9	$0	$0	$9
Residential	24	24	$5,420,443	$12,428,695	$6,214,348	$24,063,486
Vacant	3	0	$451,408	$0	$0	$451,408
Rancho Cordova Total	**40**	**24**	**$5,871,864**	**$12,428,695**	**$6,214,348**	**$24,514,907**
Oroville Dam – Extremely High Hazard Dam Outside the County						
Miscellaneous	39	**0**	$20	$0	$0	$20
Recreational	1	**0**	$9	$0	$0	$9
Residential	36	36	$3,819,039	$10,953,529	$5,476,761	$20,249,331
Vacant	3	**0**	$406,602	$0	$0	$406,602
Rancho Cordova Total	**79**	**36**	**$4,225,670**	**$10,953,529**	**$5,476,761**	**$20,655,962**

Source: CAL OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data

Population at Risk

The DSOD and Cal OES dam inundation areas were overlayed on the parcel layer. Those residential parcel centroids that intersect the dam inundation areas were counted and multiplied by the Census Bureau average household factors for Rancho Cordova – 2.14. This is shown in Table E-30.

Table E-18 City of Rancho Cordova – Count of Improved Residential Parcels and Population by Dam Inundation Area

Jurisdiction	Folsom Dam Inundation Area		Folsom Dam 235,000 cfs Scenario Inundation Area		Oroville Dam Inundation Area	
	Improved Residential Parcels	Population	Improved Residential Parcels	Population	Improved Residential Parcels	Population
Rancho Cordova	15,558	33,294	24	51	36	77

Source: Cal OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Rancho Cordova in identified dam inundation areas. GIS was used to determine whether the critical facility locations intersect a DSOD or Cal OES dam inundation area. Details of critical facilities in mapped dam inundation areas in the City of Rancho Cordova are shown in Figure E-11 for dams inside the County, Figure E-11 for dams outside the County, Figure E-12 for the Folsom Dam 235,000 cfs Scenario, and detailed in Table E-19. Details of critical facility definition, type, name and address and jurisdiction by dam inundation area are listed in Appendix F.

Figure E-11 City of Rancho Cordova – Critical Facilities in Dam Inundation Areas from Dams Inside County

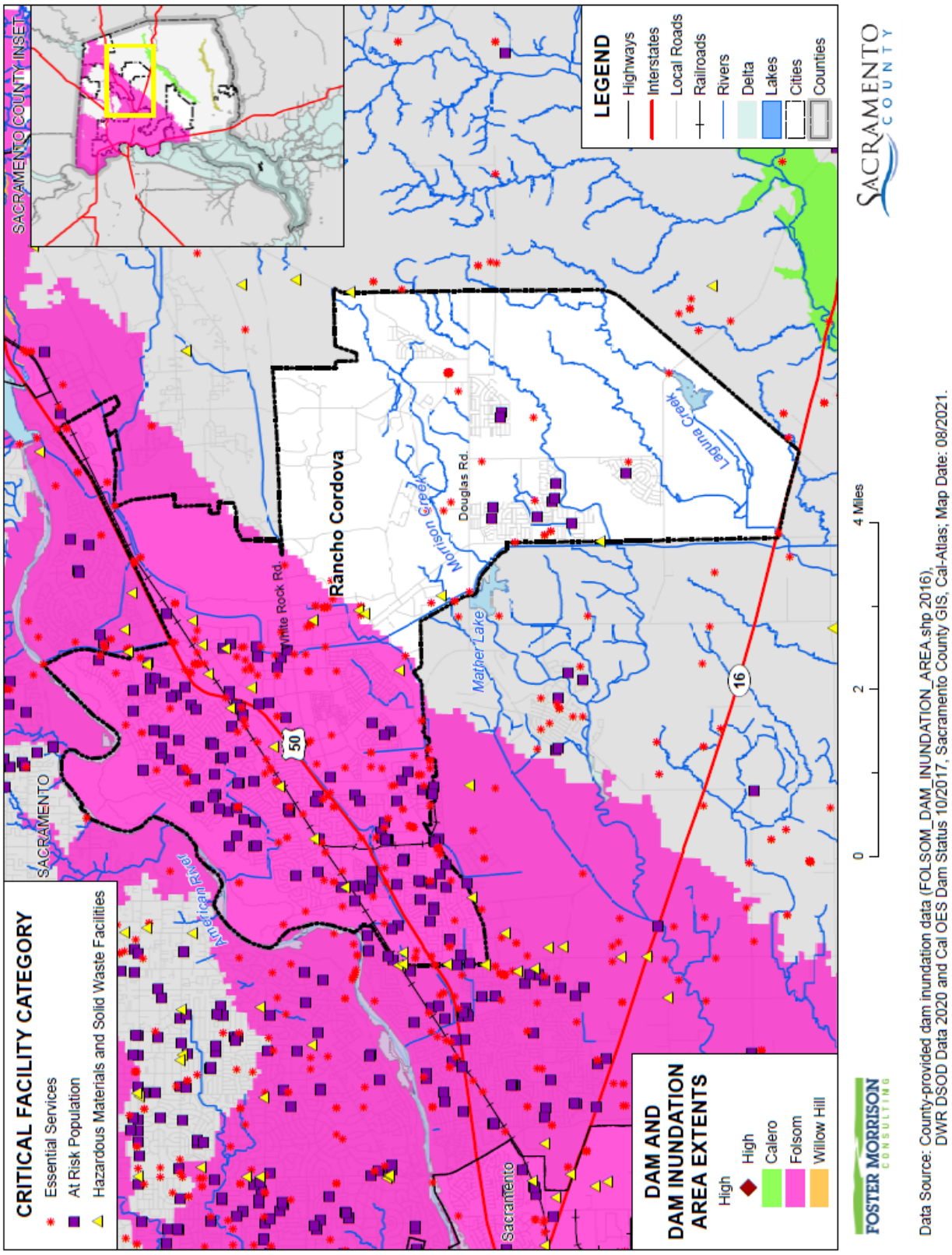


Figure E-12 City of Rancho Cordova – Critical Facilities in Dam Inundation Areas from Dams Outside County

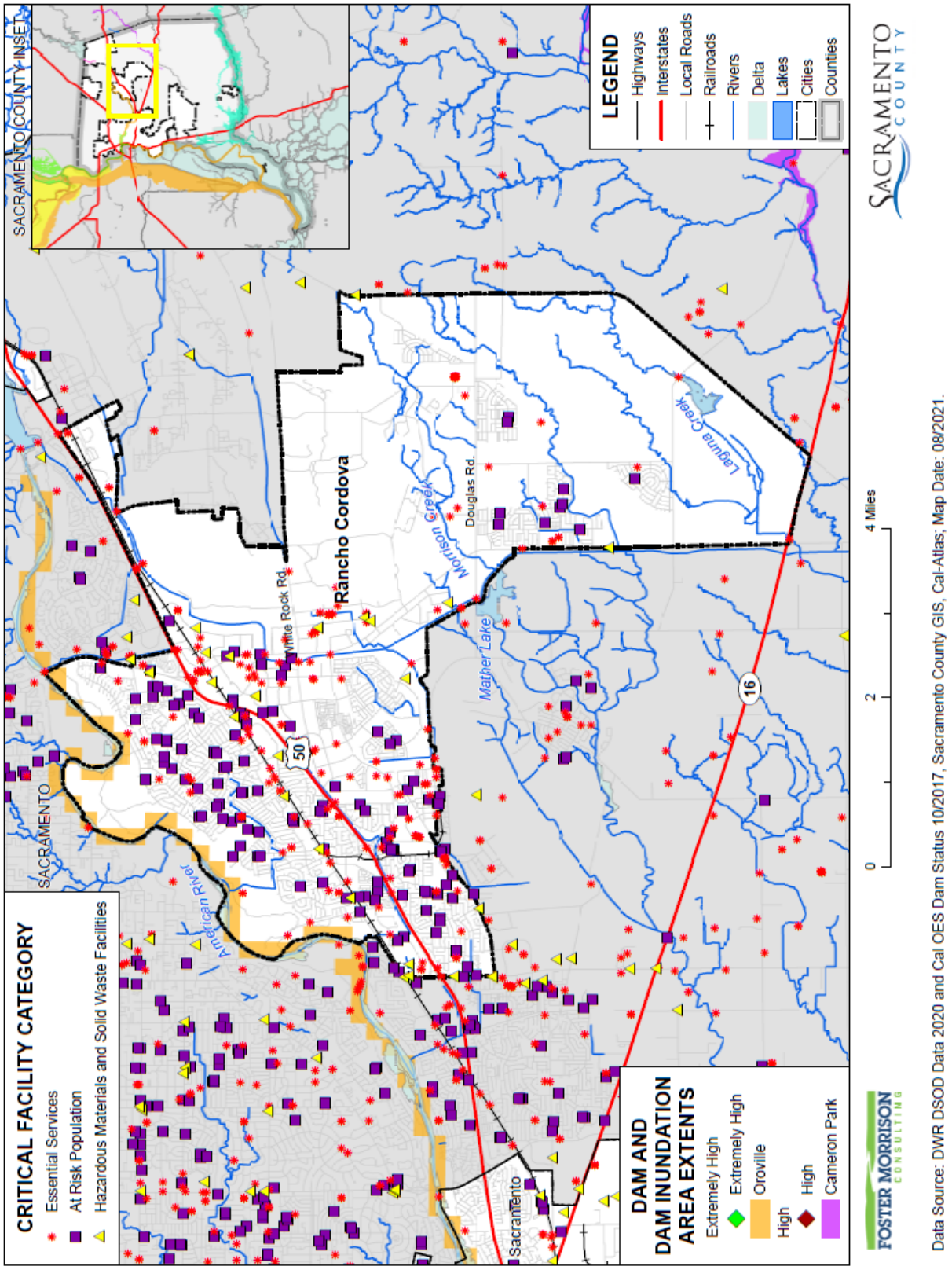


Figure E-13 City of Rancho Cordova – Critical Facilities in Folsom Dam 235,000 cfs Scenario

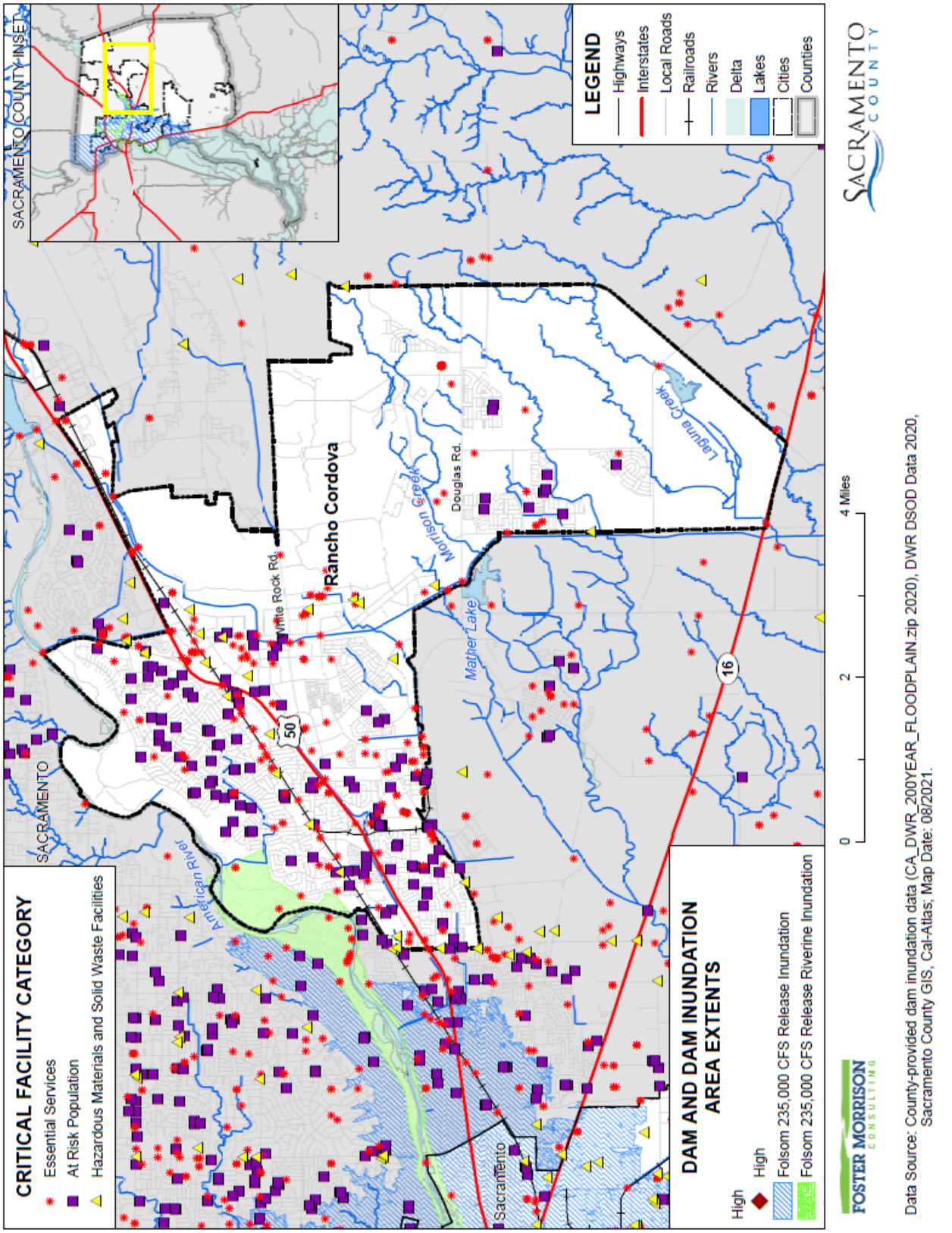


Table E-19 City of Rancho Cordova – Critical Facilities in Dam Inundation Areas by Category and Type

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
Folsom Dam (High Hazard Dam Inside the County)		
Essential Services Facilities	Bridge	12
	Cellular Tower	11
	City Facility	5
	Drainage Pump Station	6
	Emergency Evacuation Center	6
	EMS Stations	5
	FDIC Insured Banks	10
	Fire Station	3
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	59
	Power Plants	1
	Public Transit Stations	4
	State Government Building	1
	Water Well	57
	Total	**188**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Community Center	4
	Day Care Center	22
	Mobile Home Park	8
	Places of Worship	71
	School	32
	Senior Living Center	3
	Total	**143**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	1
	Leaky Underground Storage Tank	12
	Solid Waste Facility	1
	Tank Farm	2
	Waste Transfer Station	1
	Total	**18**
Folsom Dam Total		**349**

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
Oroville (Extremely High Hazard Dam Outside the County)		
Essential Services Facilities	Drainage Pump Station	1
	Total	**1**
At Risk Population Facilities	-	–
	Total	**0**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Oroville Dam Total		**1**
Folsom 235,000 cfs Scenario		
Essential Services Facilities	Water Well	3
	Total	**3**
At Risk Population Facilities	Places of Worship	1
	Total	**1**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Folsom Dam 235,000 cfs Scenario Total		**4**

Source: Cal OES, DSOD, Sacramento County GIS

Future Development

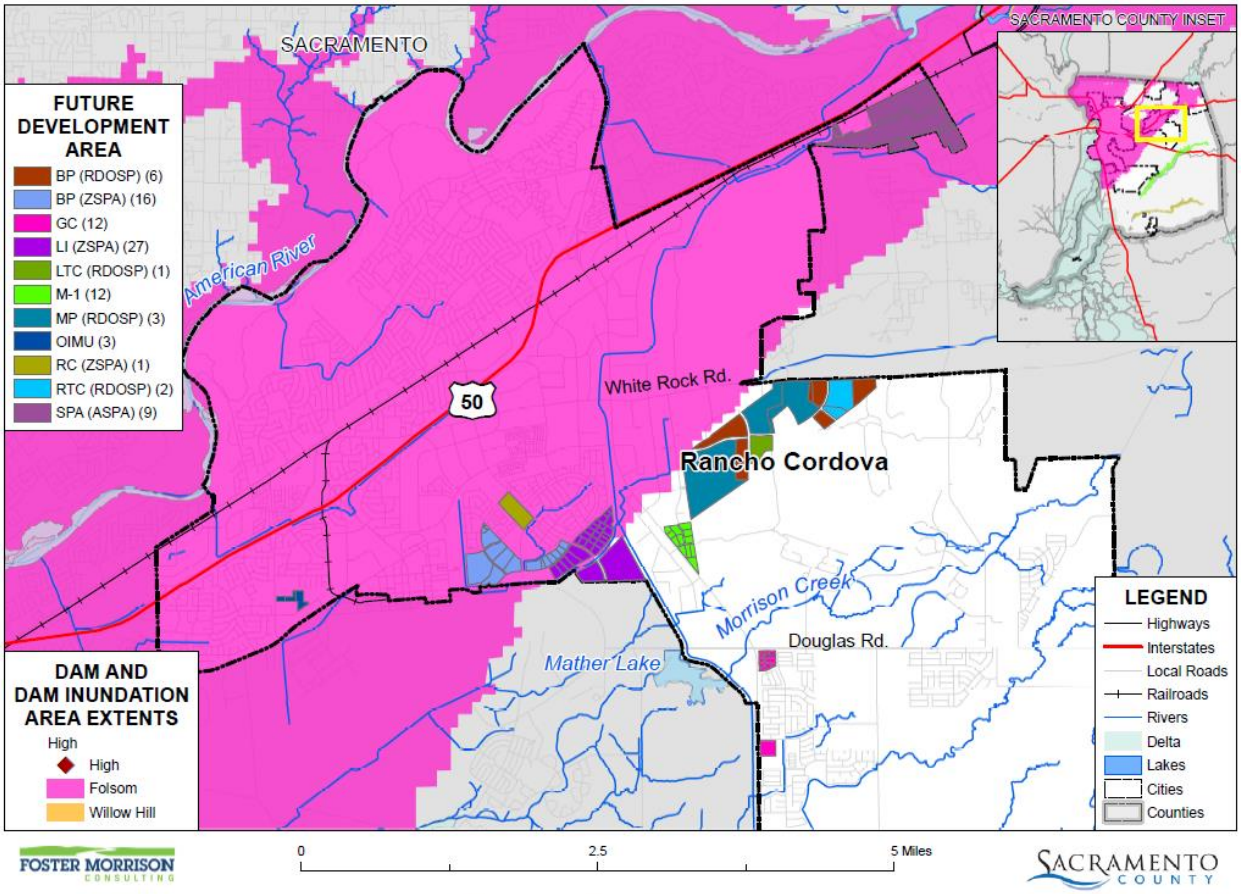
Future dam failures are considered unlikely. However, given the high number of affected parcels and the proximity of Folsom Dam, future development in the City could be affected by a dam failure and associated flooding. The City enforces it floodplain ordinance, which helps to reduce risk to flooding by requiring structures in the 1% annual chance floodplains to be above the base flood elevation, which depending on inundation depths and affected areas may provide some relief. Siting of future development areas should take dam failure flooding into account. The Folsom Dam has seen sizable improvements in recent years, which reduce the risk of a major event in the future.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure E-14 shows the locations of future development areas the City is planning to develop on the dam inundation zones from dams inside the County. Figure E-15 shows the locations of future development areas the City is planning to develop on the dam inundation zones from dams outside the County. Figure E-16 shows the locations of future development areas the City is planning to develop on the dam inundation zones from the Folsom Dam 235,000 cfs scenario. Table E-20 shows the parcels and acreages of each future development area in the City in the dam inundation areas inside the County.

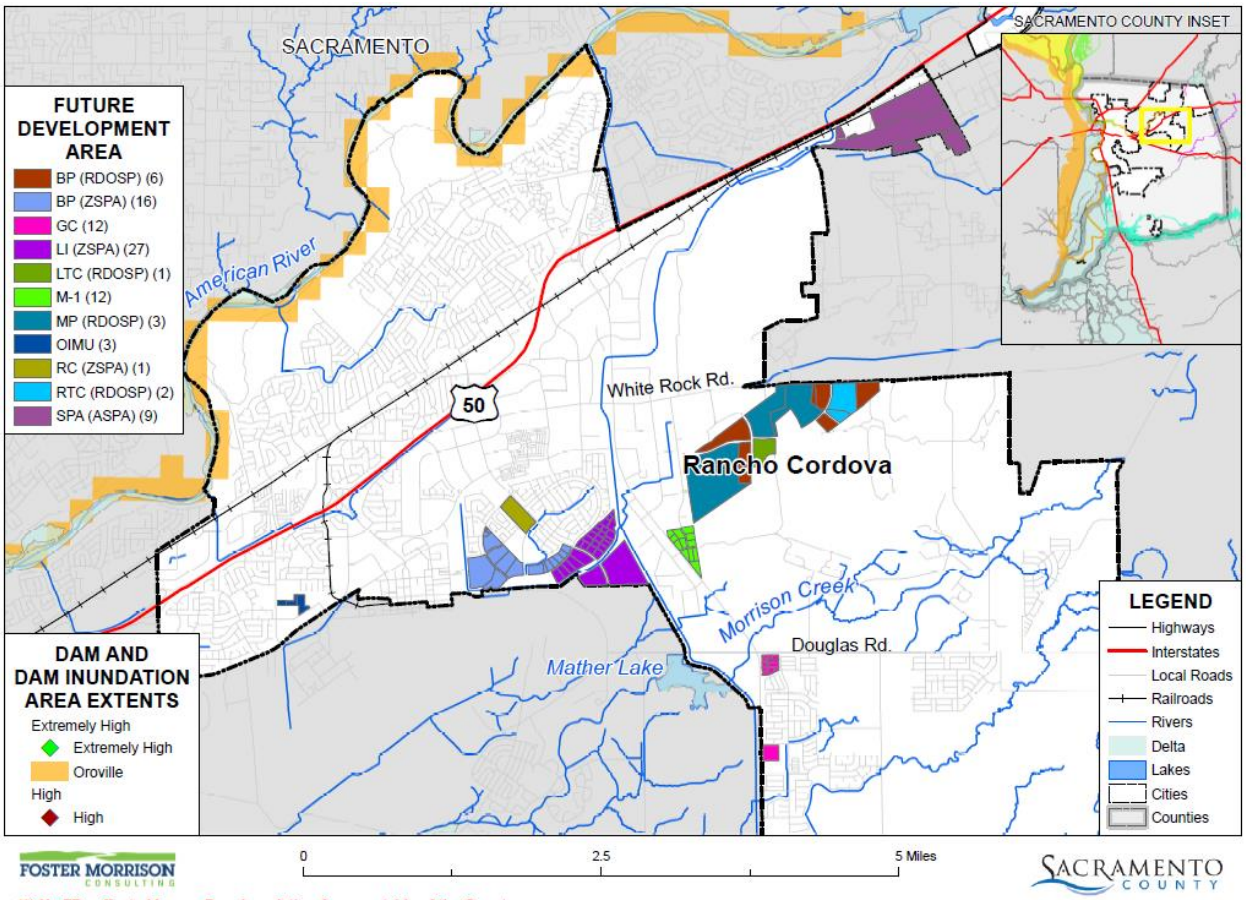
More information as to the names and specific and special plan areas these fall into can be found in Table E-14.

Figure E-14 City of Rancho Cordova – Future Development and Dam Inundation Areas from Dams Inside County



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Figure E-15 City of Rancho Cordova – Future Development and Dam Inundation Areas from Dams Outside County



*** No FDs affected by any Dam Inundation Areas outside of the County.
Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Figure E-16 City of Rancho Cordova – Future Development and Dam Inundation Areas from Folsom Dam 235,000 cfs Scenario

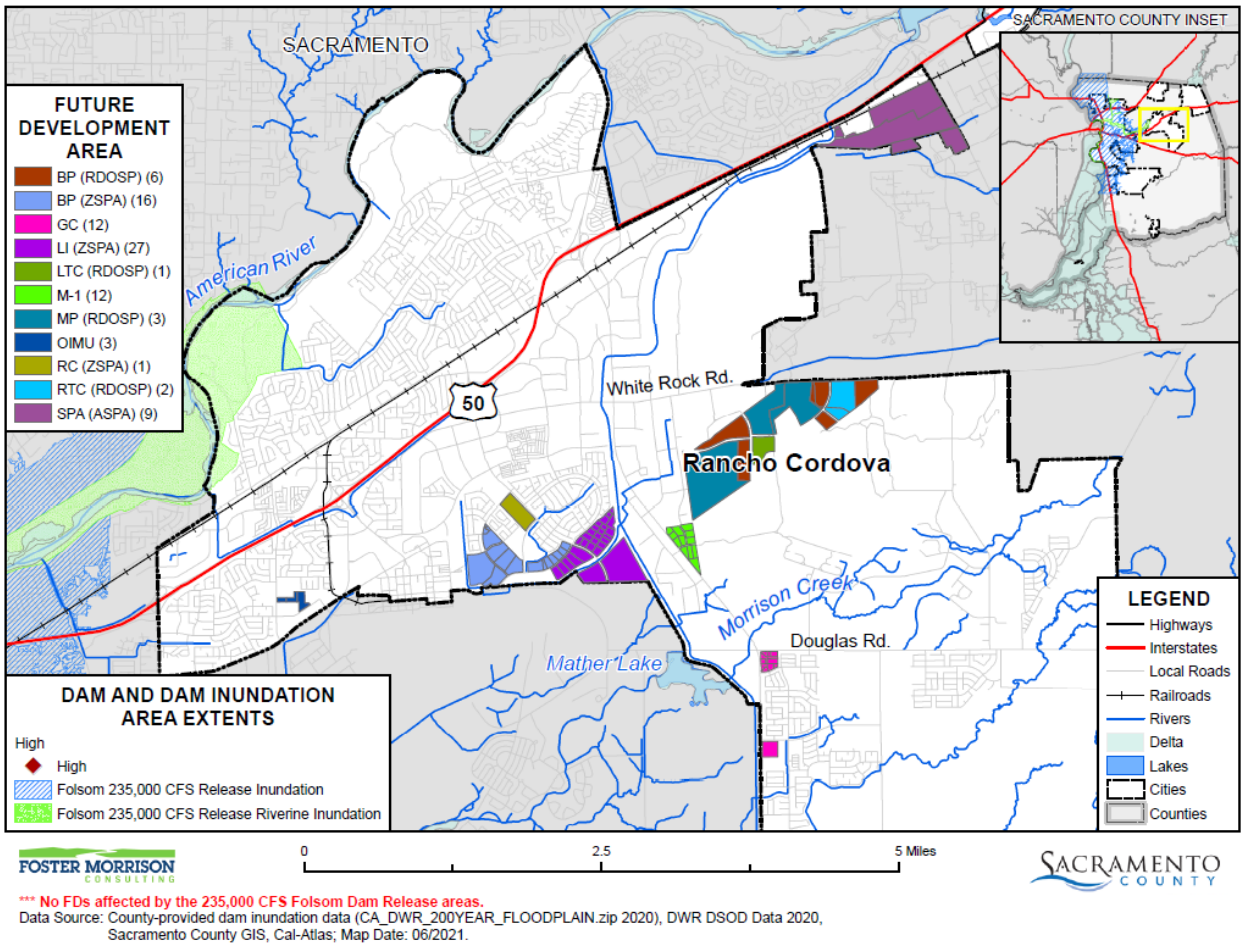


Table E-20 City of Rancho Cordova – Future Development Parcels and Acres in Dam Inundation Areas

Dam Inundation Area/ Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Folsom			
BP (ZSPA)	16	3	105
LI (ZSPA)	25	0	71
OIMU	3	0	11
RC (ZSPA)	1	0	25
SPA (ASPA)	9	2	213
Folsom Total	**54**	**5**	**426**

Source: City of Rancho Cordova, Cal OES, DSOD

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the City, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the City and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There have been two state and one federal disaster declaration from drought. This can be seen in Table E-21.

Table E-21 Sacramento County – State and Federal Drought Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the City are the same as those for the County and includes 4 multi-year droughts since 1950. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

The City Planning Team noted that from 2014 to 2016, water restrictions were put in place such as, No watering yards on certain days and times. New residential front yard landscaping and non- residential landscaping to include landscape strips along the streets and road eliminated turf and were replaced with bark, rock, and/or drought tolerant shrubs/grasses.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the City, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. Water shortages in the future may be worsened by drought, as the City relies on surface water and groundwater for its water source.

The vulnerability of the City to drought is City-wide, but impacts may vary and include reduction in water supply and an increase in dry fuels. The potential for a reduction in water supply during drought conditions generally leads to both mandated and voluntary conservations measures during extended droughts. During these times, the costs of water can also increase. The increased dry fuels and fuel loads associated with drought conditions can also result in an increased fire danger. In areas of extremely dry fuels, the intensity and speed of fires can be significant. Water supply and flows for fire suppression can also be an issue during extended droughts.

Other qualitative impacts associated with drought in the City and Sacramento County Planning Area are those related to water intensive activities such as, municipal usage, commerce, tourism, recreation and agricultural use. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

With more precipitation likely falling as rain instead of snow in the Sierra's, and warmer temperatures causing decreased snowfall to melt faster and earlier, water supply is likely to become more unreliable. In addition, drought and water shortage is predicted to become more common. This means less water available for use over the long run, and additional challenges for water supply reliability, especially during periods of extended drought.

Future Development

As the population in the area continues to grow, so will the demand for water. Water shortages in the future may be worsened by drought, as the City relies on surface water and groundwater for its water source. Ongoing planning will be needed by the City and water agencies to account for population growth and increased future water demands.

Earthquake

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

Since earthquakes are regional events, the whole of the City is at risk to earthquake. Rancho Cordova and the surrounding area are at limited risk from significant seismic and geologic hazards. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The City is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the City fall within a low to moderate shake risk.

Past Occurrences

The City noted no past occurrences of earthquakes or that affected the City in any meaningful way.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured housing is very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. The City Planning Team noted none of these types of building exist in the City.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The City of Rancho Cordova is within the less hazardous Zone 3.

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

Impacts from earthquake in the City will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

Earthquake Analysis

Due to the regional effects of an earthquake, a Hazus earthquake analysis was performed on a countywide basis. This can be found in Section 4.3.11 of the Base Plan. While these runs were not done specific to the City, maps showing damage in the County show greater areas of damage near the cities in the County.

Future Development

Although new growth and development corridors would fall in the area affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in areas prone to earthquakes will continue to occur. The City enforces the state building code, which mandates construction techniques that minimize seismic hazards. Future development in the City is subject to these building codes.

Flood: 1%/0.2% Annual Chance

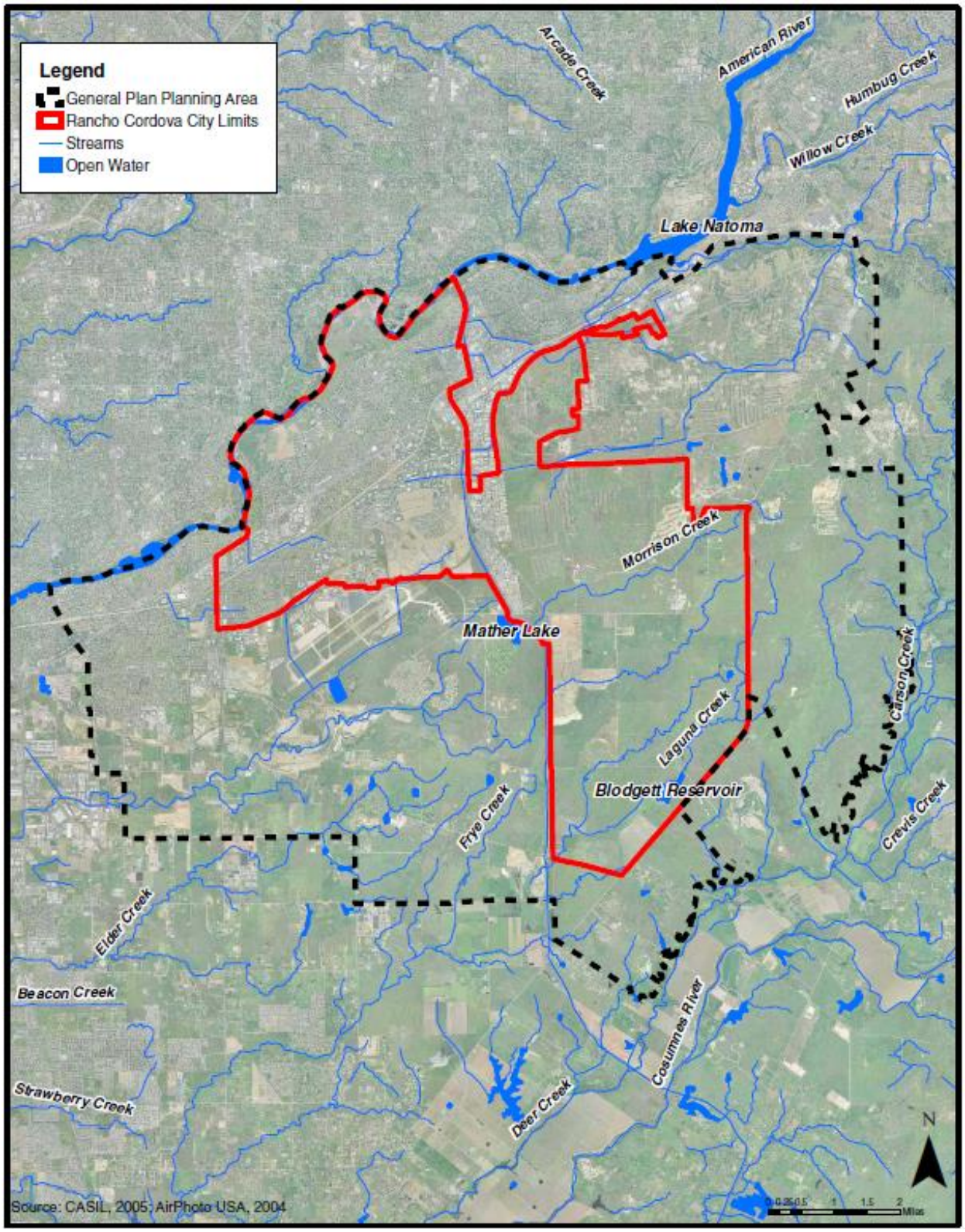
Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the City, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the City. Historically, the City has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

Major surface waters in the vicinity of Rancho Cordova include the American River, Folsom Reservoir, and Lake Natoma to the north; the Sacramento River to the west; and the Consumnes River to the southeast. Other surface waters within the Rancho Cordova include the Folsom South Canal, Cordova Creek, Deer Creek, and the Morrison Creek Stream Group (Morrison, Laguna, Elder, Gerber, Unionhouse, Florin, Buffalo, and Frye Creek, as well as Rebel Hill Ditch) which generally flow in a southwesterly direction southeast of the City, as illustrated in Figure E-17. The topography within the City includes gently rolling terrain, such as that found in the eastern Great Central Valley interrupted by numerous seasonal creeks and streams. These creeks and streams are largely ephemeral and intermittent, which is typical of areas that experience dry summers and cool, wet winters, as in this part of the Central Valley.

Figure E-17 City of Rancho Cordova Waterways and Drainage

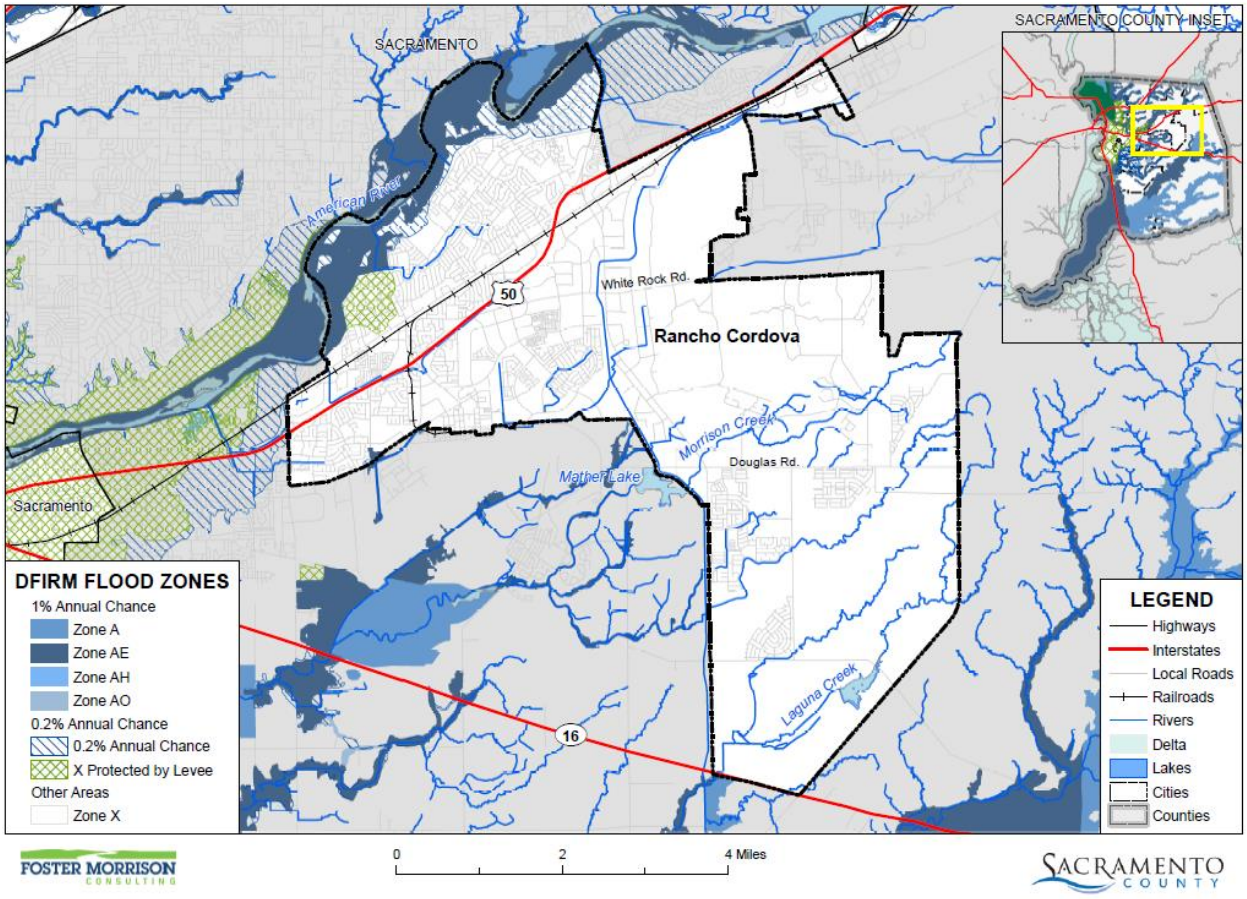


Source: City of Rancho Cordova General Plan Environmental Impact Report (2006)

Location and Extent

The City of Rancho Cordova has areas located in the 1% and 0.2% annual chance flood zones. This is seen in Figure E-18. Table E-22 details the DFIRM mapped flood zones located within the City.

Figure E-18 City of Rancho Cordova – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table E-22 City of Rancho Cordova– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in City
A	1% annual chance flooding: No base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
AE	1% annual chance flooding: Base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	

Flood Zone	Description	Flood Zone Present in City
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood. Flood insurance is not mandatory but is available.	X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	X
X (unshaded)	No flood hazard	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the City vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the City tends to have a shorter speed of onset, due to the amount of water that flows through the City.

Geographical flood extents for the City from the FEMA DFIRMs are shown in Table E-23.

Table E-23 City of Rancho Cordova – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance	1,149	5.37%	23	0.23%	1,125	9.93%
0.2% Annual Chance	973	4.55%	660	6.57%	313	2.76%
Other Areas	19,264	90.08%	9,368	93.20%	9,896	87.31%
Total	**21,386**	**100.00%**	**10,051**	**100.00%**	**11,334**	**100.00%**

Source: FEMA DFIRM 11/2/2018

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table E-24. These events also likely affected the City to some degree.

Table E-24 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Other than localized flooding of streets, there have been no significant flooding events within the City.

Vulnerability to and Impacts from Flood

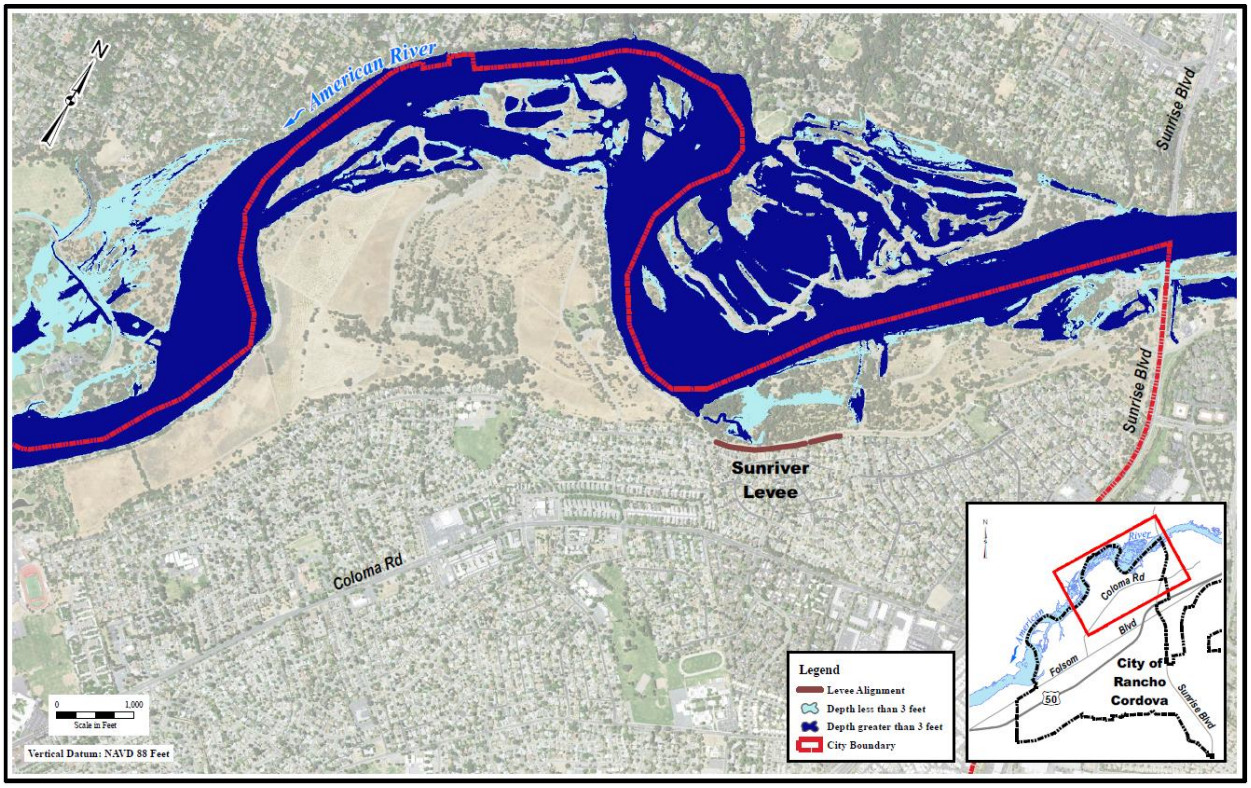
Floods have been a part of the City's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

To satisfy the requirements of ULOP, the City has developed a 200-yr floodplain map based on the proposed Folsom Dam improvements by the US Army Corps of Engineers. These are shown in Figure E-19 and

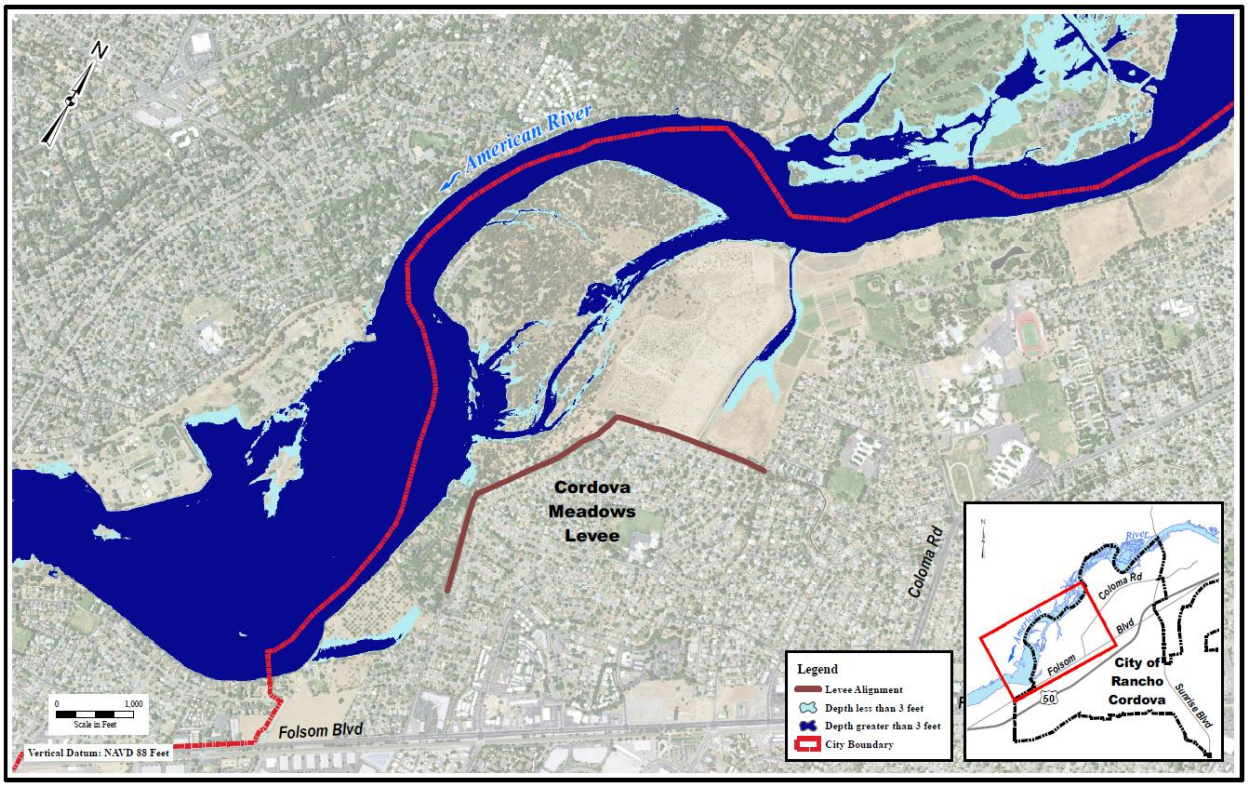
Figure E-20. These improvements include the Joint Federal Project to improve the dam spillway and the future dam raise to increase flood storage. In conjunction with the new 200-yr map, the City has made changes to its General Plan and zoning code that will guide development within the 200-yr Urban Level of Flood Protection. The map and associated code changes were adopted by the City Council in the Summer of 2016.

Figure E-19 City of Rancho Cordova – 200-year Flood Depth with Folsom Dam Raise (Upstream)



Source: City of Rancho Cordova, 2016

Figure E-20 City of Rancho Cordova – 200-year Flood Depth with Folsom Dam Raise (Downstream)



Source: City of Rancho Cordova, 2016

The City's biggest concern associated with floods includes severe local flooding and street flooding and any potential impacts to residential neighborhoods and businesses.

Assets at Risk

Based on the vulnerability of Rancho Cordova to the flood hazard, the sections that follow describes significant assets at risk in the City of Rancho Cordova. This section includes the values at risk, flooded acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Rancho Cordova. The methodology described in Section 4.3.12 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table E-25 is a summary table for the City of Rancho Cordova. Parcel counts, values, estimated contents, and total values in the City are shown for the 1% and 0.2% annual chance flood zones, as well as for those properties that fall outside of the mapped FEMA DFIRM flood zones. Table E-26 breaks down Table E-25 and shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in FEMA flood zones in the City.

Table E-25 City of Rancho Cordova – Count and Value of Parcels at Risk in Summary DFIRM Flood Zones*

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard	58	19	$6,117,986	$10,358,719	$5,179,359	$21,656,064
0.2% Annual Chance Flood Hazard**	1,972	1,920	$134,045,116	$382,757,390	$199,010,254	$715,812,763
Other Areas	21,755	19,593	$2,556,793,512	$6,435,032,495	$4,794,431,555	$13,786,257,438
City of Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table E-26 City of Rancho Cordova – Count and Values of Parcels at Risk by Detailed Flood Zone and Property Use*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard						
Zone AE						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	35	0	$14	$0	$0	$14
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	1	0	$9	$0	$0	$9
Residential	19	19	$4,041,261	$10,358,719	$5,179,359	$19,579,339
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	3	0	$2,076,702	$0	$0	$2,076,702
Zone AE Total	**58**	**19**	**$6,117,986**	**$10,358,719**	**$5,179,359**	**$21,656,064**
1% Annual Chance Flood Hazard Total	**58**	**19**	**$6,117,986**	**$10,358,719**	**$5,179,359**	**$21,656,064**

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
0.2% Annual Chance Flood Hazard**						
0.2% Annual Chance						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	2	2	$258,840	$6,135,993	$6,135,993	$12,530,826
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	11	0	$10	$0	$0	$10
Office	2	2	$1,601,838	$2,829,553	$2,829,553	$7,260,944
Public/Utilities	2	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	1,118	1,116	$69,274,972	$199,416,216	$99,708,110	$368,399,289
Retail/ Commercial	3	3	$4,328,392	$4,556,056	$4,556,056	$13,440,504
Unknown	0	0	$0	$0	$0	$0
Vacant	7	1	$1,159,230	$156,528	$0	$1,315,758
0.2% Annual Chance Total	**1,145**	**1,124**	**$76,623,282**	**$213,094,346**	**$113,229,712**	**$402,947,331**
X Protected by Levee						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	3	3	$306,918	$1,565,802	$1,565,802	$3,438,522
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	14	0	$15,996	$0	$0	$15,996
Office	0	0	$0	$0	$0	$0
Public/Utilities	2	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	807	792	$56,836,783	$167,764,962	$83,882,460	$308,484,217
Retail/ Commercial	1	1	$262,137	$332,280	$332,280	$926,697
Unknown	0	0	$0	$0	$0	$0
Vacant	0	0	$0	$0	$0	$0
X Protected by Levee Total	**827**	**796**	**$57,421,834**	**$169,663,044**	**$85,780,542**	**$312,865,432**
0.2% Annual Chance Flood Hazard Total	**1,972**	**1,920**	**$134,045,116**	**$382,757,390**	**$199,010,254**	**$715,812,763**
Other Areas						
Zone X						

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	24	3	$22,818,860	$142,065	$142,065	$23,102,990
Care/Health	10	8	$2,823,872	$20,365,319	$20,365,319	$43,554,510
Church/Welfare	31	30	$18,916,597	$52,253,796	$52,253,796	$123,424,189
Industrial	743	706	$304,286,152	$758,045,202	$1,137,067,811	$2,199,399,156
Miscellaneous	465	1	$729,505	$1,085	$1,085	$731,675
Office	290	261	$268,694,290	$1,137,029,622	$1,137,029,622	$2,542,753,534
Public/Utilities	55	0	$19	$0	$0	$19
Recreational	15	10	$8,063,746	$22,999,996	$22,999,996	$54,063,738
Residential	18,487	18,312	$1,479,298,945	$4,035,107,429	$2,017,553,726	$7,531,959,985
Retail/ Commercial	262	246	$206,640,650	$407,018,135	$407,018,135	$1,020,676,920
Unknown	3	3	$0	$311,254	$0	$311,254
Vacant	1,370	13	$244,520,876	$1,758,592	$0	$246,279,468
Zone X Total	**21,755**	**19,593**	**$2,556,793,512**	**$6,435,032,495**	**$4,794,431,555**	**$13,786,257,438**
Other Areas Total	**21,755**	**19,593**	**$2,556,793,512**	**$6,435,032,495**	**$4,794,431,555**	**$13,786,257,438**
Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table E-27 summarizes Table E-26 above and shows City of Rancho Cordova loss estimates and improved values at risk by FEMA 1% and 0.2% annual chance flood zones.

Table E-27 City of Rancho Cordova – Flood Loss Estimates

Flood Zone	Total Parcel Count*	Improved Parcel Count*	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood	58	19	$10,358,719	$5,179,359	$15,538,078	$3,107,616	0.00%
0.2% Annual Chance Flood**	1,972	1,920	$382,757,390	$199,010,254	$581,767,644	$116,353,529	0.06%
Grand Total	**2,030**	**1,939**	**$393,116,109**	**$204,189,613**	**$597,305,722**	**$119,461,145**	**0.06%**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table E-26 and Table E-27, the City of Rancho Cordova has 58 parcels and $15.5 million of structure and contents values or values in the 1% annual chance flood zone, and 1,920 improved parcels and $581.8 million of structure and contents values in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.11 of the Base Plan, there is a 1% chance in any given year of a flood event causing $3.1 million in damage and a 0.2% chance in any given year of a flood event causing $116.4 million in damage in the City of Rancho Cordova. The loss ratio of 0.00% and 0.06% indicates that flood losses for 1% and 0.2% annual chance flooding, respectively, would be relatively minor and the City would be able to recover relatively quickly.

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits. The same methodology, as discussed in Section 4.3.12 of the Base Plan, was used for the City of Rancho Cordova as well as for the County as a whole. Table E-28 represents a summary analysis of total acres for each FEMA DFIRM flood zone in the City. Table E-29 represents a detailed analysis of total acres by property use in each FEMA DFIRM flood zone.

Table E-28 City of Rancho Cordova – Flooded Acres by Flood Zone

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard	1,149	0.18%	23	0.01%	1,125	0.40%
0.2% Annual Chance Flood Hazard*	973	0.15%	660	0.18%	313	0.11%
Other Areas	19,264	2.99%	9,368	2.59%	9,896	3.49%
Rancho Cordova Total	**21,386**	**3.32%**	**10,051**	**2.78%**	**11,334**	**4.00%**

Source: FEMA 11/2/2018 DFIRM

*This acre count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all acres in the 1% annual chance flood zone.

Table E-29 City of Rancho Cordova – Flooded Acres by Flood Zone and Property Use

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard						
Zone AE						
Agricultural	0	0.00%	0	0.00%	0	0.00%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	0	0.00%	0	0.00%	0	0.00%
Industrial	0	0.00%	0	0.00%	0	0.00%
Miscellaneous	1,080.1	0.17%	0	0.00%	1,080.1	0.38%
Office	0.1	0.00%	0.1	0.00%		
Public/Utilities	1.3	0.00%	0	0.00%	1.3	0.00%
Recreational	8.8	0.00%	0	0.00%	8.8	0.00%
Residential	23.0	0.00%	23.0	0.01%	0	0.00%
Retail/ Commercial	0	0.00%	0	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	35.2	0.01%	0	0.00%	35.2	0.01%
Zone AE Total	**1,148.6**	**0.18%**	**23.1**	**0.01%**	**1,125.5**	**0.40%**
1% Annual Chance Flood Hazard Total	**1,148.6**	**0.18%**	**23.1**	**0.01%**	**1,125.5**	**0.40%**
0.2% Annual Chance Flood Hazard*						
0.2% Annual Chance						
Agricultural	0	0.00%	0	0.00%	0	0.00%
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	5.4	0.00%	5.4	0.00%	0	0.00%
Industrial	1.8	0.00%	0	0.00%	1.8	0.00%
Miscellaneous	243.5	0.04%	0	0.00%	243.5	0.09%
Office	2.3	0.00%	2.3	0.00%		
Public/Utilities	21.9	0.00%	0	0.00%	21.9	0.01%
Recreational	1.2	0.00%	0	0.00%	1.2	0.00%
Residential	465.4	0.07%	462.1	0.13%	3.3	0.00%
Retail/ Commercial	15.4	0.00%	15.4	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	19.6	0.00%	0.2	0.00%	19.4	0.01%
0.2% Annual Chance Total	**776.5**	**0.12%**	**485.3**	**0.13%**	**291.2**	**0.10%**
X Protected by Levee						
Agricultural	0	0.00%	0	0.00%	0	0.00%
Care/Health	1.5	0.00%	1.3	0.00%	0.2	0.00%
Church/Welfare	0	0.00%	0	0.00%	0	0.00%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Industrial	0	0.00%	0	0.00%	0	0.00%
Miscellaneous	6.9	0.00%	0	0.00%	6.9	0.00%
Office	0.1	0.00%	0.1	0.00%		
Public/Utilities	10.0	0.00%	0	0.00%	10.0	0.00%
Recreational	0	0.00%	0	0.00%	0	0.00%
Residential	175.1	0.03%	171.4	0.05%	3.7	0.00%
Retail/ Commercial	2.0	0.00%	2.0	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	1.2	0.00%			1.2	0.00%
X Protected by Levee Total	**196.8**	**0.03%**	**174.8**	**0.05%**	**22.0**	**0.01%**
0.2% Annual Chance Flood Hazard Total	**973.3**	**0.15%**	**660.2**	**0.18%**	**313.2**	**0.11%**
Other Areas						
Zone X						
Agricultural	3,365.2	0.52%	946.4	0.26%	2,418.7	0.85%
Care/Health	10.7	0.00%	7.2	0.00%	3.5	0.00%
Church/Welfare	107.2	0.02%	97.4	0.03%	9.8	0.00%
Industrial	3,829.2	0.59%	3,466.5	0.96%	362.6	0.13%
Miscellaneous	1,740.4	0.27%	0.0	0.00%	1,740.4	0.61%
Office	834.7	0.13%	724.2	0.20%	110.5	0.04%
Public/Utilities	304.4	0.05%	0	0.00%	304.4	0.11%
Recreational	70.0	0.01%	32.2	0.01%	37.8	0.01%
Residential	3,685.8	0.57%	3,564.8	0.99%	121.0	0.04%
Retail/ Commercial	445.5	0.07%	426.4	0.12%	19.0	0.01%
Unknown	0.1	0.00%	0.1	0.00%	0	0.00%
Vacant	4,870.6	0.76%	102.7	0.03%	4,768.0	1.68%
Zone X Total	**19,263.7**	**2.99%**	**9,368.0**	**2.59%**	**9,895.7**	**3.49%**
Other Areas Total	**19,263.7**	**2.99%**	**9,368.0**	**2.59%**	**9,895.7**	**3.49%**
Rancho Cordova Total	**21,385.6**	**3.32%**	**10,051.3**	**2.78%**	**11,334.4**	**4.00%**

Source: FEMA 11/2/2018 DFIRM

*This acre count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all acres in the 1% annual chance flood zone.

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Rancho Cordova – 2.14. According to this analysis, there is a total population of 41 and 2,388 residents of the City at risk to flooding in the 1% and 0.2% annual chance floodplains, respectively. This is shown in Table E-30.

Table E-30 City of Rancho Cordova – Count of Improved Residential Parcels and Population by Flood Zone

Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Rancho Cordova	19	41	1,116	2,388

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Rancho Cordova in identified DFIRM flood zones. GIS was used to determine whether the critical facility locations intersect a DFIRM flood zone, and if so, which flood zone they intersect. Details of critical facilities in DFIRM flood zones in the City of Rancho Cordova are shown in Figure E-21 for and detailed by dam inundation in Table E-31. Details of critical facility definition, type, name, and address and jurisdiction by DFIRM flood zones are listed in Appendix F.

Figure E-21 City of Rancho Cordova – Critical Facilities in DFIRM Flood Zones

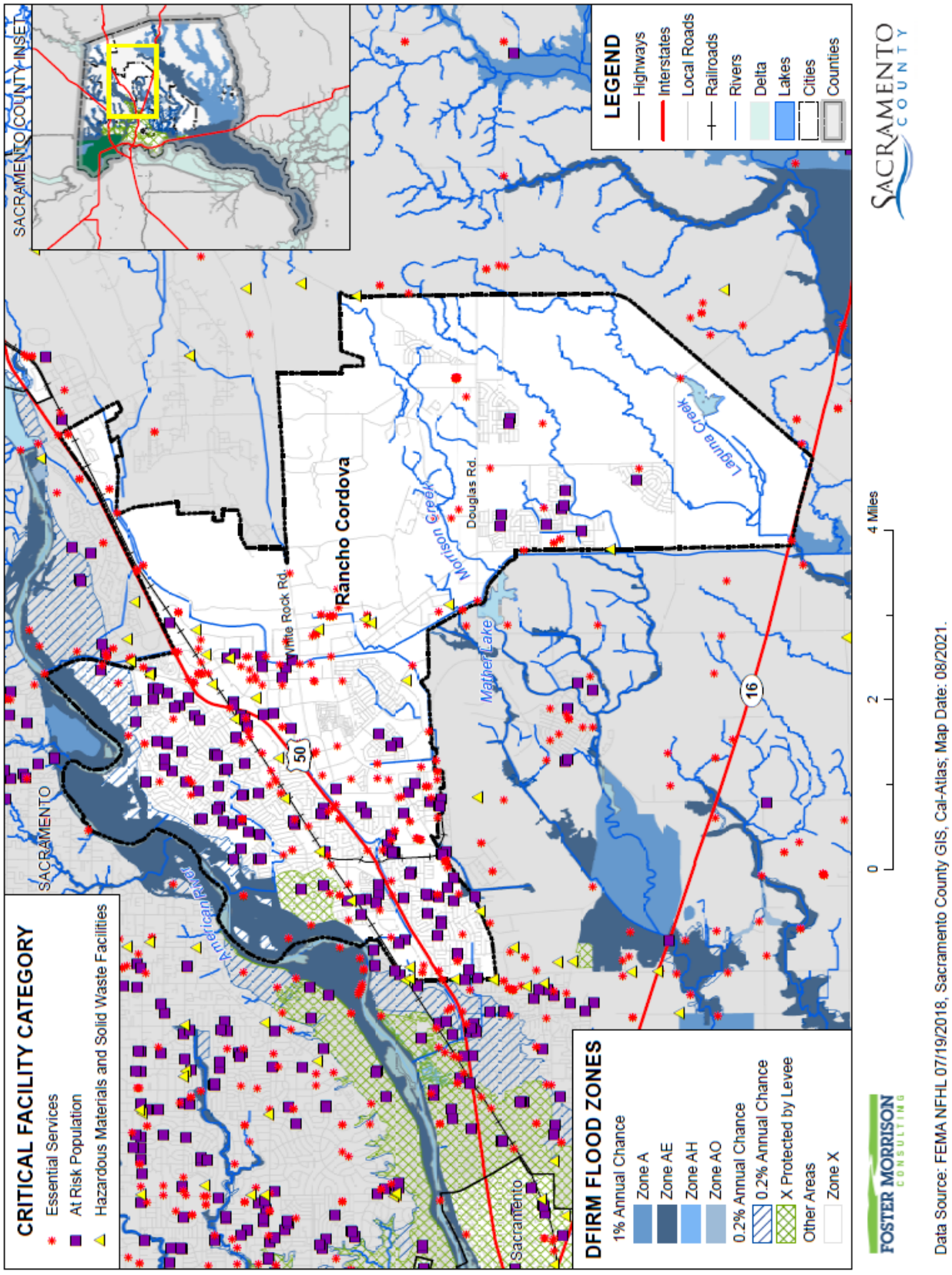


Table E-31 City of Rancho Cordova – Critical Facilities in DFIRM Flood Zones by Category and Type

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
1% Annual Chance Flood Hazard		
Essential Services Facilities	Water Well	3
	Total	**3**
1% Annual Chance Flood Hazard Total		**3**
0.2% Annual Chance Flood Hazard		
Essential Services Facilities	Drainage Pump Station	2
	Emergency Evacuation Center	1
	Water Well	2
	Total	**5**
At Risk Population Facilities	Community Center	1
	Day Care Center	1
	Places of Worship	3
	School	1
	Total	**6**
0.2% Annual Chance Flood Hazard Total		**11**
Other Areas		
Essential Services Facilities	Bridge	16
	Cellular Tower	14
	City Facility	5
	Drainage Pump Station	4
	Emergency Evacuation Center	5
	EMS Stations	6
	FDIC Insured Banks	11
	Fire Station	4
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	77
	Power Plants	1
	Public Transit Stations	4
	State Government Buildings	1
	Water Well	61
	Total	**217**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Community Center	4

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
	Day Care Center	22
	Mobile Home Parks	8
	Places of Worship	74
	School	33
	Senior Living or Other Living	3
	Total	**147**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	12
	Solid Waste Facility	2
	Tank Farm	2
	Waste Transfer Station	1
	Total	**20**
Other Areas Total		**384**
Rancho Cordova Total		**398**

Source: Sacramento County GIS, FEMA 7/19/2018 DFIRM

Insurance Coverage, Claims Paid, and Repetitive Losses

Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures located within a 100-year floodplain – a requirement that affects nearly all mortgages financed through commercial lending institutions. Flood insurance is also recommended for all structures protected by levees, even if not mapped within a floodplain.

The City of Rancho Cordova joined the National Flood Insurance Program (NFIP) on September 15, 2004. The City does not participate in CRS program. NFIP data indicates that as of March 24, 2020, there were 229 flood insurance policies in force in the City with $6,937,000 of coverage. Of the 229 policies, 224 were residential (single-family homes) and 5 were non-residential buildings. Of the 229 policies, 13 were in A zones, while 216 were in B, C, and X zones. There has been no historical claim for flood losses. NFIP data further indicates that there are no repetitive loss (RL) or severe repetitive loss (SRL) buildings in Rancho Cordova.

Based on this analysis of insurance coverage, the City has values at risk to the 1% annual chance and greater floods. Of the 19 improved parcels within the 1% annual chance flood zone, only 13 (or 68.4 percent) of those parcels maintain flood insurance. This can be seen on Table E-32.

Table E-32 City of Rancho Cordova – Percentage of Policy Holders to Improved Parcels in the 1% Annual Chance Floodplain

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Rancho Cordova	19	13	68.4%

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, NFIP CIS data 3/2020.

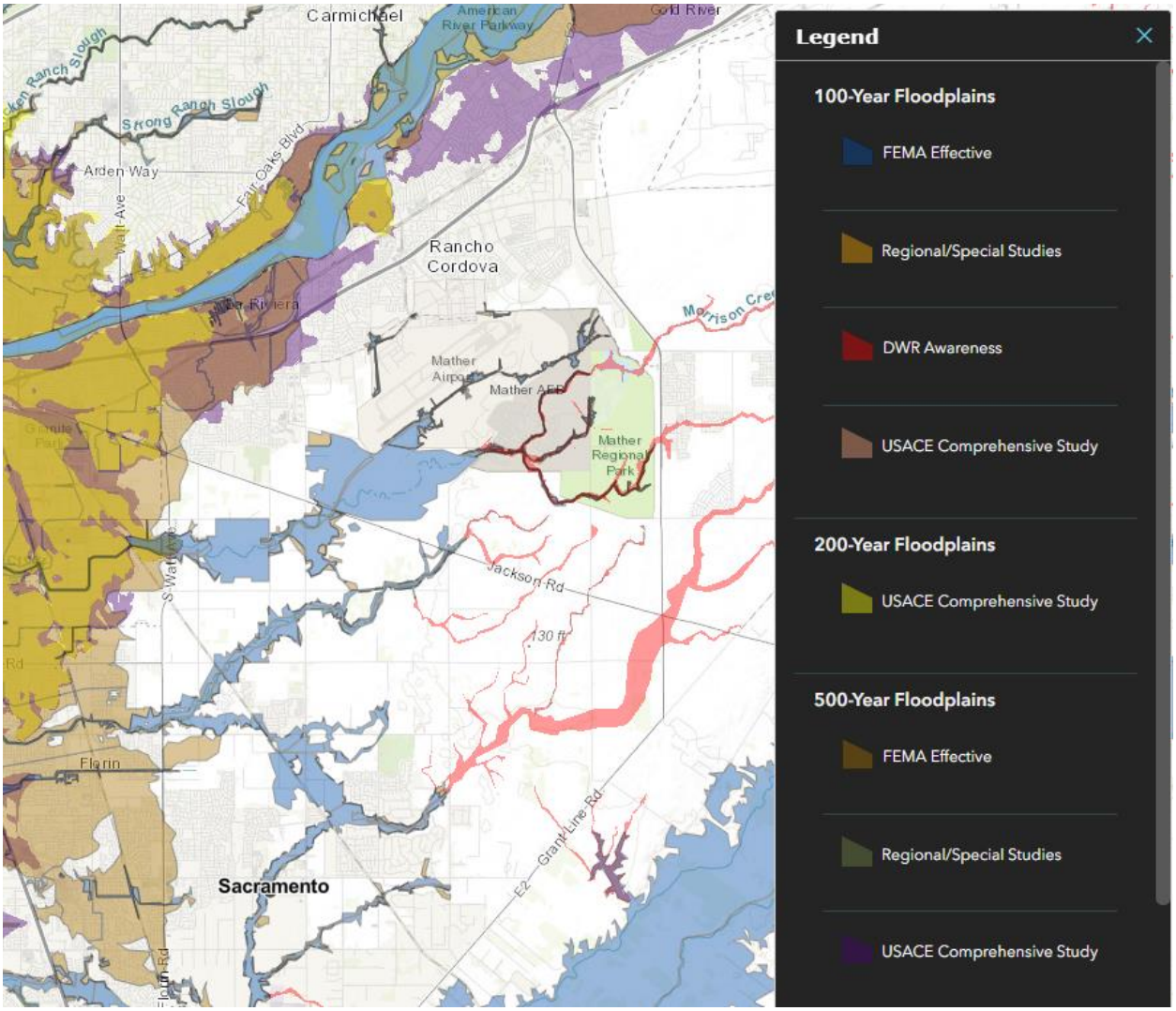
California Department of Water Resources Best Available Maps (BAM)

The FEMA regulatory maps provide just one perspective on flood risks in Sacramento County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Nevada-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-(as applicable), and 500-year event risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the City than that provided in the FEMA DFIRMs. The BAM map for Rancho Cordova is shown in Figure E-22.

Figure E-22 City of Rancho Cordova – Best Available Map



Source: California DWR

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1%r (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2% (2002 Sac and San Joaquin River Basins Comp Study).

Future Development

The potential for flooding may increase as floodwaters are channeled due to land development. Such changes can exacerbate flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning should be based on build out property use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the overall floodplain.

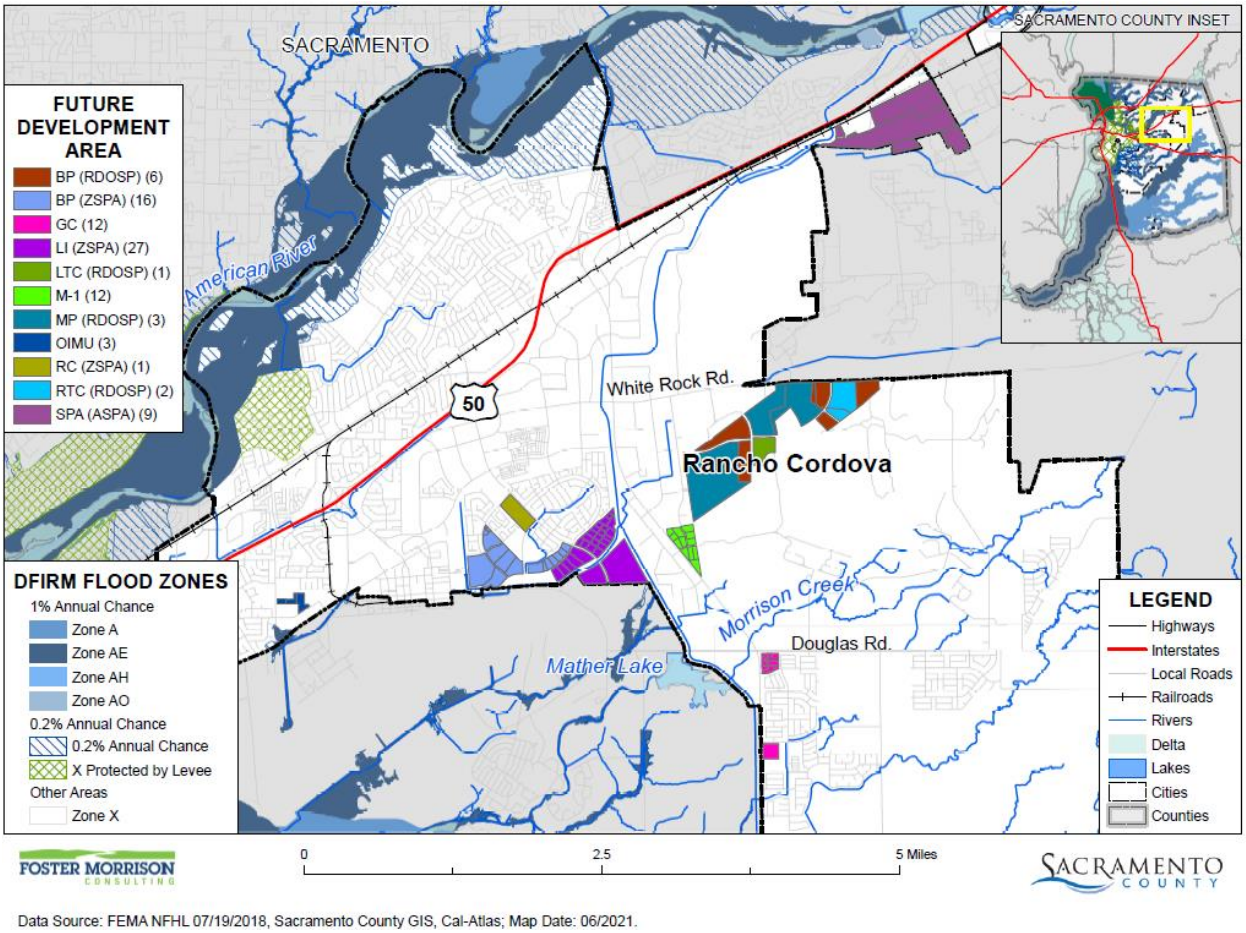
The City enforces the floodplain ordinance. If any development is to occur in the floodplain, it would have to conform to the elevation standards of the floodplain ordinance. No development is expected in the floodplain in the future. If applicable, any development proposed in a FEMA floodplain will be required to comply with the City's Floodplain Ordinances, FEMA Region 9 regulations, and the Central Valley Flood Protection Board.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure A 13 shows the locations of future development areas the City is planning to develop on the DFIRM flood zones, with a legend of these locations shown on Figure E-23. Table E-33 shows the parcels and acreages of each future development area in the City in the DFIRM flood zones.

More information as to the names and specific and special plan areas these fall into can be found in Table E-14.

Figure E-23 City of Rancho Cordova – Future Development and FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Table E-33 City of Rancho Cordova – Future Development Parcels and Acres by FEMA DFIRM Flood Zones

Flood Zone/ Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Other Areas			
Zone X			
BP (ZSPA)	16	3	105
GC	12	0	25
LI (ZSPA)	27	0	141
M-1	12	1	33
MP (RDOSP)	12	0	390
OIMU	3	0	11
RC (ZSPA)	1	0	25
SPA (ASPA)	9	2	213
Zone X Total	**92**	**6**	**944**
Other Areas Total	**92**	**6**	**944**
Grand Total	**92**	**6**	**944**

Source: City of Rancho Cordova, FEMA 7/19/2018 DFIRM

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The City of Rancho Cordova is subject to localized flooding throughout the City. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the City vary by location. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the City tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Currently the City experiences localized flooding issues associated with undersized drainage facilities in existing developed and developing areas. This includes existing drainage issues along Sunrise Boulevard south of White Rock Road where surface water flows exceed the capacity of drainage facilities (siphons and overchutes) of the Folsom South Canal. Existing 100-year peak flows are exceeded in several of these facilities and result in localized flooding along Sunrise Boulevard as well as discharge of drainage into the Folsom South Canal.

The City tracks localized flooding areas. Affected localized flood areas identified by the City of Rancho Cordova are summarized in Table E-34.

Table E-34 City of Rancho Cordova – List of Localized Flooding Problem Areas

Road Name	Flooding	Pavement Deterioration	Washout	High Water	Landslide/ Mudslide	Debris	Downed Trees
Bradshaw Rd, near southern city limits	x						
Coloma Rd and McGregor Dr	x						
Coloma Rd, just west of Sunrise Blvd	x						
Douglas Rd, West of Sunrise Blvd	x						
Ellenwood Ave and Routier Rd	x						
Folsom Blvd and Don Juan Dr	x						
International Dr between S White Rock Rd and Data Dr	x						
Kiefer Blvd	x						
Malaga Way	x						
Mills Tower Dr	x						
Sunrise Blvd near Monier Circle, Recycle Rd	x						
Trade Center Dr and Sunrise Blvd	x						

Source: City of Rancho Cordova

Past Occurrences

The City noted the following past occurrences of localized flooding:

February 2015 - Widespread rainfall of 3 to 6 inches fell causing river flooding and urban flooding in poor drainage areas. A power outage left 8,000 customers without power in Sacramento, KCRA-TV reported. The outage was attributed to lightning after a Sacramento Municipal Utility District was damaged. The SMUD said 14,000 additional customers were left without power in the Carmichael-Rancho Cordova area.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the City and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to road, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Future Development

Future development in the City will add more impervious surfaces causing an increase in stormwater runoff and the continued need to drain these waters. The City will need to be proactive to ensure that increased development has proper siting and drainage for stormwaters. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Another factor that will reduce local flooding is implementing the City's Hydromodification Management and Low Impact Development requirements, which helps reduce runoff from new development areas. Mitigating the root causes of the localized stormwater flooding will reduce future risks of losses.

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the City, County, and surrounding region is at risk, as pandemic is a regional, national, or international event. The speed of onset of pandemic is usually short, while the

duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table E-35.

Table E-35 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic flu.

- The **1918-1919 Influenza Pandemic (H1N1)**
- The **February 1957-1958 Influenza Pandemic (H2N2)**
- The **1968 Influenza Pandemic (H3N2)**

To date, the 21st century has seen two acknowledged pandemics.

- **2009 Swine Flu (H1N1**)
- **2019/2020 COVID 19**

Vulnerability to and Impacts from Pandemic

Pandemic has and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the City. Pandemic can have varying levels of impact to the citizens of the City and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently) an unemployment rose significantly. Supply chains for food can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

Future Development

Future development is not expected to be significantly impacted by this hazard, though population growth in the City could increase exposure to a pandemic, and increase the ability of each disease to be transmitted among the population of the City. If the median age of City residents continues to increase, vulnerability to pandemic diseases may increase, due to the fact that these diseases are often more deadly to senior citizens.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and lasts for several weeks. Heat kills by taxing the human body beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature." Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the City, there are risk to the built environment from extreme heat. While extreme heat on its own does not usually affect structures, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat can lead to power outages and when combined with high winds, to Public Safety Power Shutdown (PSPS) events, creating significant issues in the City. However, PSPS events in the City have not occurred with SMUD's reliable system and PG&E's refined system for shutting power off in high wildfire risk areas.

Location and Extent

Heat is a regional phenomenon and affects the whole of the City. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

The City Planning Team noted that since extreme heat is a regional phenomenon, events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

The City opened cooling centers within the last five years on the following dates:

- September 6-8, 2020
- August 14-21, 2020
- August 14-16, 2019
- August 28-September 2, 2017
- August 1, 2017
- June 18-22, 2017
- July 26-29, 2016
- June 27-29, 2016
- June 2-4, 2016
- September 9-11, 2015
- July 28-30, 2015

Vulnerability to and Impacts from Extreme Heat

The City experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-115°F in rather extreme situations. During these times, drought conditions may worsen and the City may see an increase in dry fuels. Also, power outage and PSPS events may occur during these times as well. Health issues are the primary concern with this hazard, although economic impacts can also be an issue.

The elderly and individuals below the poverty level are the most vulnerable to extreme temperatures. Nursing homes and elder care facilities are especially vulnerable to extreme heat events if power outages occur and air conditioning is not available. In addition, individuals below the poverty level may be at increased risk to extreme heat if use of air conditioning is not affordable. This is especially true of homeless people and the transient population.

Days of extreme heat have been known to result in medical emergencies, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts. Extreme heat can also dry out vegetations, making it more vulnerable to wildfire ignitions.

Future Development

Future development of new buildings in the City will likely not be affected by extreme heat. Extreme heat is more likely to affect vulnerable populations. Vulnerability to extreme heat will increase as the average age of the population in each City shifts. It is encouraged that nursing homes and elder care facilities have emergency plans or backup power to address power failure during times of extreme heat and in the event of a PSPS. Low income residents and homeless populations are also vulnerable. Cooling centers for these populations should be utilized when necessary.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the City occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the City falls mainly in the fall, winter, and spring months. Wind often accompanies these storms; hail and lightning are rare in the City.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the City. All portions of the City are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Hail and lightning are rare in the City and Sacramento County. Duration of severe storms in California, Sacramento County, and the City can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the City. This is the cause of many of the federal disaster declarations related to flooding.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the City. These events can cause significant and localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the City, but also can cause damage, with lightning occasionally igniting wildfires.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Power outages may also occur. Heavy rains and storms often result in flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

Future Development

Building codes in the City ensure that new development is built to current building standards, which should reduce the risk to future development in the City from heavy rains and storms. New critical facilities such as communications towers and others should be built to withstand hail damage, lightning, and thunderstorm winds. With adherence to development standards, future losses to new development should be minimal.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire City is subject to significant, non-tornadic (straight-line), winds. Each area of the County and City is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and City. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The City noted that since high winds is a regional phenomenon, events that affected the lower elevations of the City also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.5.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the City throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County and City. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the City will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Increased PSPS events
- Occasional building damage, primarily to roofs

Future Development

Future development projects will consider wind hazards at the planning, and design stage with the goal of reducing vulnerability. The City enforces the state building code and other ordinances, which regulate construction techniques that minimize damage from windstorms. Future development in the City is subject to these building codes. New critical facilities should also consider adding generators for times of PSPS.

Wildfire

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the City of Rancho Cordova. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of

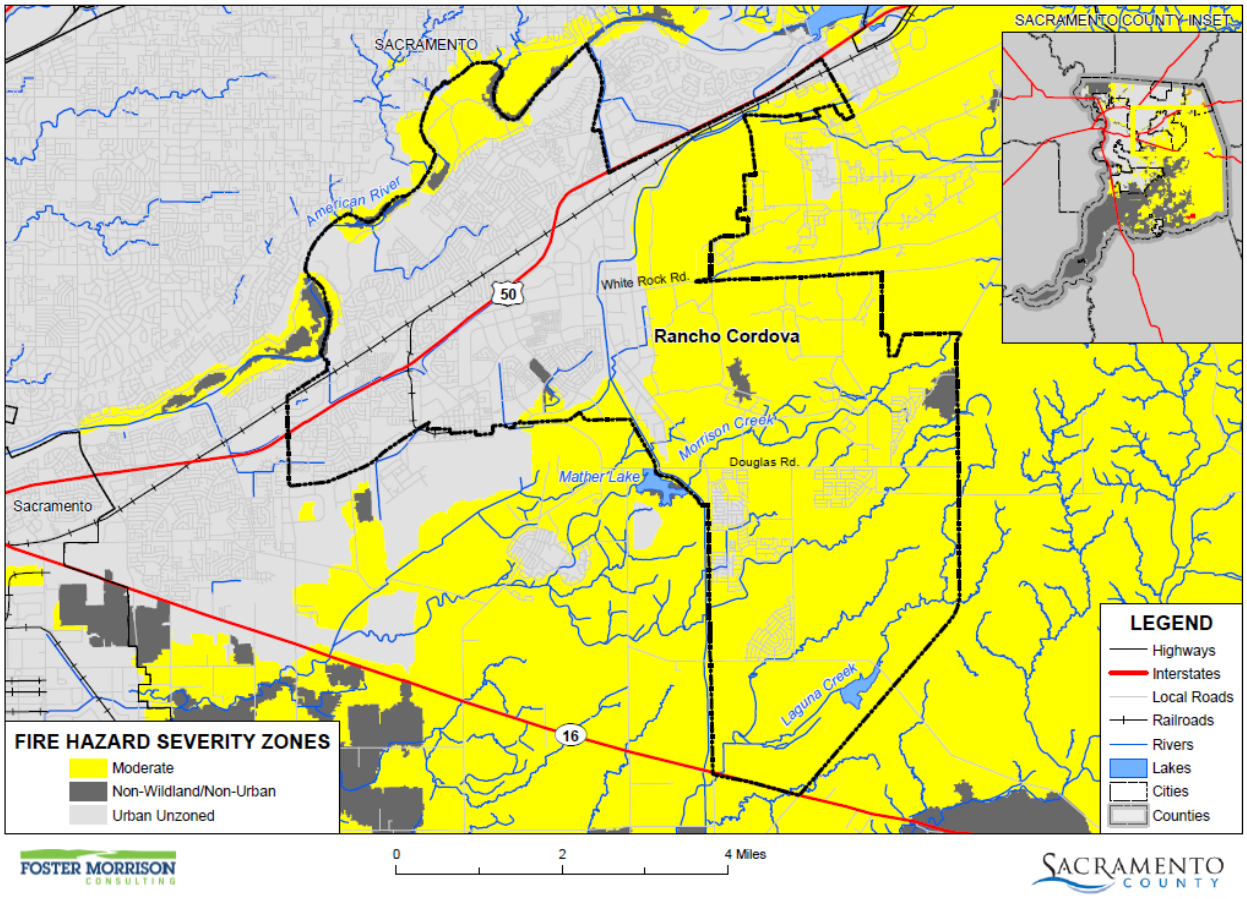
high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. These high winds can result in red flag days, and can result in PSPS events in the City. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

The Sacramento Metropolitan Fire District (SMFD) provides fire protection and prevention, fire safety education, and emergency medical response services to the citizens of Rancho Cordova. The City cooperates with SMFD to ensure adequate service levels for the City's residents.

Location and Extent

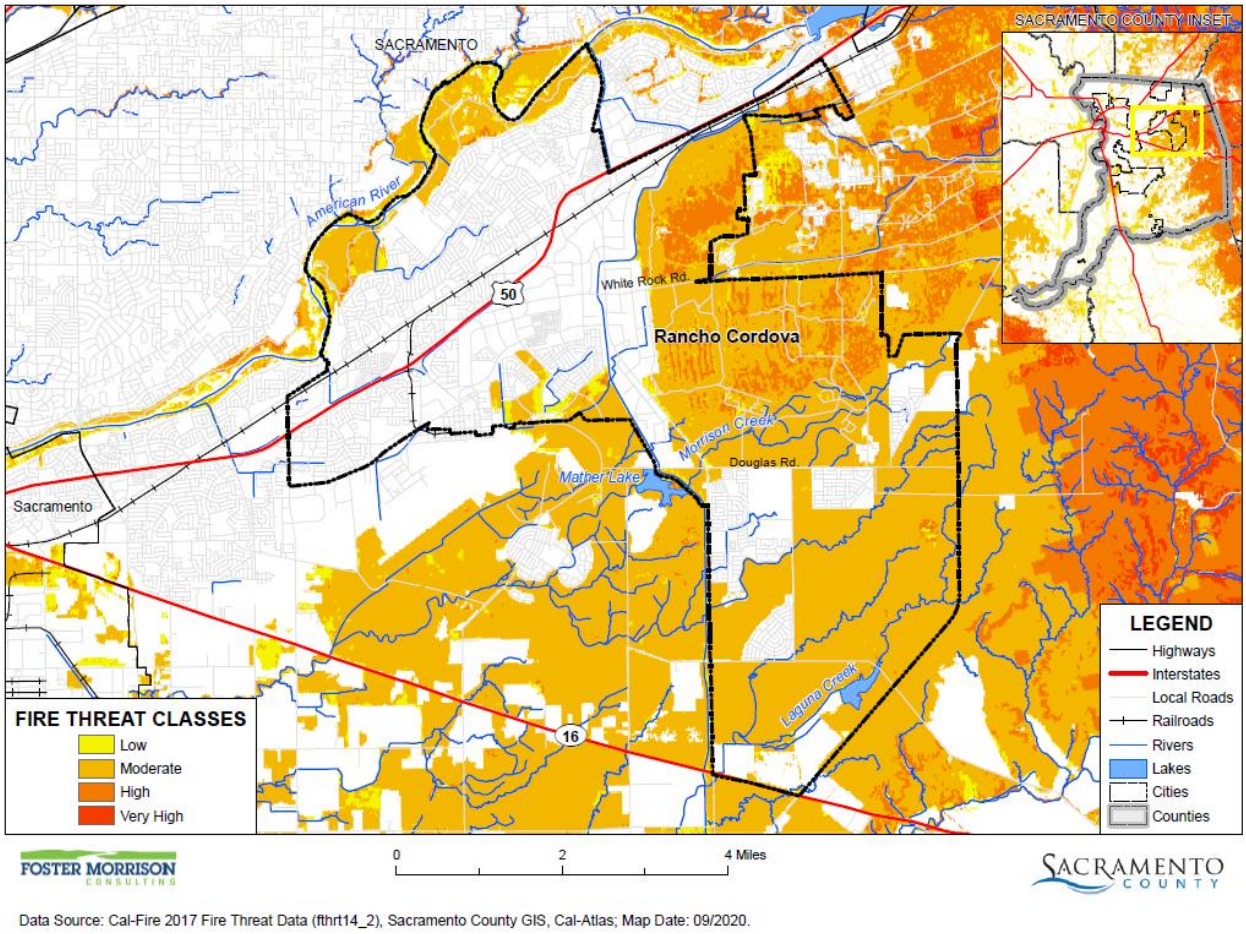
Wildfire can affect all areas of the City. CAL FIRE has estimated that the risk varies across the City and has created maps showing risk variance. Following the methodology described in Section 4.3.19 of the Base Plan, wildfire maps for the City of Rancho Cordova were created. Figure E-24 shows the CAL FIRE Fire Hazard Severity Zones (FHSZs) in the City. As shown on the maps, FHSZs within the City range from Urban Unzoned to Moderate. Figure E-25 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, fire threat within the City ranges from No Threat to High.

Figure E-24 City of Rancho Cordova – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure E-25 City of Rancho Cordova – Fire Threat Areas



Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more. Geographical FHSZ extent from CAL FIRE is shown in Table E-36. Geographical Fire Threat Area extents from CAL FIRE are shown on Table E-37.

Table E-36 City of Rancho Cordova – Geographical FHSZ Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	0	0.00%	0	0.00%	0	0.00%
Moderate	12,957.3	60.59%	3,986.7	39.66%	8,970.6	79.14%
Non-Wildland/non-Urban	293.3	1.37%	5.6	0.06%	287.7	2.54%

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Urban Unzoned	8,135.0	38.04%	6,059.0	60.28%	2,076.1	18.32%
Total	**21,385.6**	**100.00%**	**10,051.3**	**100.00%**	**11,334.4**	**100.00%**

Source: CAL FIRE

Table E-37 City of Rancho Cordova – Geographical Fire Threat Area Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	1,122.4	5.25%	402.4	4.00%	720.1	6.35%
Moderate	9,953.4	46.54%	2,238.3	22.27%	7,715.0	68.07%
Low	459.0	2.15%	56.2	0.56%	402.8	3.55%
No Threat	9,850.8	46.06%	7,354.3	73.17%	2,496.4	22.03%
Total	**21,385.6**	**100.00%**	**10,051.3**	**100.00%**	**11,334.4**	**100.00%**

Source: CAL FIRE

Past Occurrences

There has been no state and one federal disaster declaration due to fire, as shown in Table E-38. It should be noted that this fire disaster was from an explosion in Roseville, and not from an actual wildfire.

Table E-38 Sacramento County – State and Federal Wildfire Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

In **June of 2020**, the Grant Fire affected the City of Rancho Cordova. A wind-stoked grass fire quickly charred more than 5,000, prompting evacuations and road closures in a sparsely populated area of east Sacramento County between Rancho Cordova and Folsom. The fire mostly burned grasslands, which allowed firefighters to extinguish the blaze before it got close to Rancho Cordova. One outbuilding was destroyed in the unincorporated County, and no injuries or damages were reported.

Vulnerability to and Impacts from Wildfire

Fuel loads in the County and Cities, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. The more urbanized areas within the County are not immune from fire. The dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of

ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and City, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Rancho Cordova is not immune to numerous types of grass and brush fires and any one of them may accelerate into an urban interface wildfire. Such a situation could lead to evacuation of large portions of the population and the potential for significant loss of personal property, structures, and rangeland. The natural fuels available in or near the City vary greatly in the rate and intensity of burning. Fires in heavy brush and stands of trees burn with great intensity but more slowly than in dry grass and leaves. Dense fuels will propagate fire better than sparse fuels.

In addition to fire related hazards from structures in urbanized areas, the Ranch Cordova General Plan Safety Element (2018) noted that the main source of wildland fire in the City occurs where natural resource and habitat areas interface with urbanized development (e.g., along the American River Parkway and northern boundary of the City). Additionally, several of the new and proposed developments in the City contain large wetland preserves with natural vegetation, which have the potential to ignite and pose safety risks to adjacent and surrounding developments.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and timber; and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the City. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the City by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the City; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate a PSPS which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Assets at Risk

Based on the vulnerability of Rancho Cordova to the wildfire hazard, the sections that follow describes significant assets at risk in the City of Rancho Cordova. This section includes the values at risk, population at risk, and critical facilities at risk.

Values at Risk in Fire Hazard Severity Zones

GIS was used to determine the possible impacts of wildfire within the City of Rancho Cordova. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire hazard severity zones. Summary analysis results for Rancho Cordova are shown in Table E-39, which summarizes total parcel counts, improved parcel counts and their structure values by fire hazard severity zone. Table E-40 breaks out the Table E-39 by adding the property use details by fire hazard severity zone for the City.

Table E-39 City of Rancho Cordova – Count and Value of Parcels by Fire Hazard Severity Zone

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate	6,018	4,547	$717,507,511	$1,392,960,061	$795,178,643	$2,905,646,250
Non-Wildland/Non-Urban	11	2	$6,904,882	$428,132	$214,066	$7,547,080
Urban Unzoned	17,756	16,983	$1,972,544,221	$5,434,760,411	$4,203,228,459	$11,610,532,935
Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table E-40 City of Rancho Cordova – Count and Value of Parcels by Fire Hazard Severity Zone and Property Use

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate						
Agricultural	23	3	$22,734,349	$142,065	$142,065	$23,018,479
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	1	0	$9	$0	$0	$9
Industrial	97	90	$43,293,600	$80,935,544	$121,403,318	$245,632,460
Miscellaneous	183	0	$266,649	$0	$0	$266,649
Office	1	1	$400,000	$390,000	$390,000	$1,180,000
Public/Utilities	1	0	$10	$0	$0	$10
Recreational	2	0	$19	$0	$0	$19
Residential	4,566	4,437	$480,339,049	$1,274,206,793	$637,103,367	$2,391,649,246
Retail / Commercial	10	10	$10,151,598	$36,139,893	$36,139,893	$82,431,384
Unknown	0	0	$0	$0	$0	$0
Vacant	1,134	6	$160,322,228	$1,145,766	$0	$161,467,994
Moderate Total	**6,018**	**4,547**	**$717,507,511**	**$1,392,960,061**	**$795,178,643**	**$2,905,646,250**

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Non-Wildland/Non-Urban						
Agricultural	1	0	$84,511	$0	$0	$84,511
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	7	0	$19	$0	$0	$19
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	2	2	$198,731	$428,132	$214,066	$840,929
Retail / Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	1	0	$6,621,621	$0	$0	$6,621,621
Non-Wildland/Non-Urban Total	**11**	**2**	**$6,904,882**	**$428,132**	**$214,066**	**$7,547,080**
Urban Unzoned						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	13	11	$3,130,790	$21,931,121	$21,931,121	$46,993,032
Church/Welfare	32	32	$19,175,428	$58,389,789	$58,389,789	$135,955,006
Industrial	646	616	$260,992,552	$677,109,658	$1,015,664,493	$1,953,766,696
Miscellaneous	335	1	$478,857	$1,085	$1,085	$481,027
Office	291	262	$269,896,128	$1,139,469,175	$1,139,469,175	$2,548,834,478
Public/Utilities	58	0	$9	$0	$0	$9
Recreational	14	10	$8,063,736	$22,999,996	$22,999,996	$54,063,728
Residential	15,863	15,800	$1,128,914,181	$3,138,012,401	$1,569,006,222	$5,835,932,655
Retail / Commercial	256	240	$201,079,581	$375,766,578	$375,766,578	$952,612,737
Unknown	3	3	$0	$311,254	$0	$311,254
Vacant	245	8	$80,812,959	$769,354	$0	$81,582,313
Urban Unzoned Total	**17,756**	**16,983**	**$1,972,544,221**	**$5,434,760,411**	**$4,203,228,459**	**$11,610,532,935**
Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Values at Risk in Fire Threat Areas

GIS was used to determine the possible impacts of wildfire within the City of Rancho Cordova. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire threat area. Summary analysis results for Rancho Cordova are shown in Table E-41, which summarizes total parcel counts, improved parcel counts and their structure values by fire threat area. Table E-42 breaks out the Table E-41 by adding the property use details by threat areas for the City.

Table E-41 City of Rancho Cordova – Count and Value of Parcels by Fire Threat Area

Jurisdiction / Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	0	0	$0	$0	$0	$0
High	12	2	$1,063,212	$1,129,950	$1,564,925	$3,758,087
Moderate	1,275	268	$203,019,166	$89,618,589	$61,131,735	$353,769,501
Low	175	71	$17,185,898	$35,417,063	$41,930,608	$94,533,581
No Threat	22,323	21,191	$2,475,688,338	$6,701,983,002	$4,893,993,900	$14,071,665,096
Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table E-42 City of Rancho Cordova – Count and Value of Parcels by Fire Threat Area and Property Use

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
High						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	2	1	$855,392	$999,950	$1,499,925	$3,355,267
Miscellaneous	1	0	$0	$0	$0	$0
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	1	1	$55,096	$130,000	$65,000	$250,096
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	8	0	$152,724	$0	$0	$152,724
High Total	**12**	**2**	**$1,063,212**	**$1,129,950**	**$1,564,925**	**$3,758,087**

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate						
Agricultural	20	1	$21,853,389	$13,698	$13,698	$21,880,785
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	4	3	$14,453,904	$941,778	$1,412,666	$16,808,349
Miscellaneous	86	0	$21,721	$0	$0	$21,721
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	1	0	$9	$0	$0	$9
Residential	322	254	$26,611,707	$57,893,826	$28,946,908	$113,452,451
Retail/ Commercial	9	9	$8,816,355	$30,758,463	$30,758,463	$70,333,281
Unknown	0	0	$0	$0	$0	$0
Vacant	833	1	$131,262,081	$10,824	$0	$131,272,905
Moderate Total	**1,275**	**268**	**$203,019,166**	**$89,618,589**	**$61,131,735**	**$353,769,501**
Low						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	2	2	$4,124,243	$24,222,083	$36,333,124	$64,679,450
Miscellaneous	15	0	$94	$0	$0	$94
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	75	69	$4,853,710	$11,194,980	$5,597,484	$21,646,186
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	83	0	$8,207,851	$0	$0	$8,207,851
Low Total	**175**	**71**	**$17,185,898**	**$35,417,063**	**$41,930,608**	**$94,533,581**
No Threat						
Agricultural	4	2	$965,471	$128,367	$128,367	$1,222,205
Care/Health	13	11	$3,130,790	$21,931,121	$21,931,121	$46,993,032
Church/Welfare	33	32	$19,175,437	$58,389,789	$58,389,789	$135,955,015
Industrial	735	700	$284,852,613	$731,881,391	$1,097,822,096	$2,114,556,090
Miscellaneous	423	1	$723,710	$1,085	$1,085	$725,880

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Office	292	263	$270,296,128	$1,139,859,175	$1,139,859,175	$2,550,014,478
Public/Utilities	59	0	$19	$0	$0	$19
Recreational	15	10	$8,063,746	$22,999,996	$22,999,996	$54,063,738
Residential	20,033	19,915	$1,577,931,448	$4,343,428,520	$2,171,714,263	$8,093,074,097
Retail/ Commercial	257	241	$202,414,824	$381,148,008	$381,148,008	$964,710,840
Unknown	3	3	$0	$311,254	$0	$311,254
Vacant	456	13	$108,134,152	$1,904,296	$0	$110,038,448
No Threat Total	**22,323**	**21,191**	**$2,475,688,338**	**$6,701,983,002**	**$4,893,993,900**	**$14,071,665,096**
Rancho Cordova Total	**23,785**	**21,532**	**$2,696,956,614**	**$6,828,148,604**	**$4,998,621,168**	**$14,523,726,265**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Population at Risk

The FHSZ dataset was overlayed on the parcel layer. Those residential parcel centroids that intersect the FHSZs were counted and multiplied by the 2010 Census Bureau average household factors for the City of Rancho Cordova – 2.14. According to this analysis, there is a total population of 9,495 residents of Rancho Cordova at risk to moderate or higher FHSZs, while there is a total of 546 in the moderate or higher fire threat areas. This is shown in Table E-43 and Table E-44, respectively.

Table E-43 City of Rancho Cordova – Count of Improved Residential Parcels and Population by Fire Hazard Severity Zone

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Rancho Cordova	0	0	0	0	4,437	9,495

Source: CAL FIRE, US Census Bureau Average Household Sizes: Rancho Cordova (2.14)

Table E-44 City of Rancho Cordova – Count of Improved Residential Parcels and Population by Fire Threat Area

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Rancho Cordova	0	0	1	2	254	544

Source: CAL FIRE, US Census Bureau Average Household Sizes: Rancho Cordova (2.14)

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Rancho Cordova in identified FHSZs. Critical facilities in a FHSZ in the City of Rancho Cordova are shown in Figure E-26 and detailed in Table E-45. Critical facilities in a fire threat area in the City of Rancho Cordova are shown in Figure E-27 and detailed in Table E-46. Details of critical facility definition, type, name and address and jurisdiction by fire hazard severity zone are listed in Appendix F.

Figure E-26 City of Rancho Cordova – Critical Facilities in Fire Hazard Severity Zones

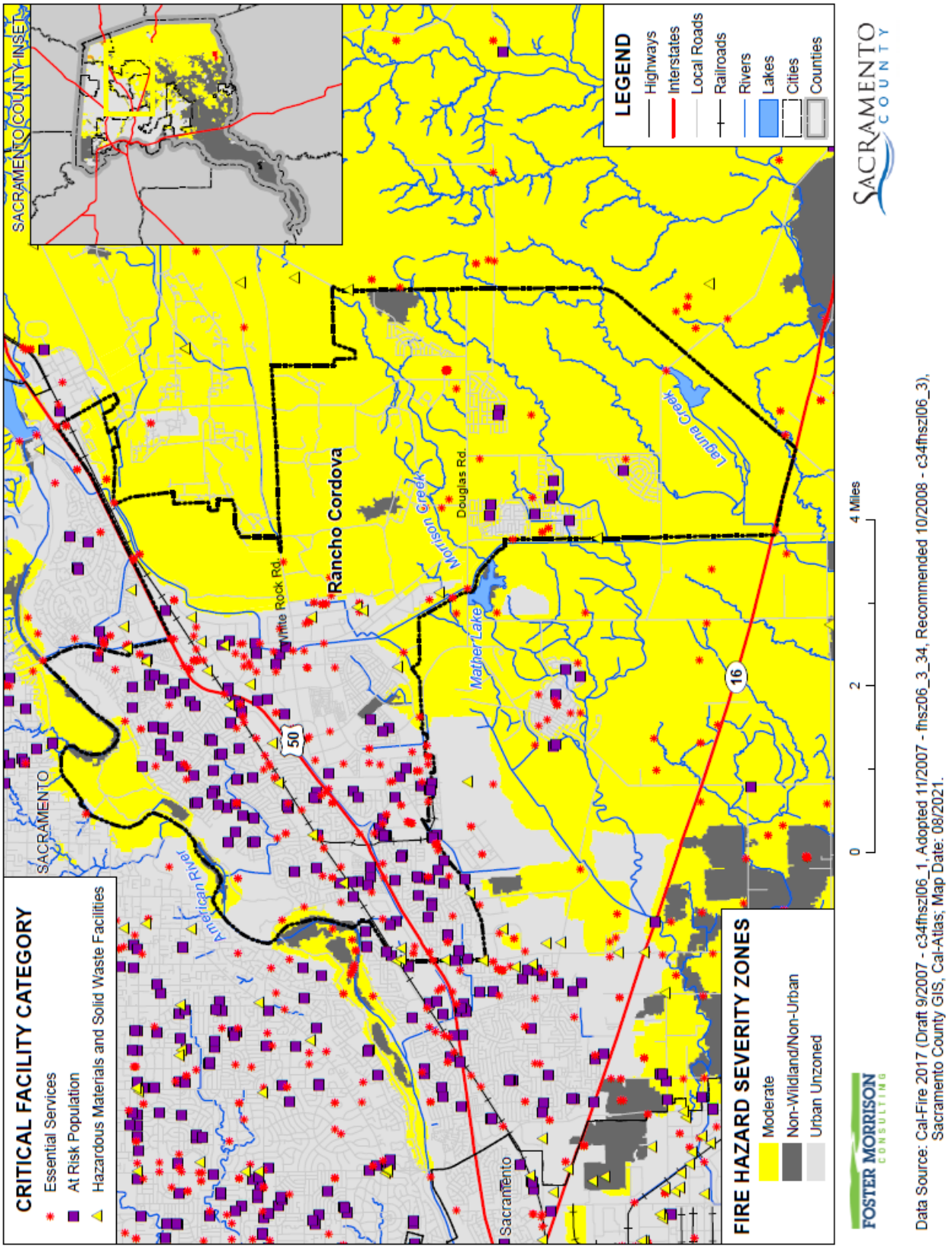


Table E-45 City of Rancho Cordova – Critical Facilities in Fire Hazard Severity Zone by Category and Type

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
Moderate		
Essential Services Facilities	Bridge	4
	Cellular Tower	2
	City Facility	1
	Drainage Pump Station	3
	EMS Stations	1
	FDIC Insured Banks	1
	Fire Station	1
	Microwave Service Towers	20
	Water Well	14
	Total	**47**
At Risk Population Facilities	Community Center	2
	Day Care Center	1
	Places of Worship	5
	School	3
	Total	**11**
Hazardous Materials and Solid Waste Facilities	Solid Waste Facility	1
	Total	**1**
Moderate Total		**59**
Urban Unzoned		
Essential Services Facilities	Bridge	12
	Cellular Tower	12
	City Facility	4
	Drainage Pump Station	3
	Emergency Evacuation Center	6
	EMS Stations	5
	FDIC Insured Banks	10
	Fire Station	3
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	57
	Power Plants	1
	Public Transit Stations	4
	State Government Buildings	1

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
	Water Well	52
	Total	**178**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Community Center	3
	Day Care Center	22
	Mobile Home Parks	8
	Places of Worship	72
	School	31
	Senior Living or Other Living	3
	Total	**142**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	12
	Solid Waste Facility	1
	Tank Farm	2
	Waste Transfer Station	1
	Total	**19**
Urban Unzoned Total		**339**
Rancho Cordova Total		**398**

Source: CAL FIRE, Sacramento County

Figure E-27 City of Rancho Cordova – Critical Facilities in Fire Threat Areas

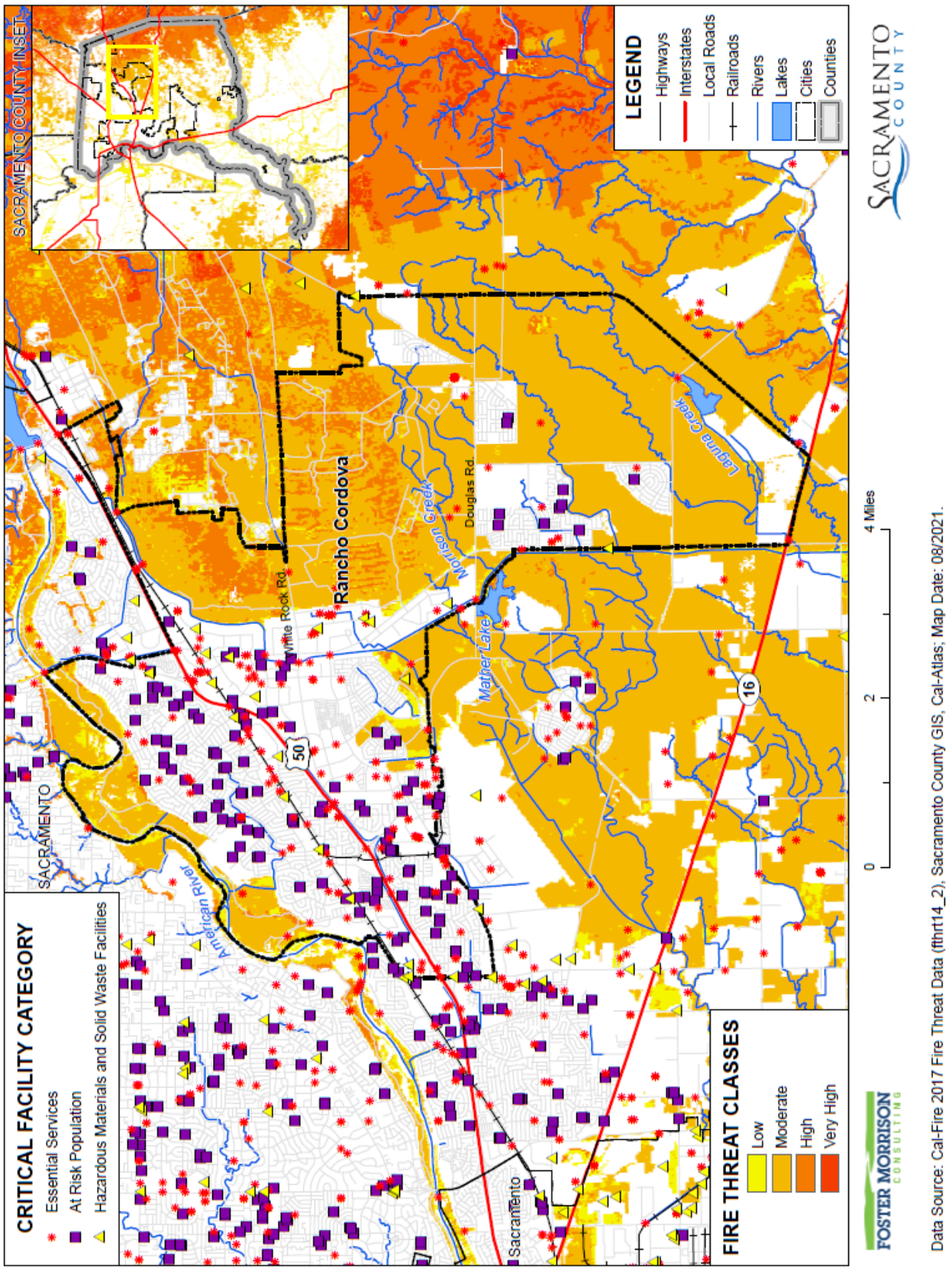


Table E-46 City of Rancho Cordova – Critical Facilities in Fire Threat Areas by Category and Type

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
Low		
Essential Services Facilities	Water Well	1
	Total	**1**
Low Total		**1**
Moderate		
Essential Services Facilities	Bridge	2
	Drainage Pump Station	1
	Water Well	11
	Total	**14**
Hazardous Materials and Solid Waste Facilities	Solid Waste Facility	1
	Total	**1**
Moderate Total		**15**
No Threat		
Essential Services Facilities	Bridge	14
	Cellular Tower	14
	City Facility	5
	Drainage Pump Station	5
	Emergency Evacuation Center	6
	EMS Stations	6
	FDIC Insured Banks	11
	Fire Station	4
	Hospital or Urgent Care	4
	Law Enforcement	4
	Microwave Service Towers	77
	Power Plants	1
	Public Transit Stations	4
	State Government Buildings	1
	Water Well	54
	Total	**210**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Community Center	5
	Day Care Center	23
	Mobile Home Parks	8
	Places of Worship	77

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
	School	34
	Senior Living or Other Living	3
	Total	**153**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	12
	Solid Waste Facility	1
	Tank Farm	2
	Waste Transfer Station	1
	Total	**19**
No Threat Total		**382**
Rancho Cordova Total		**398**

Source: CAL FIRE, Sacramento County

Future Development

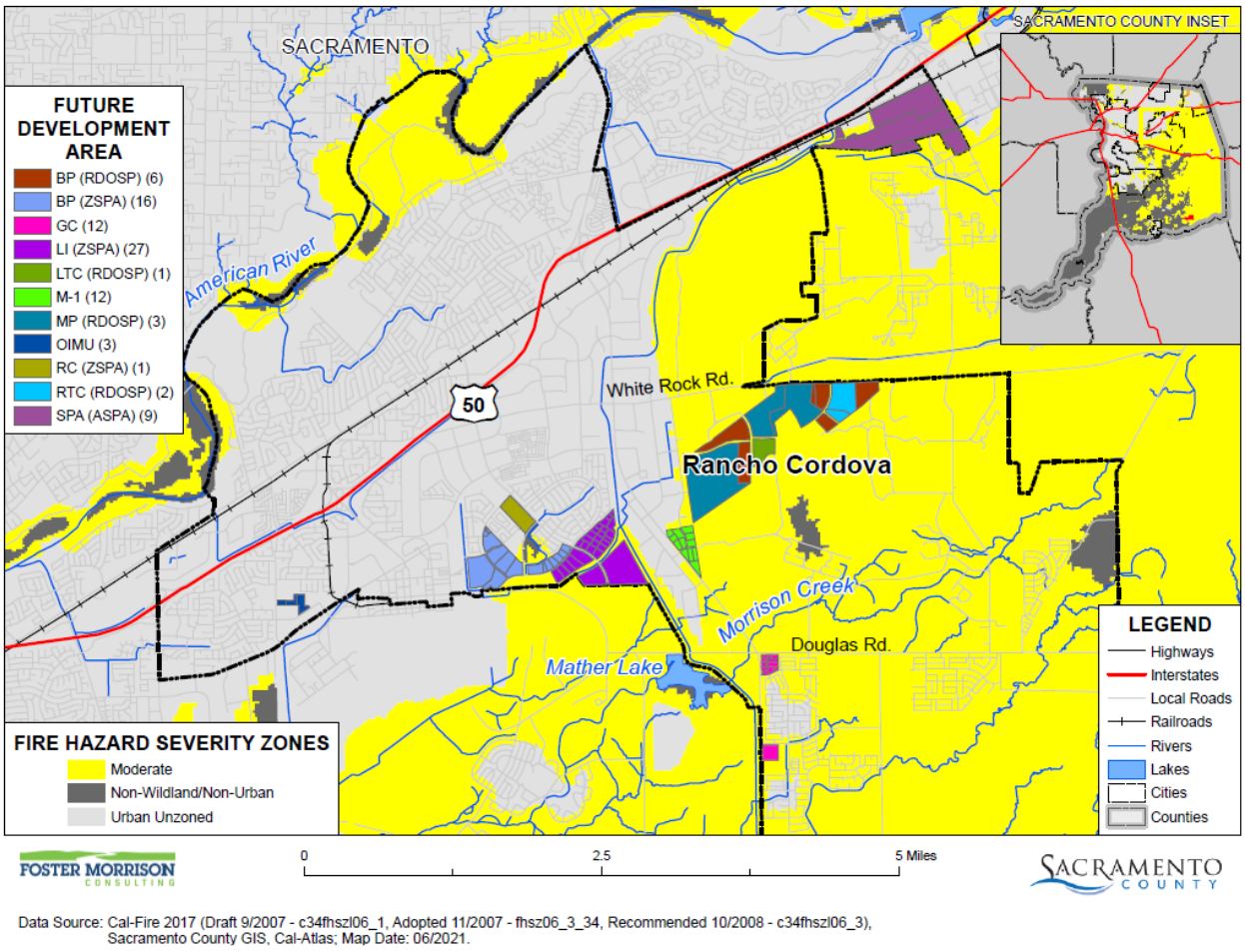
Additional growth and development within moderate or higher fire hazard severity zones in the City would place additional values at risk to wildfire. City building codes are in effect and should continue to be updated as appropriate to reduce this risk. Municipal Code, Chapter 17.12 requires that all dry grass, brush, vines or other dry vegetation shall be cleared for an area of not less than 30 feet from all structures, combustible fences, vehicles and combustible storage.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Table E-47 shows the locations of future development areas the City is planning to develop on the FHSZs. Figure E-28 shows the parcels and acreages of each future development area in the City in each FHSZ. Figure E-29 shows the locations of future development areas the City is planning to develop on the Fire Threat Area. Table E-48 shows the parcels and acreages of each future development area in the City in each Fire Threat Area.

More information as to the names and specific and special plan areas these fall into can be found in Table E-14.

Figure E-28 City of Rancho Cordova – Future Development in FHSZs



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

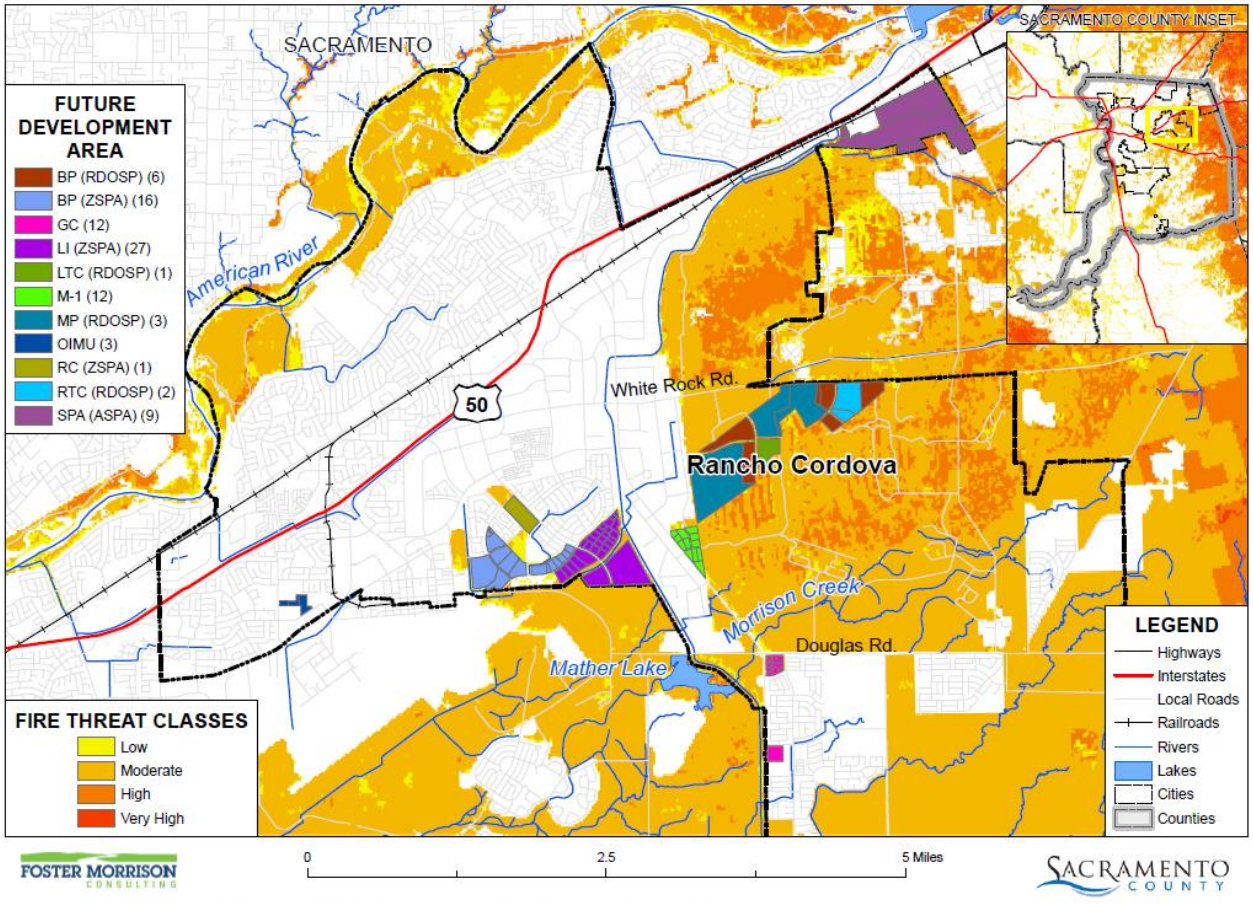
Table E-47 City of Rancho Cordova – Future Development Parcels and Acres in FHSZs

Fire Hazard Severity Zone/Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Moderate			
BP (ZSPA)	6	1	34
GC	12	0	25
LI (ZSPA)	11	0	101
M-1	12	1	33
MP (RDOSP)	12	0	390
SPA (ASPA)	8	2	212
Moderate Total	**61**	**4**	**795**
Non-Wildland/Non-Urban			
RC (ZSPA)	1	0	25

Fire Hazard Severity Zone/Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
Non-Wildland/Non-Urban Total	**1**	**0**	**25**
Urban Unzoned			
BP (ZSPA)	10	2	72
LI (ZSPA)	16	0	40
OIMU	3	0	11
SPA (ASPA)	1	0	1
Urban Unzoned Total	**30**	**2**	**124**
Grand Total	**92**	**6**	**944**

Source: City of Rancho Cordova, CAL FIRE

Figure E-29 City of Rancho Cordova – Future Development and Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 06/2021.

Table E-48 City of Rancho Cordova – Future Development Parcels and Acres in Fire Threat Areas

Fire Threat/ Future Development Area	Total Parcel Count	Improved Parcel Count	Total Acres
High			
LI (ZSPA)	1	0	2
MP (RDOSP)	7	0	141
SPA (ASPA)	4	1	104
High Total	**12**	**1**	**246**
Moderate			
BP (ZSPA)	5	0	66
GC	11	0	14
LI (ZSPA)	12	0	109
M-1	5	0	15
MP (RDOSP)	5	0	249
RC (ZSPA)	1	0	25
SPA (ASPA)	3	0	108
Moderate Total	**42**	**0**	**586**
Low			
BP (ZSPA)	7	1	28
LI (ZSPA)	13	0	29
M-1	7	1	18
Low Total	**27**	**2**	**75**
No Threat			
BP (ZSPA)	4	2	12
GC	1	0	11
LI (ZSPA)	1	0	1
OIMU	3	0	11
SPA (ASPA)	2	1	1
No Threat Total	**11**	**3**	**37**
Grand Total	**92**	**6**	**944**

Source: City of Rancho Cordova, CAL FIRE

E.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections:

regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

E.6.1. Regulatory Mitigation Capabilities

Table E-49 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Rancho Cordova.

Table E-49 City of Rancho Cordova Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2006	The General Plan does identify and address hazards in the Safety element with Goals and Policies. The General Plan does not identify projects to include in the mitigation strategy. The General Plan sets Goals and Policies in a broad sense. A more appropriate place for implementation of mitigation strategy/action items is the Zoning Ordinance
Capital Improvements Plan	Y 2016	The CIP does identify hazards and projects to include in the mitigation actions (stormwater, dam, back-up generators) to include in the mitigation strategy. The Plan can be used to implement mitigation actions
Economic Development Plan	N	Currently the City does not have a Plan adopted. The City is currently working on a Plan.
Local Emergency Operations Plan	Y 2013	
Continuity of Operations Plan		
Transportation Plan	Y	
Stormwater Management Plan/Program	Y	
Engineering Studies for Streams	Y	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	2019 California Building Code as amended by municipal code
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	Y	Rating: 3/8 (urban/rural)
Site plan review requirements	Y	Codes are enforced.

Land Use Planning and Ordinances	Y/N	Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Zoning ordinance	Y 2013	Ordinance is an effective measure and is enforced.
Subdivision ordinance	Y 2013	Ordinance is an effective measure and is enforced.
Floodplain ordinance	Y 2013	Ordinance is an effective measure and is enforced.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	Ordinance is an effective measure and is enforced.
Flood insurance rate maps	Y 2012	Ordinance is an effective measure and is enforced.
Elevation Certificates	Y	Ordinance is an effective measure and is enforced.
Acquisition of land for open space and public recreation uses	Y	Ordinance is an effective measure and is enforced.
Erosion or sediment control program	Y	Ordinance is an effective measure and is enforced.
Other		
How can these capabilities be expanded and improved to reduce risk?		
The City will continue to revise ordinances and enhance enforcement policies as needed to continue to reduce risks.		

Source: City of Rancho Cordova

City of Rancho Cordova General Plan (2006)

The City of Rancho Cordova General Plan serves as a blueprint for future growth and development and provides comprehensive planning for the future. It encompasses what the City currently is and what it intends to be. It provides the general framework to achieve the desired future condition.

The General Plan includes a Safety Element that focuses on safety issues to be considered in planning for the present and future development for the City. Mitigation related goals of the City of Rancho Cordova General Plan Safety Element are:

- Goal S.1: Establish Rancho Cordova as a safe community and environment for all persons.
- Goal S.2: Reduce the possibility of a flooding or drainage issue causing damage to urban land uses within the City.
- Goal S.3: Reduce the risk of adverse effects to residents or businesses as a result of geologic or seismic instability.
- Goal S.4: Safe railroad crossings for pedestrians, bicyclists, or motorists.
- Goal S.5: Reduce the possibility of serious harm to residents, employees, or the environment as the result of an accidental release of toxic or hazardous substances.
- Goal S.6: Protect the community from potential harm associated with Mather Airport operations.
- Goal S.7: Design neighborhoods and buildings in a manner that prevents crime and provides security and safety for people and property.
- Goal S.8: Maintain effective and community-oriented law enforcement.
- Goal S.9: Reduce the probability of fire damage to all of the City's structures.

The City of Rancho Cordova Disaster Debris Management Plan (July 2016)

The Disaster Debris Management Plan is designed to guide the City of Rancho Cordova's General Services Department during the debris removal planning and post-event operations. The Plan identifies tools to assist the City in addressing debris removal following a debris generating event. The City intends to utilize this Plan to reduce the cost associated with a debris generating event. The Plan incorporates a methodology that has been tested in many regions throughout the U.S. and meets the needs of the City and its residents.

This Plan is intended to guide the City in response to a natural or manmade debris generating event. This Plan is designed to identify agencies and activities that are involved in debris operations to ensure a coordinated response that achieves removal, storage, reduction and final disposition of debris deposited along or immediately adjacent to public rights-of-way.

The City is a contract city, and some of the Public Works' staff works under contract. The City participates as an active member of the Solid Waste Working Group and the Operational Area Council, and will work closely in these settings to execute the procurement of a private hauling company for debris collection and removal services and debris monitoring services, and provide disaster services in event of a disaster.

The Plan's purpose is the following:

- Establish and provide a centralized repository of information critical to developing and operating a disaster debris management program (including location of community drop-off stations, Temporary Debris Storage and Reduction Site (TDSRS), site criteria for locating new TDSRS, boundary map, flood plain maps, etc.);
- Identify the rules, regulations and guidelines enacted by Cal OES, CDAA, FEMA and other agencies governing the disaster debris removal process;
- Establish and provide reference and contact information for key personnel;
- Identify the roles and responsibilities of all involved parties; and
- Establish language and a protocol for pertinent public information such as press releases and other debris management information.

E.6.2. Administrative/Technical Mitigation Capabilities

Table E-50 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Rancho Cordova.

Table E-50 City of Rancho Cordova's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	Y	Was formed for this LHMP Update. Coordination is expected to be effective in the future when yearly plan review is performed.
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	The City has an ongoing maintenance program to storm drainpipes, structures, channels and basins.

Mutual aid agreements	Y	The City contracts to remove debris around the City in the event of flooding.
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	Y	Staffing is adequate and staff are trained. Coordination occurs between agencies.
Floodplain Administrator	Y	Staffing is adequate and staff are trained. Coordination occurs between agencies.
Emergency Manager	Y	Staffing is adequate and staff are trained. Coordination occurs between agencies.
Community Planner	Y	Staffing is adequate and staff are trained. Coordination occurs between agencies.
Civil Engineer	Y	Staffing is adequate and staff are trained. Coordination occurs between agencies.
GIS Coordinator	Y	Staffing is adequate and staff are trained. Coordination occurs between agencies.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	
Hazard data and information	Y	
Grant writing	Y	
Hazus analysis		
Other		
How can these capabilities be expanded and improved to reduce risk?		
Floodplain Manager to obtain Floodplain Management certification, continue close coordination with other local and regional agencies.		

Source: City of Rancho Cordova

E.6.3. Fiscal Mitigation Capabilities

Table E-51 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table E-51 City of Rancho Cordova's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Yes. It funds drainage improvements to reduce flooding
Authority to levy taxes for specific purposes	Y	

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	Yes, to fund storm water infrastructure projects
Storm water utility fee	Y	Yes, to fund drainage improvements to reduce flooding
Incur debt through general obligation bonds and/or special tax bonds	Y	Requires special election.
Incur debt through private activities	Y	
Community Development Block Grant	Y	
Other federal funding programs	Y	
State funding programs	Y	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The City will explore opportunities to apply for grant funding to help fund flood control projects and reduce flooding risk.		

Source: City of Rancho Cordova

E.6.4. Mitigation Education, Outreach, and Partnerships

Table E-52 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table E-52 City of Rancho Cordova's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	The City works with Sacramento SPLASH to help children understand and value their natural world
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	The City participates in Creek Week which is a week-long celebration focusing on the ecology of local rivers and lakes
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
The City will explore opportunities for public outreach and collaboration with other regional agencies on outreach campaigns.		

Source: City of Rancho Cordova

E.6.5. Other Mitigation Efforts

The City has many other completed or ongoing mitigation projects/efforts that include the following:

- The City has entered into an agreement with the County of Sacramento regarding regional disaster debris and hazardous waste removal after a disaster is declared.
- The City completed working on a Stormwater Capital Improvement Program Master Plan that identified a number of flood control projects that need to be implemented Citywide to reduce street flooding and reduce flooding risk.

E.7 Mitigation Strategy

E.7.1. Mitigation Goals and Objectives

The City of Rancho Cordova adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

E.7.2. NFIP Mitigation Strategy

The City of Rancho Cordova joined the National Flood Insurance Program (NFIP) on September 15, 2004. As a participant of the NFIP, the City of Rancho Cordova has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the City. The City of Rancho Cordova will continue to comply with the requirements of the NFIP in the future.

In addition, the City of Rancho Cordova actively participates with Sacramento County to address local NFIP issues through a regional approach. Many of the program activities are the same for the City of Rancho Cordova as for Sacramento County since participation at the County level includes all local jurisdictions.

The City of Rancho Cordova Public Works Department provides public outreach activities which include map information services, public awareness, public hazard disclosure, and flood protection information. This information is readily available to the public and consists of current and accurate flood mapping. In addition, the Public Works Department provides information about our stormwater management program and up-to-date information related to the maintenance of our drainage system.

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As

a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS which are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The City of Rancho Cordova is not a current participant in the CRS program.

More information about the floodplain administration in the City of Rancho Cordova can be found in Table E-53.

Table E-53 City of Rancho Cordova Compliance with NFIP

NFIP Topic	Comments
Insurance Summary	
How many NFIP policies are in the community? What is the total premium and coverage?	229 policies $104,534 in premiums $73,540,900 in coverage
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	0 claims $0 in claims paid 0 substantial damage claims
How many structures are exposed to flood risk within the community?	19 in 1% annual chance 1,920 in 0.2% annual chance
Repetitive Loss (RL) and Severe Repetitive Loss Properties (SRL)	0 RL properties 0 SRL properties
Describe any areas of flood risk with limited NFIP policy coverage	None
Staff Resources	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	No
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	Regulate development in the floodplain to reduce impacts to life and property
What are the barriers to running an effective NFIP program in the community, if any?	None
Compliance History	
Is the community in good standing with the NFIP?	Y
Are there any outstanding compliance issues (i.e., current violations)?	N
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	CAV 9/29/2010
Is a CAV or CAC scheduled or needed?	N
Regulation	
When did the community enter the NFIP?	9/15/2004
Are the FIRMs digital or paper?	Digital
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Meet
Provide an explanation of the permitting process.	The Planning Department issues permits to build based on zoning codes and floodplain ordinances.

NFIP Topic	Comments
Community Rating System	
Does the community participate in CRS?	N
What is the community's CRS Class Ranking?	N/A
What categories and activities provide CRS points and how can the class be improved?	N/A
Does the plan include CRS planning requirements?	N/A

Source: City of Rancho Cordova, FEMA

E.7.3. Mitigation Actions

The planning team for the City of Rancho Cordova identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Pandemic
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Severe Weather: High Winds and Tornadoes
- Wildfire

After a review of possible mitigation actions, the following hazards were dropped to low significance for the pursuit of mitigation actions:

- Earthquake
- Pandemic

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Severe Weather: High Winds and Tornadoes, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140). Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

Project Description: On October 20, 2017, the City of Rancho Cordova adopted the 2016 Multi-Jurisdictional Local Hazard Mitigation Plan (LHMP). The LHMP assess natural hazards of concern to Sacramento County and Cities within; evaluates risk to life safety, public health, property, and the environment; and evaluates mitigation measures to reduce these risks and vulnerabilities, minimize losses, and increase community resilience.

The LHMP includes an Action Plan for each City within Sacramento County that identifies actions to be completed under the current Hazard Mitigation Plan. Adoption of the Multi-Jurisdictional Local Hazard Mitigation Plan into the City of Rancho Cordova General Plan Safety Element is identified as one of the Mitigation Action items to be completed by the end of 2018. Approval of the General Plan Amendment will complete the Hazard Mitigation Plan action item.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Safety Element of General Plan

Responsible Office: City of Rancho Cordova Planning Department

Priority (H, M, L): High

Cost Estimate: Jurisdictional board/staff time

Potential Funding: Local budgets

Benefits (avoided Losses): Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

Schedule: As soon as possible

Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Severe Weather: High Winds and Tornadoes, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City and County play a key role in public outreach/education efforts to communicate the potential risk and vulnerability of their community to the effects of natural hazards. A comprehensive multi-hazard public education program will better inform the community of natural hazards of concern and actions the public can take to be better prepared for the next natural disaster event.

Project Description: A comprehensive multi-hazard outreach program will ascertain both broad and targeted educational needs throughout the community. The City will work with the County and other agencies as appropriate to develop timely and consistent annual outreach messages in order to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will leverage and build upon existing mechanisms, will include elements to meet the objectives of Goal 3 of this LHMP Update, and will consider:

- Using a variety of information outlets, including websites, local radio stations, news media, schools, and local, public sponsored events;
- Creating and distributing (where applicable) brochures, leaflets, water bill inserts, websites, and public service announcements;
- Displaying public outreach information in County office buildings, libraries, and other public places and events;
- Developing public-private partnerships and incentives to support public education activities.

Location of Project: Citywide

Other Alternatives: Continue public information activities currently in place.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing County outreach programs will be reviewed for effectiveness and leveraged and expanded upon to reach the broader region.

Responsible Office: City of Rancho Cordova in partnership with the County

Priority (H, M, L): High

Cost Estimate: Annual costs to be determined, and will depend on the scope and frequency of activities and events as well as volunteer participation

Benefits (Losses Avoided): Increase residents' knowledge of potential hazards and activities required to mitigate hazards and be better prepared. Protect lives and reduce damages, relatively low cost to implement.

Potential Funding: Local budgets, grant funds

Timeline: Ongoing/Annual public awareness campaign

Action 3. Sunrise Blvd Widening Kiefer to Jackson

Hazards Addressed: Flood, Localized Flooding, Climate Change, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: A section of Sunrise Boulevard south of Kiefer and north of Jackson is subject to localized flooding (expected to be exacerbated by climate change). This project will raise the road in this area to be above the local floodplain.

Project Description: The project proposes to widen Sunrise Boulevard to four-lanes from Kiefer Boulevard to State Route 16 (Jackson Highway) and construct partial intersection improvements at Sunrise Boulevard and State Route 16. The project includes placement of a bridge on Sunrise Boulevard over Laguna Creek. Project assumes costs for the intersection at a 25% City and 75% County split, and 85% City and 15% County split for the widening.

Other Alternatives: The project is located in a rural area. Vehicles must travel several miles to avoid this location of localized flooding

Existing Planning Mechanism(s) through which Action Will Be Implemented: The project is currently listed in the City Capital Improvement Plan. City staffs are currently preparing a funding plan and exploring funding options to construct this project.

Responsible Agency/ Department/Partners: Public Works

Cost Estimate: 36 million

Benefits (Losses Avoided): Raising the road above the local flood plain will allow emergency access through the area.

Potential Funding: Federal and/or state grants. Local transportation funds

Timeline: Within 5 years (Anticipate design start in 2022.)

Project Priority (H, M, L): Medium

Action 4. City of Rancho Cordova Disaster Debris Management Plan

Hazards Addressed: Multi-hazard – Debris management for floods, fire, dam failure, earthquake, etc.

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The plan addresses responsibilities and roles for removal, disposal and recycling of debris generated from a disaster event.

Project Description: The plan was submitted to the Office of Emergency Services for review and approval.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: None

Responsible Agency/ Department/Partners: Public Works

Cost Estimate: Varies depending on magnitude of disaster

Benefits (Losses Avoided): N/A

Potential Funding: FEMA, General Fund

Timeline: Plan completed – will work to carry out plan objectives over the next 5 years

Project Priority (H, M, L): Medium

Action 5. Transportation Interconnectivity

Hazards Addressed: Multi-hazard (dam failure, flood, wildfire, earthquake, etc.); evacuation routes

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Long range transportation

Project Description: Ensure interconnectivity and road standards are maintained for disaster preparedness/evacuation routes.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Development Process

Responsible Office/Partners: Planning/Public Works

Cost Estimate: Staff time Undetermined as a case by case basis

Benefits (Losses Avoided): Increased ability to evacuate during hazard events.

Potential Funding: Local Funds

Timeline: On-going

Project Priority: High

Action 6. Intergovernmental Agreement between the County of Sacramento and the City of Rancho Cordova

Hazards Addressed: Multi-hazard – debris management for floods, fire, earthquake, etc.

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Debris management is a significant issue in the aftermath of a disaster. The MOU with Sacramento County allows the City to expedite the execution of contracts with waste haulers for debris removal services by allowing the City to use the County's procurement program

Project Description: The MOU allows the City to use the County's procurement program to hire contractors for debris removal, disposal and recycling.

Other Alternatives: The City could procure the services independently if necessary.

Existing Planning Mechanism(s) through which Action Will Be Implemented: None

Responsible Office/Partners: Public Works

Cost Estimate: Varies depending on magnitude of disaster

Benefits (Losses Avoided): N/A

Potential Funding: FEMA, General Fund

Timeline: MOU completed

Project Priority: Medium

Action 7. Land Use (Long Range)

Hazards Addressed: Multi-hazard (environmental sensitive areas)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Long Range Sustainability

Project Description: Land Use (Long range): As the City grows towards the south and east, cluster development and open space will be encouraged (environmentally sensitive areas to include vernal pools, creeks, and streams). Review projects for environmental sensitive areas when submitted to the City

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Development Process

Responsible Office/Partners: Planning

Cost Estimate: Staff time Undetermined as a case by case basis

Benefits (Losses Avoided): Better land use planning should help keep future development out of known hazard zones.

Potential Funding: Local Funding

Timeline: On-Going

Project Priority: High

Action 8. Post-Disaster training for staff

Hazards Addressed: Multi–hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Training

Project Description: OES training and post disaster planning classes/webinars for planning staff

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Classes and webinars

Responsible Office/Partners: Planning

Cost Estimate: Staff time; Cost of classes

Benefits (Losses Avoided): Increased ability of the City to respond to hazard events.

Potential Funding: Local funding

Timeline: On-going staff training

Project Priority: High

Action 9. Update/Maintain Emergency Operation Plans (EOPs)

Hazards Addressed: Multi–hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Current Emergency Operations Plan was last updated in 2013 and is required to be updated every 5 years.

Project Description: Assemble key City staff to form a team to update and maintain EOPs

Other Alternatives: Maintain existing and outdated EOPs

Existing Planning Mechanism(s) through which Action Will Be Implemented: City staff will review existing EOPs and develop recommended changes/updates to the EOPs.

Responsible Office/Partners: PW Department/Facilities Division/Finance Department/Human Resources/Economic Development/Planning

Cost Estimate: $25,000 - $50,000

Benefits (Losses Avoided): N/A

Potential Funding: City funds

Timeline: Next 5 years

Project Priority: High

Action 10. Increase Everbridge Enrollment

Hazards Addressed: Multi–hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: With more people using cell phones as their primary method of communication, there is an increased need to enroll citizens/groups in Everbridge. Everybridge is essentially a reverse 911 system where agencies and local jurisdiction can provide message alerts to individual citizens or groups. These messages can help the City provide citizens important information regarding natural disasters.

Project Description: Outreach to citizens/groups via news outlets/City website/kiosk to encourage enrollment. City staff will conduct periodic tests of the Everbridge system to measure its effectiveness in reaching out to enrollees.

Other Alternatives: Do Nothing

Existing Planning Mechanism(s) through which Action Will Be Implemented: Work with Public Information Officer to Outreach to groups to encourage enrollment.

Responsible Office/Partners: PIO/EOC Coordinator

Cost Estimate: $5,000

Benefits (Losses Avoided): N/A

Potential Funding: City Funding

Timeline: 2016-2017

Project Priority: Medium

Action 11. Developing and maintaining a database to track community vulnerability

Hazards Addressed: All Hazards, Gas infrastructure and facility disaster preparedness

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Rancho Cordova has at least one major gas transmission line (PG&E) and a large gasoline transfer/storage facility. Public safety and property would certainly be negatively impacted if an explosion (from wildfire, earthquake, or other hazard) were to occur on the large transmission line or gasoline storage facility. This mitigation effort would seek to collect and maintain GIS information that could be utilized to better prepare for and respond to such a disaster.

Project Description: The City of Rancho Cordova has built an enterprise GIS that houses approximately 75 GIS layers, including parcels, streets, addresses, public works infrastructure, zoning, etc. As part of this project, work would be performed to research, gather, and store GIS data relative to major gas transmission lines and facilities. This information would then be used to perform research and prepare pre-operation maps and GIS viewers that would be used for drills and an actual disaster scenario.

Other Alternatives: Rely on general hardcopy maps and Google Maps to assist during emergency operation exercises and actual events.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The City of Rancho Cordova GIS staff would take on the bulk of the project work and implementation. Some support would be required from the Police and Fire Departments. Existing GIS software would be used for the collection, storage, and map creation steps. No new software is required for this project.

Responsible Office/Partners: IT Department with GIS staff, Public Works Department, Police Department, Sacramento Metro Fire Department

Cost Estimate: $5,000

Benefits (Losses Avoided): Reduces the potential impacts from a gas explosion, which would help to reduce negative impacts to property and people living and working near the gas transmission line and facility.

Potential Funding: City funding

Timeline: 1 month (staff time)

Project Priority: Medium

Action 12. Landscape and Irrigation Requirements/Retro

Hazards Addressed: Drought & Water Supply

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Landscaped areas around City owned facilities do not meet new drought standards. Developing a new drought policy will help the City conserve water and demonstrate to the community the City's commitment to promote water conservation.

Project Description: Develop a 5 year plan to upgrade City owned and operated facilities to include drought tolerant plants in landscaped areas and more efficient irrigation systems

Other Alternatives: Do nothing/remove City landscaping

Existing Planning Mechanism(s) through which Action Will Be Implemented: Include budget for projects that reduce the use of water for landscaped areas around City owned buildings.

Responsible Office/Partners: PW Department/Facilities Division/Finance Department

Cost Estimate: $25,000-$50,000

Benefits (Losses Avoided): Lower irrigation water costs

Potential Funding: City Funding

Timeline: Next Five years

Project Priority: Medium

Action 13. Landscape Ordinance and Model Water Efficient Landscape Ordinance Implementation

Hazards Addressed: Drought & Water Supply

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Proper landscape selection

Project Description: Update and maintain to incorporate proper selection, planting, and maintenance practices into landscape ordinance.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Development Process

Responsible Office/Partners: Planning

Cost Estimate: Staff time; Undetermined as a case by case basis

Benefits (Losses Avoided): Reduced drought risk in the City.

Potential Funding: Local Funds

Timeline: On-going

Project Priority: High

Action 14. Restrict Impervious Surfaces in Front Yards

Hazards Addressed: Drought & Water Shortage, Flood, Heavy Rains and Storms, Localized Flood

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Restrict impervious surface, reduce surface run-off

Project Description: Continue to limit impervious surfaces within front yard of residential lots. Zoning Code restricts impervious surface within front yard of residential lots.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Building permit review and Code enforcement issues

Responsible Office/Partners: Planning

Cost Estimate: Staff time;

Benefits (Losses Avoided): Reduced risk to localized flooding.

Potential Funding: Local Funds

Timeline: On-going

Project Priority: Medium

Action 15. Porous pavement and vegetative buffers

Hazards Addressed: Drought & Water Shortage, Flood

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Ground water retainment

Project Description: Encourage the use of porous pavement, vegetative buffers and islands in large parking areas.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Development Process

Responsible Office/Partners: Planning

Cost Estimate: Staff time; Undetermined as a case by case basis

Benefits (Losses Avoided): Reduced risk to flooding

Potential Funding: Local Funds

Timeline: On-going

Project Priority: Medium

Action 16. Storm Water Pump Station Generator Purchase and Infrastructure Upgrades

Hazards Addressed: Flood, Severe Weather: Heavy Rains and Storms, Extreme Heat, High Winds and Tornadoes

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City owns and operates six pump stations which serve to convey storm water during rain events. The City owns and maintains one stationary generator and one portable generator that are each dedicated to powering the pump stations during power outages. The stationary generator is located at the Bear Hollow Pump Station, and the portable generator is housed at the Mills Tower Pump Station. When compared with the other pump stations that lack a generator, the Mills Tower Pump Station has the highest risk of causing significant localized flooding in the event of a power outage. This pump station sits next to residential homes in an older neighborhood that contains undersized drainage pipes. Thus, the City has chosen to house the portable generator at this station. In the event that a power outage were to occur associated with severe weather events at one of the other pump stations that lack a generator, the portable generator at Mills Tower Pump Station would need to be transported to the station in need. Transporting the portable generator is time consuming, and the City currently relies on contractor vehicles for the transport.

Project Description: City staff will purchase four generators, each to be housed at a pump station that does not currently have one onsite. Cost estimate includes the purchase and installation of transfer switches and plugs for each of the four pump stations, which would allow for a portable generator hook-up to power the pumps.

Other Alternatives: Continue to rely on the portable generator stationed at Mills Tower Pump Station to power the other pump stations in the event of a power failure.

Existing Planning Mechanism(s) through which Action Will Be Implemented: None

Responsible Office/Partners: Public Works

Cost Estimate: $500,000

Benefits (Losses Avoided): Flood hazard mitigation and reliability of critical facilities during power outages

Potential Funding: Local Funds (Storm Water Utility Fee), Grant Funding

Timeline: To be implemented over 5 years (Analysis completed. Generator specifications developed. Awaiting to purchase generator).

Project Priority: High

Action 17. SB-5 Urban Level of Flood Protection

Hazards Addressed: 200-year Flood, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: As part of Senate Bill 5, the City is required to provide a 200-yr urban level of flood protection criteria when regulating development within the 200-yr floodplain and includes amending the General Plan and Zoning Codes.

Project Description: The US Army Corps of Engineers is in the process of making improvements to the Folsom Dam spillway that would reduce the allowable release rate from the dam from into the American River from 239,000 cfs to 117,000 cfs for the 200-yr storm event. In order to accurately reflect the reduced floodplain that would result from the reduction in flow, the City has remapped the 200-yr floodplain. To satisfy the requirements of SB5, the City is in the process of updated its General Plan and incorporating the revised floodplain map into its zoning ordinance.

Other Alternatives: Do Nothing

Existing Planning Mechanism(s) through which Action Will Be Implemented: Part of Capital Improvement Program

Responsible Office/Partners: Public Works

Cost Estimate: $100,000

Benefits (Losses Avoided): Not providing a higher level of flood protection would result in an increase in property damage due to flooding.

Potential Funding: Local Funds (Stormwater Utility Fee)

Timeline: To Be Completed in 2017 (Completed in 2017)

Project Priority: High

Action 18. Channel Vegetation Management and Erosion Control Projects

Hazards Addressed: Flood, Localized Flooding, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City has a Streambed Alteration Agreement with the California Department Fish and Wildlife for routine maintenance of vegetation in and near waterways, including creeks, channels, and basins. Various locations have been identified for erosion control improvements and excavation work to improve flow capacity and minimize the potential for blockages and localized flooding.

Project Description: Undertake projects that improve the structural integrity of channel slopes in various locations. Implement solutions that control and reduce the chances for erosion, which is usually caused by runoff from adjacent properties and burrowing animals.

Perform excavation projects that remove vegetation (e.g. cattails, bulrush, plants/trees) that impede water flow and reduce flood capacity in channels.

Other Alternatives: Continue to perform routine weed abatement activities, and complete erosion control and excavation projects as funding allows

Existing Planning Mechanism(s) through which Action Will Be Implemented: Erosion control and excavation projects will be completed by the City's contractor as funding allows.

Responsible Office/Partners: Public Works

Cost Estimate: $50,000

Benefits (Losses Avoided): Ensures flood capacity and flow capacity of streams and creeks is not diminished.

Potential Funding: Local Funding - Stormwater Utility Fee, Grant Funding

Timeline: To be implemented over 5 years

Project Priority: High

Action 19. Adoption of Hydromodification and Low Impact Development (LID) Standards

Hazards Addressed: Climate Change, Drought & Water Shortage, Localized Flooding

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: As part of the City's regionwide NPDES permit, new development and redevelopment projects will be required under certain conditions to incorporate stormwater hydromodification Management and Low Impact Development measures into their projects. Development projects that incorporate hydromodification management and LID will more closely mimic the natural hydrology of their

site which will result in less potential for flooding and erosion of stream banks due to a reduction of stormwater runoff volume into rivers, streams, pipes and culverts. Use of LIDs will also help increase water supply by increasing groundwater recharge

Project Description: Over the next several years, the City's new regionwide NPDES stormwater permit will require permittees to adopt development standards that include the use of hydromodification management and LID measures for new and redevelopment projects.

Other Alternatives: Do Nothing

Existing Planning Mechanism(s) through which Action Will Be Implemented: Identified in the City's 5-yr Capital Improvement Plan

Responsible Agency/ Department/Partners: Public Works

Cost Estimate: $10,000

Benefits (Losses Avoided): Requiring new development and redevelopment projects to implement hydromodification management and LID requirements will reduce flooding and increase groundwater recharge

Potential Funding: Local funds (Stormwater Utility Fee)

Timeline: To be implemented over 5 years. (Completed 2017)

Project Priority (H, M, L): Medium

Action 20. Implement Projects in the Stormwater Capital Improvement Program Master Plan

Hazards Addressed: Climate Change, Localized Flooding, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: After assuming ownership of the City's drainage system, the City identified a need for a comprehensive master planning study of its storm drainage system and a consultant was retained to prepare this Stormwater Capital Improvement Program Master Plan. For this Master Plan, the team evaluated the existing trunk drainage facilities serving the City and developed recommendations for eliminating existing deficiencies in capacity and conditions and for enhancing stormwater quality.

Project Description: The Master Plan identified a number of flood control projects that are required to help resolve existing flooding issues and prevent future impacts from severe storm events.

Other Alternatives: Do Nothing

Existing Planning Mechanism(s) through which Action Will Be Implemented: Identified in the City's 5-yr Capital Improvement Plan

Responsible Agency/ Department/Partners: Public Works

Cost Estimate: $60,000

Benefits (Losses Avoided): Prevent damages to life and property from large flooding events and alleviate local flooding.

Potential Funding: Local funds (Stormwater Utility Fee), Grant Funding, Funding partners

Timeline: To be implemented over 20 years. (Master Plan was Completed March 2021)

Project Priority (H, M, L): Medium

Action 21. Sunrise Blvd. & Monier Circle Drainage Improvements

Hazards Addressed: Climate Change, Localized Flooding, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Sunrise Blvd. floods between Monier Circle and Fitzgerald during severe rain events due to limited capacity of culverts under Sunrise Blvd and the Folsom South Canal siphons.

Project Description: Project includes utilizing a vacant lot to build a flood control detention basin and divert flows from the creek to the basin during large storm events. The project may also include replacing two undersized culverts across Sunrise Blvd between Recycle Road and Monier Circle.

Other Alternatives: Do Nothing

Existing Planning Mechanism(s) through which Action Will Be Implemented: Identified in the City's 5-yr Capital Improvement Plan

Responsible Office/Partners: Public Works

Cost Estimate: $5,000,000 - $6,000,000

Benefits (Losses Avoided): Project will allow unimpeded public access including access for emergency vehicles along Sunrise Blvd. during significant flooding events.

Potential Funding: Local Funds (Stormwater Utility Fee), Grant Funding

Timeline: To Be Implemented over the next 3 years

Project Priority: High

Action 22. Roundabouts

Hazards Addressed: High Winds and Tornadoes, Storms, Wildfires

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Traffic control can be an issue in the City, especially when power outages occur and traffic signals go out.

Project Description: Encourage round-abouts in place of traffic signals where appropriate.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Development Process

Responsible Office/Partners: Planning/Public Works

Cost Estimate: Staff time; Undetermined as a case by case basis

Benefits (Losses Avoided): Increased ability to evacuate and have traffic flow.

Potential Funding: Local funding

Timeline: On-Going

Project Priority: Medium

Action 23. Dam Failure Mitigation and Preparedness for Evacuations

Hazards Addressed: Dam Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Folsom Dam Failure could impact a portion of the City of Rancho Cordova. The City would like to develop evacuation plans for areas impacted by the dam breach.

Project Description: Develop evacuation plans for areas mapped in the Folsom Dam failure zone.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: The City will hire a consultant to help the City develop the evacuation plans.

Responsible Agency/ Department/Partners: Public Works Department, Planning Department.

Cost Estimate: $25,000 - $50,000

Benefits (Losses Avoided): Better evacuations in case of dam inundation. Increased level of preparedness for City staff and citizens.

Potential Funding: City Stormwater Program, other City funding, grant funding

Timeline: Next 5 years

Project Priority (H, M, L): H

Action 24. Wildfire Weed Reduction and Resiliency

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Increase the City's resiliency to wildfires.

Project Description: Increase weed abatement and vegetation clearing activities before wildfire season.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Erosion control and excavation projects will be completed by the City's contractor as funding allows.

Responsible Agency/ Department/Partners: Public Works Department, Code Enforcement.

Cost Estimate: $25,000 - $50,000

Benefits (Losses Avoided): Decrease fire risk from wildfires.

Potential Funding: City Stormwater Program, other City funding, grant funding

Timeline: Next 5 years

Project Priority (H, M, L): H

Annex F City of Sacramento

F.1 Introduction

This Annex details the hazard mitigation planning elements specific to the City of Sacramento, a previously participating jurisdiction of the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to Sacramento, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

F.2 Planning Process

As described above, Sacramento followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table F-1. Additional details on Plan participation and City representatives are included in Appendix A.

Table F-1 City of Sacramento – Planning Team

Name	Position/Title	How Participated
Neal Joyce	Supervising Engineer	Utilities Department - Development Services. Provided information on floodplain management and impacts on development.
Roshini Das	Sustainability Manager	Utilities Department - Provided information on climate change.
Samuel Leu	Administrative Analyst	Utilities Department -Provided information on climate change.
Carson Anderson	Preservation Director	Community Development Department – Planning Design/Preservation: Provided information on cultural and historical resources.
Lisa Deklinski	Program Specialist	Utilities Department - Security and Emergency Preparedness: Provided information on the Department Operations Center, levee security, and emergency management practices.
Brett Ewart	Senior Engineer	Utilities Department - Capital Improvement Program (CIP): Provide information on current and future Capital Improvement Project related to water.
Brett Grant	Senior Engineer	Utilities Department – Drainage CIP, Provided information on current and future conditions of the drainage system. Identified hazard areas and possible mitigation projects.
Richard Dalrymple	Senior Engineer	Utilities Department - Sewer CIP: Provided information on current and future conditions of the combined sewer system.

Name	Position/Title	How Participated
Dave Hansen	Supervising Engineer	Utilities Department – Information Technology: Provided information on the technology infrastructure of our utilities. Also, provided background to generator mitigation project.
Kevin Hocker	Arborist/Urban Forester	Public Works - Urban Forestry: Provided information on natural resources.
Sherill Huun	Supervising Engineer	Utilities Department - Environmental and Regulatory Compliance: Provided input on regulatory mitigation capabilities as well as water quality issues.
Karen Newton	Senior Engineer	Utilities Department - Environmental and Regulatory Compliance: Provided input on regulatory mitigation capabilities as well as water quality issues.
Deanne Neighbours	Program Specialist	Utilities Department - Integrated Planning and Asset Management: Provided perspective on maintenance and disaster recovery related to city assets.
Jessica McCabe	Program Analyst	Utilities Department - Public Affairs: Provided information on current and future public outreach programs. Insight on emergency public outreach and media relations.
Remi Mendoza	Senior Planner	Community Development Department - Long Range Planning: Provided information on the City's development, building procedures, and planning aspects.
Greta Soos	Associate Planner	Community Development Department - Long Range Planning: Provided information on the City's development, building procedures, and planning aspects.
Rosa Millino	Senior Engineer	Utilities Department - Floodplain Management: Provide information on flooding hazards, dam failure, and levee failure.
Doug Henry	Superintendent	Utilities Department - Operations and Maintenance: Provided mitigation projects related to levee patrols and flood fighting activities.
Jamie McKinley	Program Analyst	Utilities Department - Floodplain Management: Provided information on flood hazards and researched other natural hazards within the City.
Jeanelle Gottlob	Emergency Manager	City of Sacramento - Emergency Operation Center: Provided information on the City's hazard history, current preparedness, and identified multiple mitigation projects.
Mark Severeid	Superintendent	Utilities Department - Water Quality Lab and Research & Development: Provided information on the City's water plant and provided mitigation project related to flood recovery.
Daniel Bowers	Director of Emergency Management	City of Sacramento - Director of Emergency Management – Plans and mitigation actions.
Angelina Wu	Engineering Student Intern	Utilities Department – Intern. Provided many of the mitigation action worksheets for inclusion into the Plan. Provided detailed research on mitigation actions included in this plan.
Lauren Groves	Administrative Technician	Office of Emergency Management: Provided information on notification systems, training and exercises, and public outreach

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the City integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the City incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table F-2.

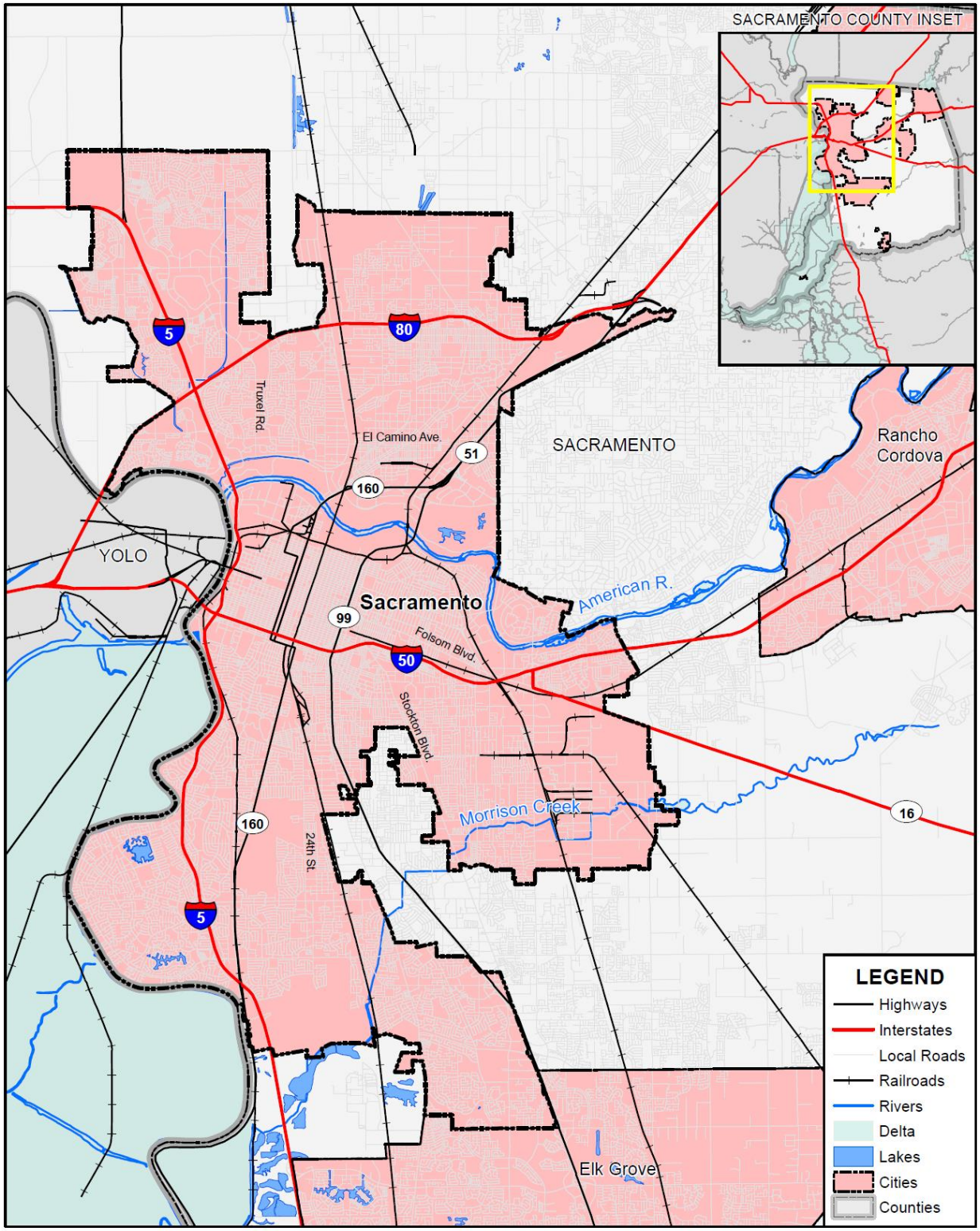
Table F-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details?
2035 General Plan	Goals and Policies related to fire prevention and suppression and flood protection have been incorporated into the Land Use, Public Health and Safety, and Environmental Constraints elements of the 2035 General Plan. The Public Health and Safety Goal 4.1.1 is to maintain and implement the Sacramento County Multi-Hazard Emergency Plan to address the major hazards facing the City of Sacramento
City Emergency Operations Plan/ Department of Utilities Emergency Action Plan	Plans to set procedures for emergency response based on natural hazards defined in the 2016 LHMP and 2018 Emergency Operations Plan. In addition, critical facilities identified in the 2011 LHMP were incorporated into these plans for emergency notification. The City of Sacramento, situated within Sacramento County, faces a variety of hazards. The city developed this plan on the basis of hazard and vulnerability findings that are identified in the Sacramento County Multi-Hazard Mitigation Plan. The analysis of these threats included both natural and technological hazards that affect the operational area.
Comprehensive Flood Management Plan	Another planning mechanism for the City that addresses flooding related hazards identified in the 2016 LHMP. This Plan discusses future development, internal drainage, Community Rating System program, National Flood Insurance Program, levee security, and flood control projects.
Repetitive Loss Area Analysis	A plan to further analyze repetitive loss properties that have flooded because of a high hazard – flooding, which was identified in the 2016 LHMP.

F.3 Community Profile

The community profile for the City of Sacramento is detailed in the following sections. Figure F-1 displays a City map and the location of Sacramento within Sacramento County. Figure F-2 shows a City map, with the addition of an area (shown in red) that the City annexed in 2019. Due to its late inclusion into the Plan, the hazard maps in Section F.5.3 below will be based on Figure F-1, while the future development maps will be based on Figure F-2.

Figure F-1 City of Sacramento

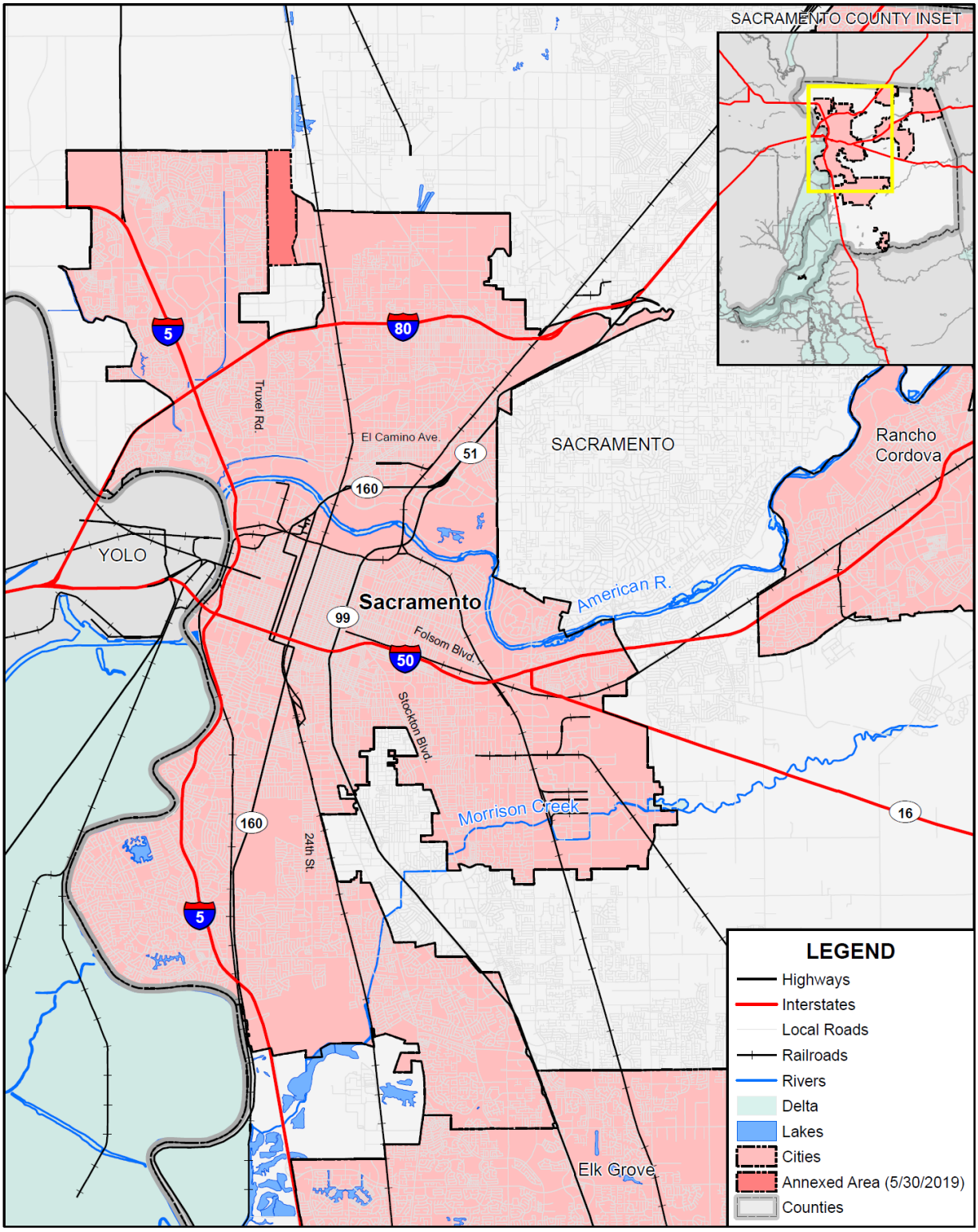


FOSTER MORRISON CONSULTING

SACRAMENTO COUNTY

Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure F-2 City of Sacramento with Annexed Area in Panhandle



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 11/2021.

F.3.1. Geography and Climate

The City of Sacramento is located in the heart of California's Central Valley at the confluence of the Sacramento and American Rivers. The Central Valley is a flat alluvial plain approximately 50 miles wide and 400 miles long in the central portion of California. Its northern part is the Sacramento Valley drained by the Sacramento River, and its southern part is the San Joaquin Valley drained by the San Joaquin River. It is surrounded by the Sierra Nevada to the east, the Tehachapi Mountains to the south, Coastal Range to the west, and Cascade Range to the north. The topography of the area is relatively flat. There is a gradual slope rising from elevations as low as sea level in the southwestern portion of the Policy Area up to approximately 75 feet above sea level in the northeastern portion.

Sacramento is the cultural and economic center of its six-county metropolitan area (El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba counties) and the largest city in the Central Valley. The regional location of Sacramento, as shown on the map above, is roughly halfway between San Francisco to the west and Lake Tahoe to the east. Sacramento covers a total area of approximately 99 square miles and is the seventh most populous city in California with a 2020 estimated population of 510,931. Sacramento has a Mediterranean climate that is characterized by mild winters and dry, hot summers. Rain typically falls between November and March, with the rainy season tapering off almost completely by the end of April. Average daily high temperatures range from the 50s in December and January to the 90s in July (with many days of over 100).

Sacramento is accessible from Interstate 80 and U.S. Highway 50 (running east/west) and Interstate 5 and U.S. Highway 99 (running north/south). Amtrak serves Sacramento's passenger rail needs, while Sacramento International Airport (SMF) provides domestic and international flights through most major airlines. Within the city and surrounding region, Sacramento Regional Transit provides bus and light rail service.

F.3.2. History

Prior to European settlement, Nisenan (Southern Maidu) and Plains Miwok Indians lived in the area. In the early 1800s, the Spanish explorer Gabriel Moraga "discovered" and named the Sacramento Valley and the Sacramento River after the Spanish term for "sacrament." Sacramento was founded during the California Gold Rush and grew quickly due to the protection of Sutter's Fort, which was established by John Sutter in 1839.

The citizens of Sacramento adopted a city charter in 1849 and became the first incorporated city in California on February 27, 1850. During the California Gold Rush and through the 1800s, Sacramento became a major distribution point, a commercial and agricultural center, a terminus for wagon trains, stagecoaches, riverboats, the telegraph, the Pony Express, and the First Transcontinental Railroad, and in 1854 the state capital of California.

The city's current charter was adopted by voters in 1920, establishing a city council-and-manager form of government, still used today. The City expanded continuously over the years in the first half of the 1900s and in 1964 merged with the city of North Sacramento, just north of the American River. Large annexations

of the Pocket area on the south and Natomas area on the north eventually led to significant population growth throughout the 1970s, 1980s, and 1990s.

Sacramento experienced a massive growth in population in the 1990s and early 2000s. Primary sources of population growth are migration from the San Francisco Bay Area due to lower housing costs, as well as immigration from Asia, Central America, Mexico, Ukraine, and the rest of the former Soviet Union.

F.3.3. Economy and Tax Base

US Census estimates show economic characteristics for the City of Sacramento. These are shown in Table F-3 and Table F-4. Mean household income in the City was $93,318. Median household income in the City was $72,017.

Table F-3 City of Sacramento – Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	5,904	0.8%
Construction	46,204	6.6%
Manufacturing	38,614	5.5%
Wholesale trade	17,503	2.5%
Retail trade	77,625	11.0%
Transportation and warehousing, and utilities	40,437	5.7%
Information	12,024	1.7%
Finance and insurance, and real estate and rental and leasing	49,446	7.0%
Professional, scientific, and management, and administrative and waste management services	83,854	11.9%
Educational services, and health care and social assistance	15,996	2.3%
Arts, entertainment, and recreation, and accommodation and food services	66,807	9.5%
Other services, except public administration	35,285	5.0%
Public administration	74,604	10.6%

Source: US Census Bureau American Community Survey 2019 Estimates

Table F-4 City of Sacramento – Income and Benefits

Income Bracket	Percent
<$10,000	4.4%
$10,000 – $14,999	4.0%
$15,000 - $24,9999	7.1%
$25,000 – $34,999	7.8%
$35,000 – $49,999	11.1%
$50,000 – $74,999	17.6%
$75,000 – $99,999	13.7%

Income Bracket	Percent
$100,000 – $149,999	17.4%
$150,000 – $199,999	8.5%
$200,000 or more	8.4%

Source: US Census Bureau American Community Survey 2019 Estimates

The largest employers in the City of Sacramento are shown on Table F-5.

Table F-5 City of Sacramento – Largest Employers

Employer Name	Location	Industry
California State Univ Sacramento	Sacramento	Schools-Universities & Colleges Academic
California Department-Corrections	Sacramento	State Govt-Correctional Institutions
Dept of Transportation In Ca	Sacramento	Government Offices-State
Disabled American Veterans	Sacramento	Veterans' & Military Organizations
Employment Development Dept	Sacramento	Outplacement Consultants
Environmental Protection Agency	Sacramento	State Government-Environmental Programs
Kaiser Permanente South	Sacramento	Hospitals
L A Care Health Plan	Sacramento	Health Plans
Mercy General Hospital	Sacramento	Hospitals
Sacramento Bee	Sacramento	Newspapers (publishers/Mfrs)
Sacramento Municipal Utility	Sacramento	Electric Contractors
Securitas Security Svc USA	Sacramento	Security Guard & Patrol Service
SMUD	Sacramento	Electric Companies
State Compensation Insurance Fund	Sacramento	Insurance
Summit Funding Inc	Sacramento	Financing
Sutter Medical Ctr-Sacramento	Sacramento	Hospitals
Water Resource Dept	Sacramento	Government Offices-State

Source: California Economic Development Department. Retrieved 6/2/2021.

The City has a wide and varied tax base. Tax base information is tracked and maintained by the Sacramento County Assessor's Office. The following tables show the tax base for the City. Tax base information is tracked and maintained by the Sacramento County Assessor's Office.

Property Use	Total Parcel Count	Percent of Total Parcels	Total Land Value	Improved Structure Value	Total Structure and Land Value	Percent of Total Value
Agricultural	14	0.01%	$3,766,304	$623,292	$4,389,596	0.01%
Care/Health	158	0.10%	$101,986,210	$1,650,906,442	$1,752,892,652	2.93%
Church/Welfare	539	0.35%	$110,796,101	$547,917,921	$658,714,022	1.10%

Property Use	Total Parcel Count	Percent of Total Parcels	Total Land Value	Improved Structure Value	Total Structure and Land Value	Percent of Total Value
Industrial	2,034	1.31%	$715,773,896	$2,237,502,146	$2,953,276,042	4.94%
Miscellaneous	3,065	1.97%	$3,772,608	$320,049	$4,092,657	0.01%
Office	1,796	1.15%	$1,194,477,660	$5,063,635,910	$6,258,113,570	10.48%
Public/Utilities	768	0.49%	$1,709,648	$31,233	$1,740,881	0.00%
Recreational	139	0.09%	$91,014,962	$472,244,051	$563,259,013	0.94%
Residential	138,671	89.13%	$11,850,039,828	$30,788,795,112	$42,638,834,940	71.39%
Retail/ Commercial	2,943	1.89%	$1,341,124,596	$2,593,301,604	$3,934,426,200	6.59%
Unknown	2	0.00%	$0	$86,693	$86,693	0.00%
Vacant	5,461	3.51%	$917,560,472	$38,071,318	$955,631,790	1.60%
City of Sacramento Total	**155,590**	**100.0%**	**$16,332,022,285**	**$43,393,435,771**	**$59,725,458,056**	**100.0%**

Source: Sacramento County 2020 Parcel/Assessor's Data

F.3.4. Population

The California Department of Finance estimated the January 1, 2020 total population for the City of Sacramento was 510,931.

F.4 Hazard Identification

Sacramento's identified the hazards that affect the City and summarized their location, extent, likelihood of future occurrence, potential magnitude, and significance specific to Sacramento (see Table F-6).

Table F-6 City of Sacramento—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Highly Likely	Critical	High	–High
Dam Failure	Significant	Unlikely	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Medium	High
Earthquake	Extensive	Occasional	Catastrophic	Medium	Low
Earthquake Liquefaction	Limited	Occasional	Critical	Medium	Low
Floods: 1%/0.2% annual chance	Significant	Occasional	Critical	High	High
Floods: Localized Stormwater	Extensive	Highly Likely	Limited	Medium	High
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Low
Levee Failure	Extensive	Unlikely	Critical	High	High
Pandemic	Extensive	Likely	Catastrophic	High	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Unlikely	Critical	High	High
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Critical	High	High
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Medium	Medium
Subsidence	Significant	Likely	Limited	Low	High
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Critical	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

F.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile Sacramento's hazards and assess the City's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City is included in this Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards ranked of medium or high significance specific to the City (as identified in the Significance column of Table F-6) and also includes a vulnerability assessment to the three primary hazards to the State of California: earthquake, flood, and wildfire. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

F.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 0, includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Planning Area.

F.5.2. Vulnerability Assessment and Assets at Risk

This section identifies Sacramento's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

Values at Risk

The following data from the Sacramento County Assessor's Office is based on the 2020 Assessor's data. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitations are created by Proposition 13 and the Williamson Act as detailed in the Base Plan. With respect to Proposition 13, instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is most likely low and does not reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table F-7 shows the 2020 Assessor's values and content replacement values (e.g., the values at risk) broken down by property use for the City.

Table F-7 City of Sacramento – Total Values at Risk by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	14	2	$3,766,304	$623,292	$623,292	$5,012,888
Care/Health	158	132	$101,986,210	$1,650,906,442	$1,650,906,442	$3,403,799,094
Church/Welfare	539	440	$110,796,101	$547,917,921	$547,917,921	$1,206,631,943
Industrial	2,034	1,820	$715,773,896	$2,237,502,146	$3,356,253,213	$6,309,529,268
Miscellaneous	3,065	9	$3,772,608	$320,049	$320,049	$4,412,706
Office	1,796	1,452	$1,194,477,660	$5,063,635,910	$5,063,635,910	$11,321,749,480
Public/Utilities	768	1	$1,709,648	$31,233	$31,233	$1,772,114
Recreational	139	80	$91,014,962	$472,244,051	$472,244,051	$1,035,503,064
Residential	138,671	136,429	$11,850,039,828	$30,788,795,112	$15,394,397,104	$58,033,232,742
Retail/ Commercial	2,943	2,341	$1,341,124,596	$2,593,301,604	$2,593,301,604	$6,527,727,804
Unknown	2	1	$0	$86,693	$0	$86,693
Vacant	5,461	189	$917,560,472	$38,071,318	$0	$955,631,790
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**

Source: Sacramento County 2020 Parcel/Assessor's Data

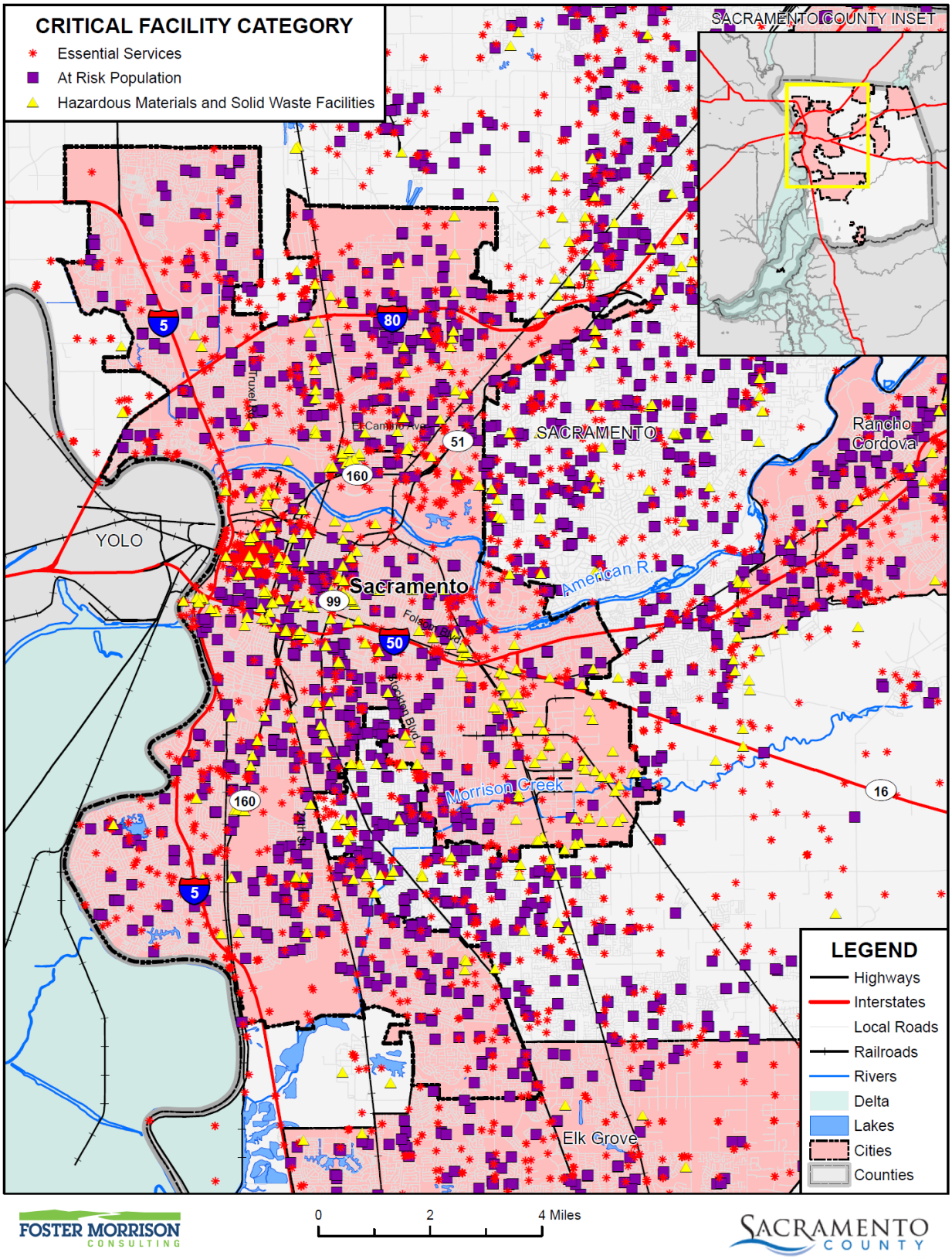
Critical Facilities and Infrastructure

Critical facilities and infrastructure are those buildings and infrastructure that are crucial to a community. Should these be damaged, it makes it more difficult for the community to respond to and recover from a disaster. For purposes of this Plan, a critical facility is defined as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities. Critical facilities in the City of Sacramento are shown in Figure F-3, and detailed in Table F-8.

Figure F-3 City of Sacramento – Critical Facilities



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table F-8 City of Sacramento – Critical Facilities by Category and Type

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
Essential Services Facilities	Airport	1
	Bridge	26
	Cellular Tower	2
	Emergency Evacuation Center	91
	EMS Stations	26
	FDIC Insured Banks	82
	Fire Station	22
	Floodgate	43
	Hospital or Urgent Care	16
	Law Enforcement	27
	Microwave Service Towers	501
	Port Facilities	6
	Power Plants	7
	Public Transit Stations	41
	Pump Station	200
	Sewage Treatment Plant	9
	State Government Buildings	33
	Water Well	151
	Total	**1,284**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	11
	Community Center	2
	Day Care Center	140
	Major Sports Venues	3
	Mobile Home Parks	22
	Places of Worship	427
	School	238
	Total	**843**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	2
	EPA ER TRI Facility	39
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	174
	Solid Waste Facility	23
	Tank Farm	4
	Waste Transfer Station	5
	Total	250

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
City of Sacramento Total		**2,377**

Source: City of Sacramento

Natural Resources

Natural resources are unique to each area and are difficult to replace. Should a natural disaster occur, these species and locations are at risk.

Habitats

The City of Sacramento has a variety of natural resources of value to the community:

- Annual Grassland
- Ruderal Habitats
- Riparian Woodland
- Oak Woodlands
- Wetlands
- Rivers, Creeks, and Canals
- Freshwater Marsh
- Vernal Pools and Seasonal Wetlands
- Ornamental Landscaping

Wetlands

The wetland and related habitat areas are some of the most important resources of the City. Wetlands are habitats in which soils are intermittently or permanently saturated or inundated. Wetland habitats vary from rivers to seasonal ponding of alkaline flats and include swamps, bogs, marshes, vernal pools, and riparian woodlands. Wetlands are considered to be waters of the United States and are subject to the jurisdiction of the U.S. Army Corps of Engineers as well as the California Department of Fish and Wildlife (CDFW). Where the waters provide habitat for federally endangered species, the U.S. Fish and Wildlife Service may also have authority.

Wetlands are a valuable natural resource for communities providing beneficial impact to water quality, wildlife protection, recreation, and education, and play an important role in hazard mitigation. Wetlands provide drought relief in water-scarce areas where the relationship between water storage and streamflow regulation is vital, and reduce flood peaks and slowly release floodwaters to downstream areas. When surface runoff is dampened, the erosive powers of the water are greatly diminished. Furthermore, the reduction in the velocity of inflowing water as it passes through a wetland helps remove sediment being transported by the water.

Wetlands are often found in floodplains and depressional areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flow. Wetlands perform a variety of ecosystem functions including food web support, habitat for insects and other invertebrates, fish and wildlife habitat, filtering of waterborne and dry-deposited anthropogenic pollutants, carbon storage, water flow regulation (e.g., flood abatement), groundwater recharge, and other human and economic benefits.

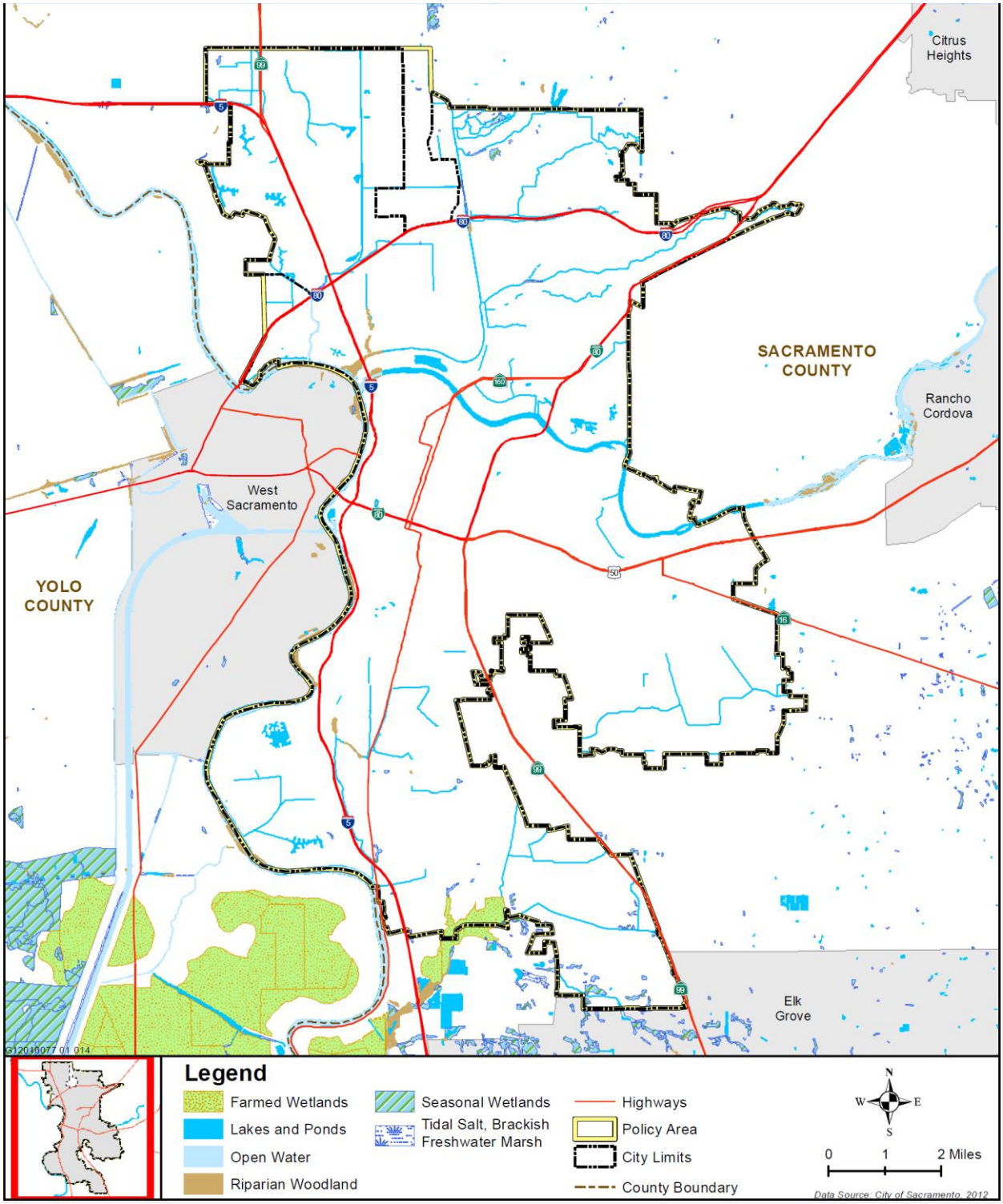
Wetlands, and other riparian and sensitive areas, provide habitat for insects and other invertebrates that are critical food sources to a variety of wildlife species, particularly birds. There are species that depend on these areas during all parts of their lifecycle for food, overwintering, and reproductive habitat. Other species use wetlands and riparian areas for one or two specific functions or parts of the lifecycle, most commonly for food resources. In addition, these areas produce substantial plant growth that serves as a food source to herbivores (wild and domesticated) and a secondary food source to carnivores.

Wetlands slow the flow of water through the vegetation and soil, and pollutants are often held in the soil. In addition, because the water is slowed, sediments tend to fall out, thus improving water quality and reducing turbidity downstream.

These natural floodplain functions associated with the natural or relatively undisturbed floodplain that moderates flooding, such as wetland areas, are critical for maintaining water quality, recharging groundwater, reducing erosion, redistributing sand and sediment, and providing fish and wildlife habitat. Preserving and protecting these areas and associated functions are a vital component of sound floodplain management practices for the City of Sacramento.

Wetlands function as natural sponges that trap and slowly release surface water, rain, snowmelt, groundwater and flood waters. Trees, root mats, and other wetland vegetation also slow the speed of floodwaters and distribute them more slowly over the floodplain. This combined water storage and braking action lowers flood heights and reduces erosion. Wetlands within and downstream of urban areas are particularly valuable, counteracting the greatly increased rate and volume of surface- water runoff from pavement and buildings. The holding capacity of wetlands helps control floods and prevents water logging of crops. Preserving and restoring wetlands, together with other water retention, can often provide the level of flood control otherwise provided by expensive dredge operations and levees. Figure F-4 provides a map of the City's wetland areas.

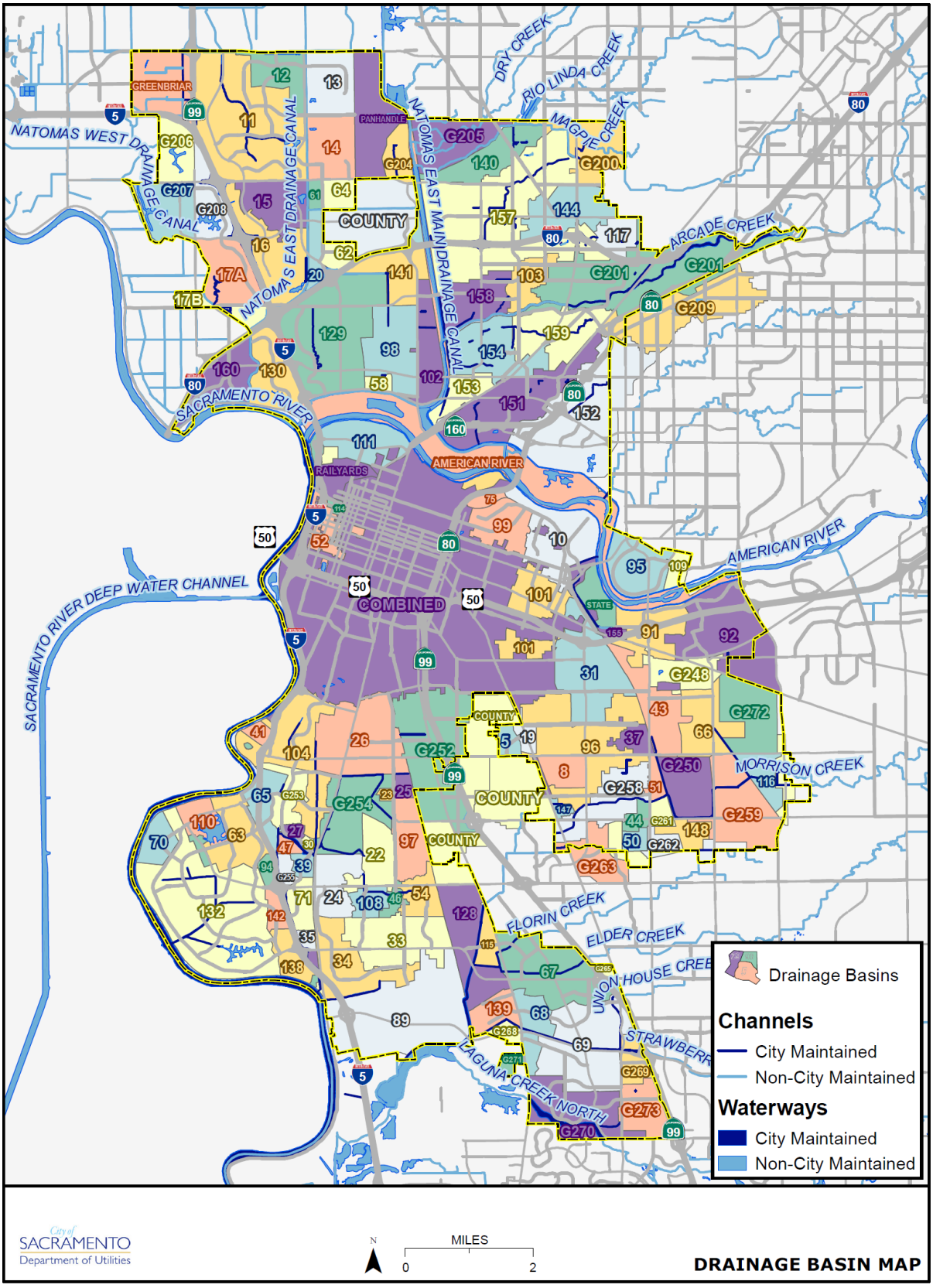
Figure F-4 City of Sacramento – Wetlands Location Map



Source: City of Sacramento 2035 General Plan

In addition to these wetlands, the City noted it has many drainage and detention basins that serve as wetlands during times of heavy rains. These are shown on Figure F-5.

Figure F-5 City of Sacramento – Drainage Basins and Waterways



Special Status Species

The following special-status species are known to occur within the natural habitats most likely to be present within the Policy Area boundaries. These and other species potentially occurring in the Policy Area can be found in Table F-9. Figure F-6 shows the locations of sensitive elements within the Policy Area.

Table F-9 Special-Status Species Potentially Occurring in the City of Sacramento

Scientific Name	Common Name	Status	Habitat
Plants			
Astragalus tener var. tener	Alkali milk-vetch	1B.2	Vernal pools, playas and Valley grasslands on adobe clay and/or alkaline soils.
Atriplex depressa	Brittlescale	1B.2	Chenopod scrub, meadows, playas, valley grassland, vernal pools. Usually in alkali scalds or alkali clay in meadows or annual grassland.
Atriplex joaquiniana	San Joaquin saltbush	1B.2	Chenopod scrub, alkali meadow, valley and foothill grassland.
Balsamorhiza macrolepis var. macrolepis	Big-scale balsamroot	1B.2	Grassland
Chloropyron molle ssp. hispidum	Hispid bird's beak	1B.1	Grassland/ vernal pool.
Chloropyron palmatum	Palmate-bracted bird's-beak	FE, CE, 1B.1	Chenopod scrub, valley and foothill grassland. usually on alkaline clay, with Distichlis, Frankenia, etc.
Downingia pusilla	Dwarf downingia	2.2	Vernal pool
Gratiola heterosepala	Boggs Lake hedge-hyssop	CE, 1B.2	Vernal pool
Hibiscus lasiocarpus	Woolly rose-mallow	2.2	Freshwater marshes and swamps in the Central Valley.
Juglans hindsii	Northern California black walnut	1B.1	Riparian forest, and woodland. Few extant native stands remain; but is widely naturalized from rootstock plants
Juncus leiospermus var. ahartii	Ahart's dwarf rush	1B.2	Vernal pool
Legenere limosa	Legenere	1B.1	Vernal pool
Lepidium latipes var. heckardii	Heckard's pepper-grass	1B.2	Valley and foothill grassland and vernal pools on alkaline soils
Navarretia myersii ssp. myersii	Pincushion navarretia	1B.1	Vernal pool
Orcuttia tenuis	Slender orcutt grass	FT/CE/1B.1	Vernal pool
Orcuttia viscida	Sacramento orcutt grass	FE, 1B.1	Vernal pool and occasionally seasonal wetlands
Sagittaria sanfordii	Sanford's arrowhead	1B.2	Marshes and swamps (assorted shallow fresh water).
Invertebrates			
Branchinecta lynchi	Vernal pool fairy shrimp	FT	Vernal pools and seasonal wetlands in grassland habitats

Scientific Name	Common Name	Status	Habitat
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	FT (under review for de-listing)	Elderberry shrubs, typically in or near riparian areas.
Lepidurus packardi	Vernal pool tadpole shrimp	FE	Vernal pools and seasonal wetlands in grassland habitats
Fish			
Archoplites interruptus	Sacramento Perch	CSC	Historically found in the sloughs, slow-moving rivers, and lakes of the central valley. Prefer warm water. Aquatic vegetation is essential for young. Tolerant of a wide range of physiochemical water conditions.
Acipenser medirostris	Green Sturgeon	FT, CSC	Long-lived anadromous species that migrates through the Sacramento River to spawning grounds in the Feather and upper Sacramento rivers. Occurs in low numbers in the San Francisco Estuary and Sacramento River. Thought to spawn in deep holes with fast moving water over cobble substrates. Larvae develop within freshwater systems, migrate downstream and remain in the estuaries for between one and four years before migrating to the ocean. Mature adults move into estuaries in the spring, and spawning adults continue into natal rivers in late spring/early summer. Post spawning adults return to the estuary before migrating back to the ocean in late fall. Sub-adult fish are also thought to enter estuaries during the summer and fall months. The Sacramento River adjacent to the Policy Area does not support spawning habitat for adult fish or rearing habitat for juveniles.
Hypomesus transpacificus	Delta smelt	FT, CE	Occurs in Sacramento-San Joaquin Delta most of the year. Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands along the Sacramento River, downstream from its confluence with the American River
Oncorhynchus mykiss	Central Valley steelhead	FT	Occurs in the Pacific Ocean for most of its life. Travels to clean gravel beds in the upper Sacramento and portions of the American River for spawning
Oncorhynchus tshawytscha	Central Valley spring run Chinook salmon	FT, CT	Occurs in the Pacific Ocean for most of its life. Travels to clean gravel beds in the upper Sacramento and portions of the American River for spawning

Scientific Name	Common Name	Status	Habitat
Oncorhynchus tshawytscha	Central Valley Winter run Chinook salmon	FE, CE	Occurs in the Pacific Ocean for most of its life. Travels to clean gravel beds in the upper Sacramento and portions of the American River for spawning.
Pogonichthys macrolepidotus	Sacramento splittail	SC/CSC	Endemic to the lakes and rivers of the central valley, but now confined to the Delta, Suisun Bay & associated marshes. Prefers slow moving river sections, dead end sloughs. Requires flooded vegetation for spawning & foraging for young.
Amphibians			
Spea hammondii	Western spadefoot	CSC	Breeds in seasonal wetlands and large vernal pools, spends most of the year underground in adjacent upland areas.
Reptiles			
Actinemys marmorata	Western pond turtle	CSC	Ponds, streams, rivers, marshes and canals with suitable basking sites and vegetative cover. Nests and aestivates in adjacent uplands.
Phrynosoma coronatum frontale	California horned lizard	CSC	Annual grassland, chaparral, saltbush scrub, alkali flats, oak woodland, riparian woodland, and coniferous forest; open habitats with loose fine (often sandy) soils.
Thamnophis gigas	Giant garter snake	FT, CT	Cattail and tule marshes, low gradient streams, rice fields and canals on the Valley floor
Birds			
Agelaius tricolor	Tricolor blackbird	CSC (nesting)	Nest in dense stands of cattails, thickets of willows, blackberries, or tall herbs adjacent to open grasslands
Athene cunicularia	Burrowing owl	CSC (burrow sites)	Grassland, deserts and other open habitats. Requires ground squirrel or other small mammal burrows for nesting
Buteo swainsoni	Swainson's hawk	CT	Nests in riparian trees; forages in open fields
Circus cyaneus	Northern harrier	CSC (nesting)	Nests in freshwater marsh and agricultural fields; forages in marshes, grasslands and agricultural fields
Elanus leucurus	White-tailed kite	CFP (Nesting)	Nests colonially in large trees adjacent to open grasslands for foraging.
Lanius ludovicianus	Loggerhead shrike	CSC (nesting)	Nests in woodlands adjacent to grassland foraging habitat
Melospiza melodia	Song sparrow "Modesto" population	CSC (year round)	Associated with emergent freshwater marshes, irrigation canals, riparian scrub, riparian woodland.

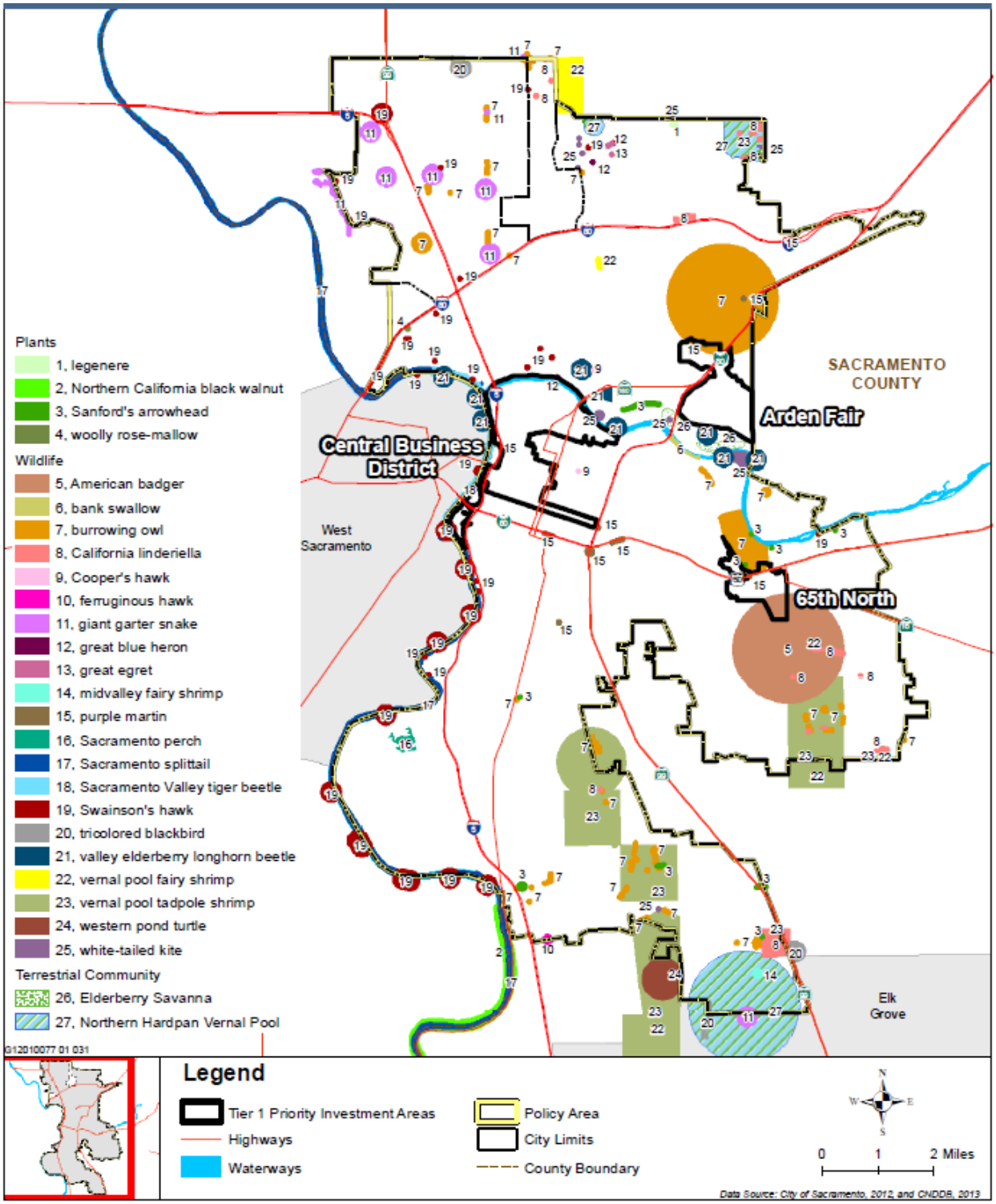
Scientific Name	Common Name	Status	Habitat
Progne subis	Purple martin	CSC (nesting)	Nest in cavities in trees, under bridges and other human-made structures
Riparia riparia	Bank swallow	CT	Nests in sandy banks or cliffs, usually over water (typically rivers and streams).
Mammals			
Antrozous pallida	Pallid bat	CSC	Roosts in crevices in caves, mines, large rock outcrops, under bridges and in abandoned buildings. Forages on or near the ground in a wide variety of open habitats
Corynorhinus townsendii townsendii	Pacific western big eared bat	CSC	Roosts in the open in large caves, abandoned mines and buildings. Very sensitive to roost disturbance
Lasiurus blossevillii	Western red bat	CSC	Roosts primarily in tree foliage, especially in cottonwood, sycamore, and other riparian trees or orchards. Although potential habitat for these species is present within the Policy Area, none have been recorded. Distribution of special-status bat species is difficult to study and therefore poorly known. Bat colonies that may harbor some or all of these specialstatus species are present in several of the older buildings in downtown Sacramento and in humanmade structures along the American and Sacramento rivers.
Taxidea taxus	American Badger	CSC	Principal habitat requirements include: sufficient prey base; friable soils; and relatively open, uncultivated ground such as grasslands. Prey primarily on burrowing rodents such as gophers, ground squirrels, marmots, and kangaroo rats. Badgers survive only in low numbers in peripheral parts of the Central Valley. The CNDDB includes one recorded occurrence in the Policy Area near Power Inn and Fruitridge roads.

Scientific Name	Common Name	Status	Habitat

Notes: Status =
Federal:
FE = Endangered, legally protected by the Federal Endangered Species Act (ESA)
FT = Threatened, legally protected by the Federal Endangered Species Act (ESA)
State:
CE = Endangered, legally protected by the California Endangered Species Act (CESA)
CFP = Fully Protected species (legally protected under Fish and Game Code)
CSC = California Species of Concern by DFG (no formal protection other than CEQA consideration)
CT = Threatened, legally protected by the California Endangered Species Act (CESA)
SA = Animal included on the CDFW's Special Animal List.
California Rare Plant Ranks (no formal protection other than CEQA consideration):
1B - Plant species that is rare or endangered in California or elsewhere.
2 - Plant species that is rare or endangered in California, but is more common elsewhere.
Threat code extensions:
.1 - Seriously endangered in California
.2 – Fairly endangered in California
.3 – Not very endangered in California

Source: California Department of Fish and Game 2011, California Natural Diversity Database, 2007.

Figure F-6 City of Sacramento Biological Resources



Source: City of Sacramento 2035 General Plan Environmental Resources Background Report

Historic and Cultural Resources

Historic and cultural resources are difficult to replace. Should a natural disaster occur, these properties and locations can be at risk.

The City of Sacramento has a stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. OHP administers the National Register of Historic Places, the California Register of Historical Resources, California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the Base Plan. Table F-10 lists the historical buildings in the City.

Table F-10 City of Sacramento – Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
A. W. Clifton House, Compton Mansion (C17)			X		2/1/2002	Sacramento
Adams And Company Building (607)		X			5/22/1957	Sacramento
Alkali Flat Central Historic District (N1294)	X				7/26/1984	Sacramento
Alkali Flat North Historic District (N1279)	X				4/19/1984	Sacramento
Alkali Flat West Historic District (N1295)	X				7/26/1984	Sacramento
B. F. Hastings Building (606)		X			5/22/1957	Sacramento
Blue Anchor Building (N1171)	X				2/3/1983	Sacramento
Brighton School (N952)	X				4/3/1981	Sacramento
Business & Professional Building, Consumer Affairs Building (C8)			X		2/10/2000	Sacramento
California Almond Growers Exchange Processing Facility (967)		X			10/1/1985	Sacramento
California Governor's Mansion (N60)	X				11/10/1970	Sacramento
California State Capitol (N222)	X				4/3/1973	Sacramento
California's Capitol Complex (872)	X	X			5/6/1974	Sacramento
California's First Passenger Railroad (526)		X			3/7/1955	Sacramento
Calpak Plant No. 11 (N1285)	X				5/17/1984	Sacramento
Camp Union, Sacramentoville (666)		X			11/5/1958	Sacramento
Capitol Extension District (N1288)	X				5/24/1984	Sacramento
Chevra Kaddisha (Home Of Peace Cemetery) (654)		X			7/28/1958	Sacramento

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Coloma Road at Sacramento's Fort (745)		X			7/5/1960	Sacramento
Coolot Company Building (N671)	X				9/20/1978	Sacramento
Cranston--Geary House (N2010)	X				1/23/1998	Sacramento
Crocker, E. B., Art Gallery (N86)	X	X			5/6/1971	Sacramento
Curran Farmhouse (P666)				X	12/17/1985	Sacramento
D. O. Mills Bank Building (609)		X			5/22/1957	Sacramento
Dunlap's Dining Room (N1764)	X				4/2/1992	Sacramento
Eagle Theater (595)		X			5/22/1957	Sacramento
Eastern Star Hall (P754)	X			X	8/8/1991	Sacramento
Ebner's Hotel (602)		X			5/22/1957	Sacramento
Fire Station No. 6 (N1686)	X				4/25/1991	Sacramento
Firehouse No. 3 (N1743)	X				10/29/1991	Sacramento
First Transcontinental Railroad (780)		X			11/20/1962	Sacramento
First Transcontinental Railroad-Western Base of The Sierra Nevada (780)		X			11/20/1962	Sacramento
Five Mile House-Overland Pony Express Route in California (697)		X			9/11/1959	Sacramento
Galarneaux, Mary Haley, House (N2121)	X				2/12/2001	Sacramento
George Hack House (P800)				X	8/5/1994	Sacramento
Goethe House (N1036)	X				2/19/1982	Sacramento
Governor's Mansion (823)		X			6/7/1968	Sacramento
Greene, John T., House (N1092)	X				4/15/1982	Sacramento
Headquarters of The Big Four (600)		X			5/22/1957	Sacramento
Heilbron House (N462)	X				12/12/1976	Sacramento
Hotel Regis (N1147)	X				10/29/1982	Sacramento
Hotel Senator (N782)	X				5/30/1979	Sacramento
Howe, Edward P., Jr., House (N1037)	X				2/19/1982	Sacramento
Hubbard-Upson House (N543)	X				12/2/1977	Sacramento
I Street Bridge (N1094)	X				4/22/1982	Sacramento
J Street Wreck (N1692)	X				5/16/1991	Sacramento
Joe Mound (N121)	X				10/14/1971	Sacramento
Johnson, J. Neely, House (N438)	X				9/13/1976	Sacramento
Joseph Hampton Kerr Homesite (P126)				X	6/6/1969	Sacramento

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Judah, Theodore, School (N1985)	X				7/25/1997	Sacramento
Kuchler Row (N1121)	X				6/25/1982	Sacramento
Lady Adams Building (603)		X			5/22/1957	Sacramento
Lais, Charles, House (N1350)	X				2/28/1985	Sacramento
Libby Mcneil And Libby Fruit and Vegetable Cannery (N1050)	X				3/2/1982	Sacramento
McClatchy, C.K., Senior High School (N2148)	X				11/2/2001	Sacramento
Merchants National Bank of Sacramento (N1936)	X				2/16/1996	Sacramento
Merrium Apartments (N1654)	X				9/13/1990	Sacramento
Mesick House (N1002)	X				1/21/1982	Sacramento
Michigan (468)		X			8/30/1950	Sacramento
Motor Vehicle Building, Department of Food & Agriculture (C4)			X		11/5/1999	Sacramento
New Helvetia Cemetery (592)		X			5/22/1957	Sacramento
Nisipowinan Village Site (900)	X	X			6/16/1976	Sacramento
Old Elk Grove Hotel Site (P532)				X	6/29/1979	Sacramento
Old Folsom Powerhouse-Sacramento Station A (633)		X			3/3/1958	Sacramento
Old Sacramento (812)	X	X			12/30/1965	Sacramento
Old Tavern (N1242)	X				9/15/1983	Sacramento
Original Sacramento Bee Building (611)		X			5/22/1957	Sacramento
Overton Building (610)		X			5/22/1957	Sacramento
Pioneer Telegraph Station (366)		X			10/9/1939	Sacramento
Pony Express Terminal (N66000220)	X				10/15/1966	Sacramento
Public Works Office Building, Caltrans Building (C5)			X		11/5/1999	Sacramento
River Mansion (P149)				X	11/3/1969	Sacramento
Ruhstaller Building (N1003)	X				1/21/1982	Sacramento
Sacramento Bank Building (N1004)	X				1/21/1982	Sacramento
Sacramento City Cemetery (566)		X			2/25/1957	Sacramento
Sacramento City Library (N1784)	X				7/30/1992	Sacramento
Sacramento Hall of Justice (N2067)	X				9/24/1999	Sacramento
Sacramento Junior College Annex and Extensions (N1874)	X				8/22/1994	Sacramento

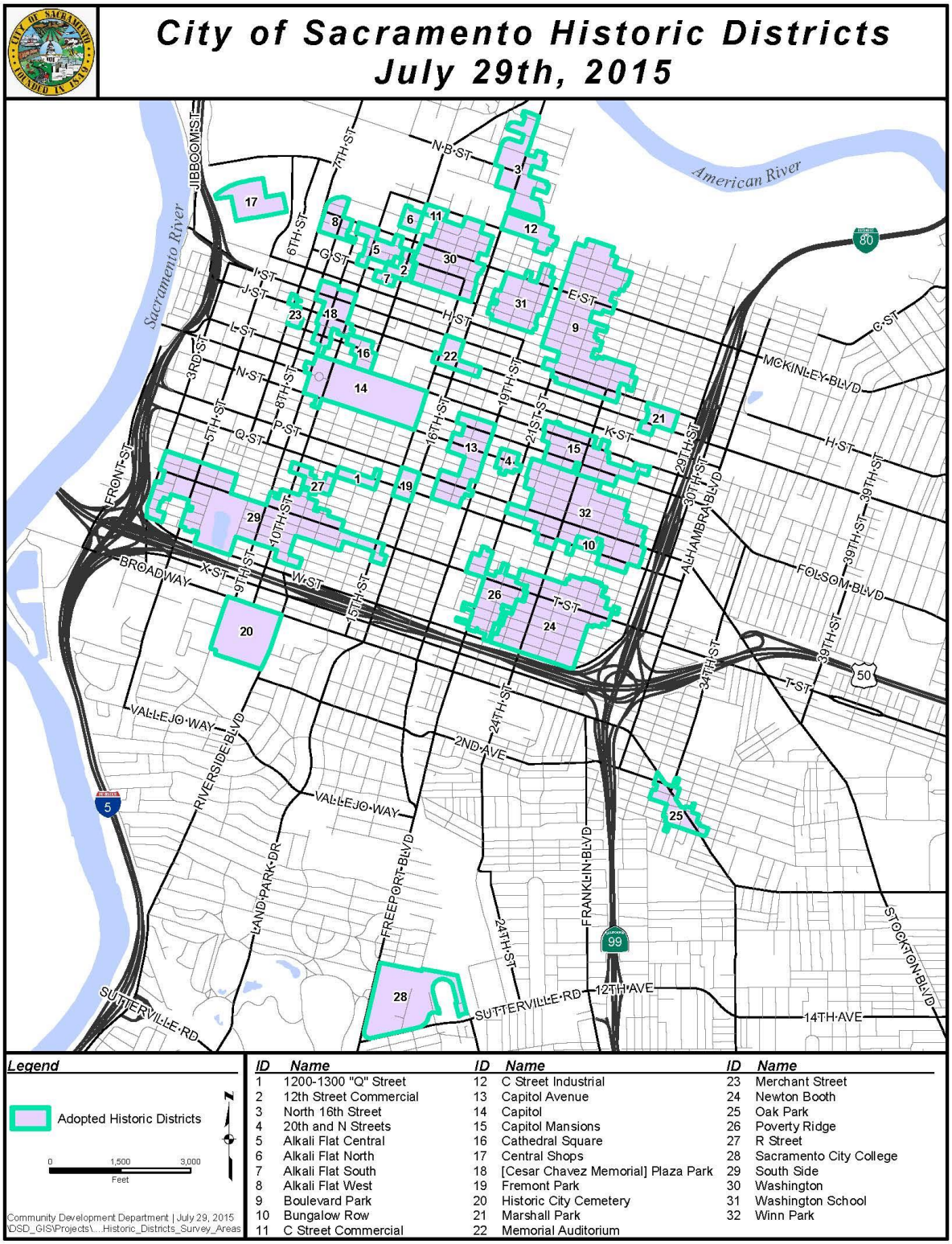
Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Sacramento Masonic Temple (N2131)	X				5/17/2001	Sacramento
Sacramento Memorial Auditorium (N566)	X				3/29/1978	Sacramento
Site of China Slough (594)		X			5/22/1957	Sacramento
Site of Congregational Church (613)		X			5/22/1957	Sacramento
Site of First and Second State Capitols at Sacramento (869)		X			1/11/1974	Sacramento
Site of Home of Newton Booth (596)		X			5/22/1957	Sacramento
Site of Orleans Hotel (608)		X			5/22/1957	Sacramento
Site of Sacramento Union (605)		X			5/22/1957	Sacramento
Site of Sam Brannan House (604)		X			5/22/1957	Sacramento
Site of Stage and Railroad (First) (598)		X			5/22/1957	Sacramento
Site of The First African American Episcopal Church Established on The Pacific Coast (1013)		X			5/5/1994	Sacramento
Site of The First Jewish Synagogue Owned by A Congregation on The Pacific Coast (654)		X			7/28/1958	Sacramento
Site of Pioneer Mutual Volunteer Firehouse (612)		X			5/22/1957	Sacramento
Southern Pacific Railroad Company's Sacramento Depot (N353)	X				4/21/1975	Sacramento
St. Elizabeth's Church (P611)				X	3/2/1983	Sacramento
Stanford-Lathrop House (614)		X			5/22/1957	Sacramento
Sacramento's Fort (525)		X			11/1/1954	Sacramento
Sacramento's Landing (591)		X			5/22/1957	Sacramento
Sacramentoville (593)		X			5/22/1957	Sacramento
Temporary Detention Camps for Japanese Americans-Sacramento Assembly Center (934)		X			5/13/1980	Sacramento
Tower Bridge (N1116)	X				6/24/1982	Sacramento
Travelers' Hotel (N680)	X				10/19/1978	Sacramento
U.S. Post Office, Courthouse and Federal Building (N855)	X				1/25/1980	Sacramento
Van Voorhies House (N535)	X				11/17/1977	Sacramento
Wagner, Anton, Duplex (N923)	X				11/10/1980	Sacramento
Western Hotel (601)		X			5/22/1957	Sacramento

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Westminster Presbyterian Church (N2203)	X				5/22/2003	Sacramento
Wetzlar, Julius, House (N1183)	X				3/31/1983	Sacramento
What Cheer House (597)		X			5/22/1957	Sacramento
Whitter Ranch (Originally Saylor Ranch), Witter Ranch (P744)				X	5/8/1991	Sacramento
Winters House (N2046)	X				1/25/1999	Sacramento
Witter, Edwin, Ranch (N1675)	X				3/14/1991	Sacramento
Woodlake Site (N88)	X				5/6/1971	Sacramento

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/

Over the years the City of Sacramento has undertaken several historic building surveys in an effort to establish specific Historic Districts. As of the date of this document's publication, the City of Sacramento has designated 32 Historic Districts and 14 Design Review Districts. The City Code provides for the compilation of Landmarks, Contributing Resources, and Historic Districts into the Sacramento Register of Historic and Cultural Resources (Sacramento Register). The Sacramento Register includes all listed or surveyed historic resources in the City of Sacramento. The Sacramento Register also includes listings or maps of the properties within the City's Design Review Districts that have been afforded preservation protection by ordinance, but are not designated as a Historic District. The historic districts are shown in Figure F-7.

Figure F-7 Historic Districts in the City of Sacramento



Source: Sacramento Register of Historic & Cultural Resources, 2016

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. Information from the City of Sacramento General Plan Housing Element, the California Department of Finance, the US Census Bureau form the basis of this discussion.

Historic Population Trends and Current Population

Population growth can increase the number of people living in hazard prone areas. Sacramento has generally seen steady growth. Sacramento has seen growth rates as shown in Table F-11.

Table F-11 City of Sacramento – Population Changes Since 1950

Year	Population	% Change
1950	137,572	–
1960	191,667	39.3%
1970	257,105	34.1%
1980	282,400	9.8%
1990	366,500	29.8%
2000	407,018	11.1%
2010[1]	466,488	14.6%
2020[2]	510,931	9.5%

Source: [1]US Census Bureau, [2]California Department of Finance

Special Populations and Disadvantaged Communities

Within the United States, those groups that have been found to generally be more vulnerable to climate impacts and natural hazards include the poor, communities of color, older adults, young children, people with physical and mental illness, people with cognitive and physical disabilities, immigrants, those experiencing discrimination, the socially isolated, those with limited transportation options, and those with inadequate housing. These groups of people experience elevated levels of vulnerability for a number of potentially overlapping reasons. Some of these factors include:

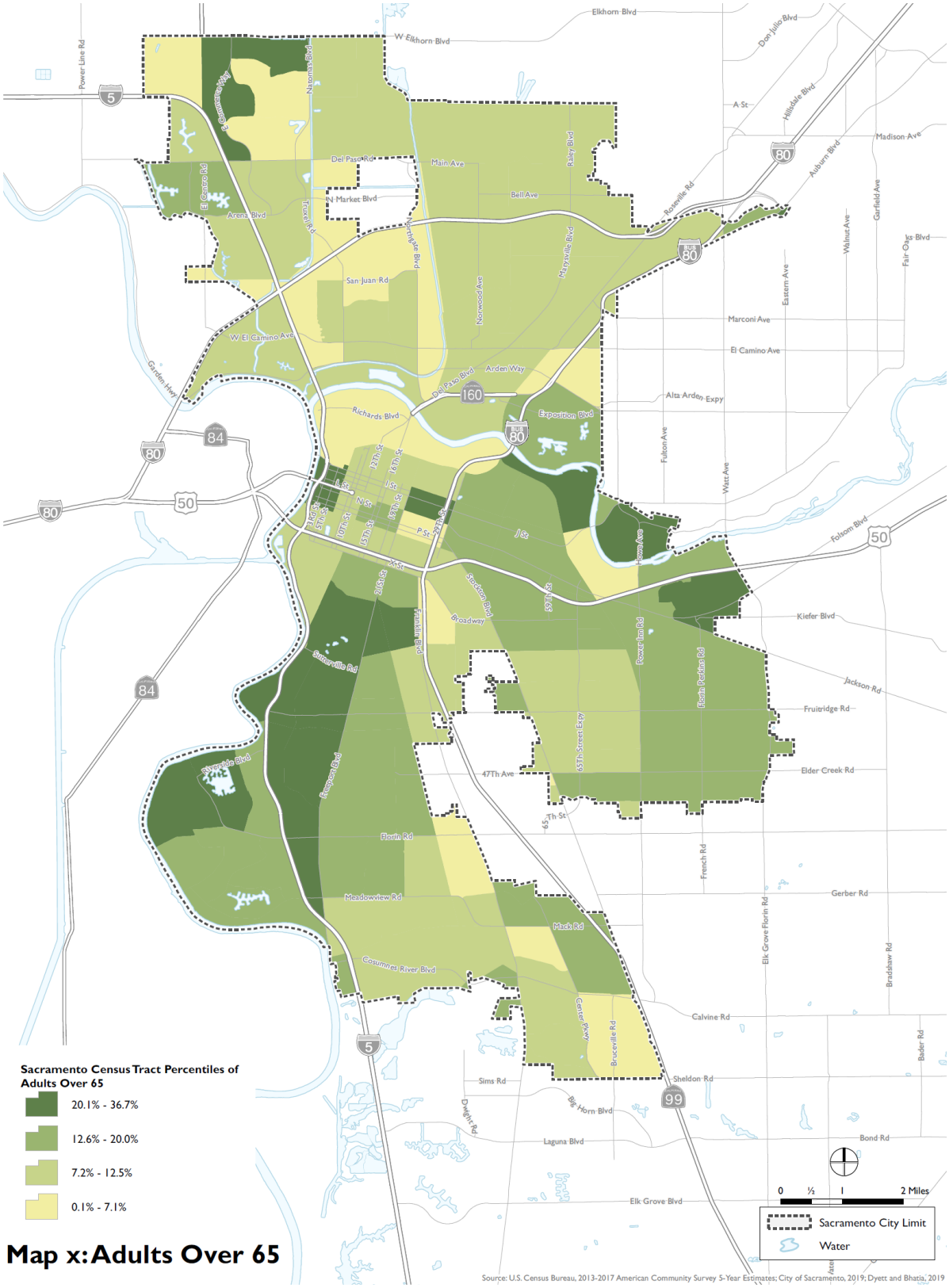
- Housing quality and location: Some populations have higher probabilities of living in risk prone areas, areas with poorly maintained infrastructure, and areas with increased levels of air pollution.

- Cultural barriers: Limited English speaking ability may make it more difficult for certain individuals to understand resources such as hazard warnings and emergency preparedness plans. Other cultural barriers, such as lack of familiarity with American government and planning processes, may prevent certain groups from engaging in planning processes and accessing key government-provided resources.
- Lack of access to critical services: Public facilities and services such as hospitals and community centers are key providers of shelter and support during extreme events. Access to transportation facilities that one can use to evacuate from harm's way are also important tools to addressing vulnerability. Those who lack access to these facilities or have limited mobility experience heightened levels of vulnerability.
- Health disparities: People experiencing higher rates of illnesses such as cardiovascular and kidney disease, diabetes, asthma, and COPD, whose effects can be exacerbated by climate impacts, are also more vulnerable. Health-related vulnerability may be especially significant for those who lack health insurance, have limited mobility, are undocumented, are experiencing social or linguistic isolation, or have a lack of funds to pay for medical care, as these factors all pose significant barriers to obtaining medical care.

It is important to remember that individuals and communities can be affected by more than one of these contributing factors at once. Those who are exposed to a higher number of contributing factors may be especially vulnerable.

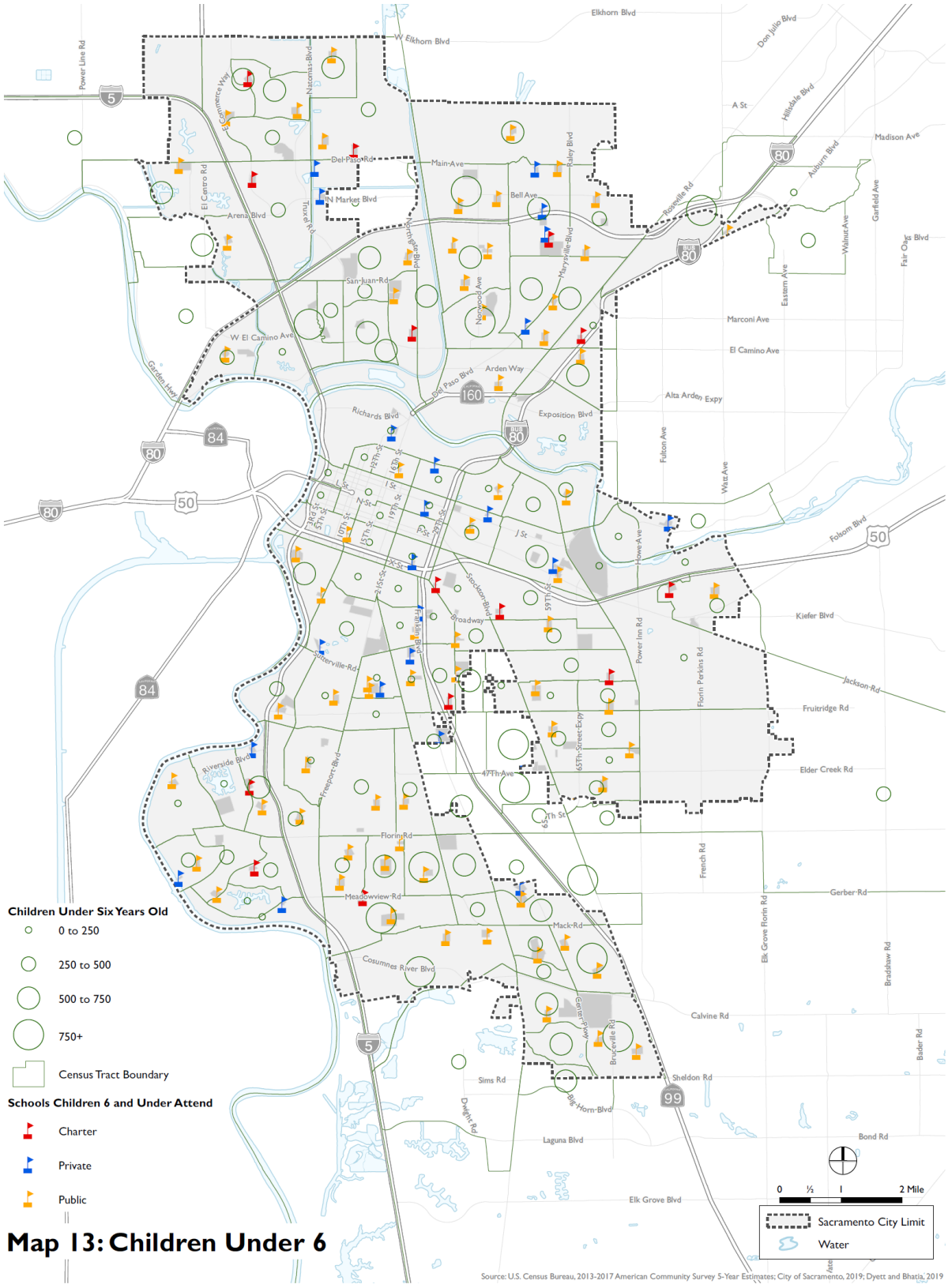
The City of Sacramento provided maps to show the distribution of special populations throughout the City. These are shown on Figure F-8 through Figure F-12.

Figure F-8 City of Sacramento – Distribution of Population over Age 65



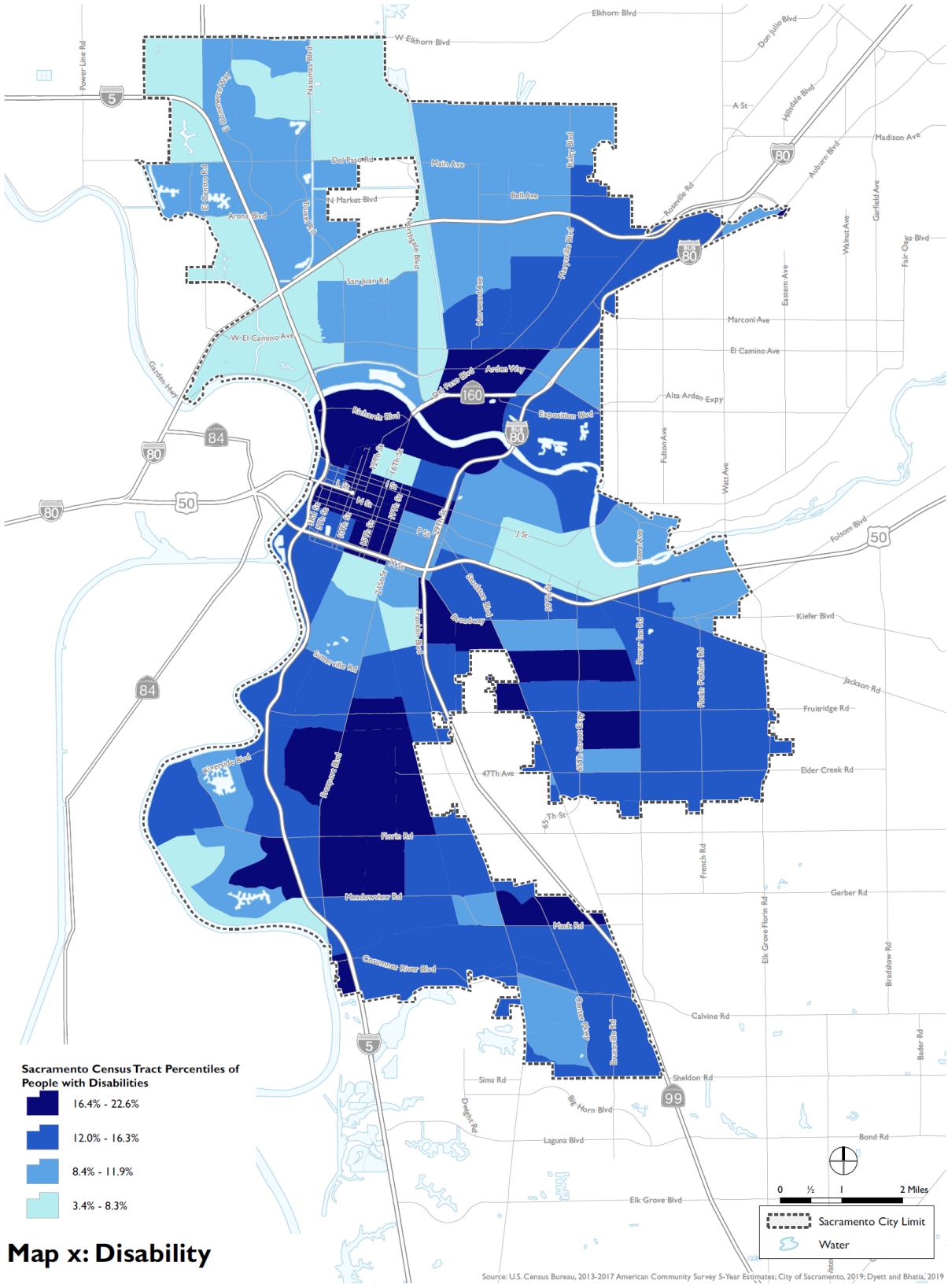
Source: City of Sacramento

Figure F-9 City of Sacramento – Distribution of Population Under 6



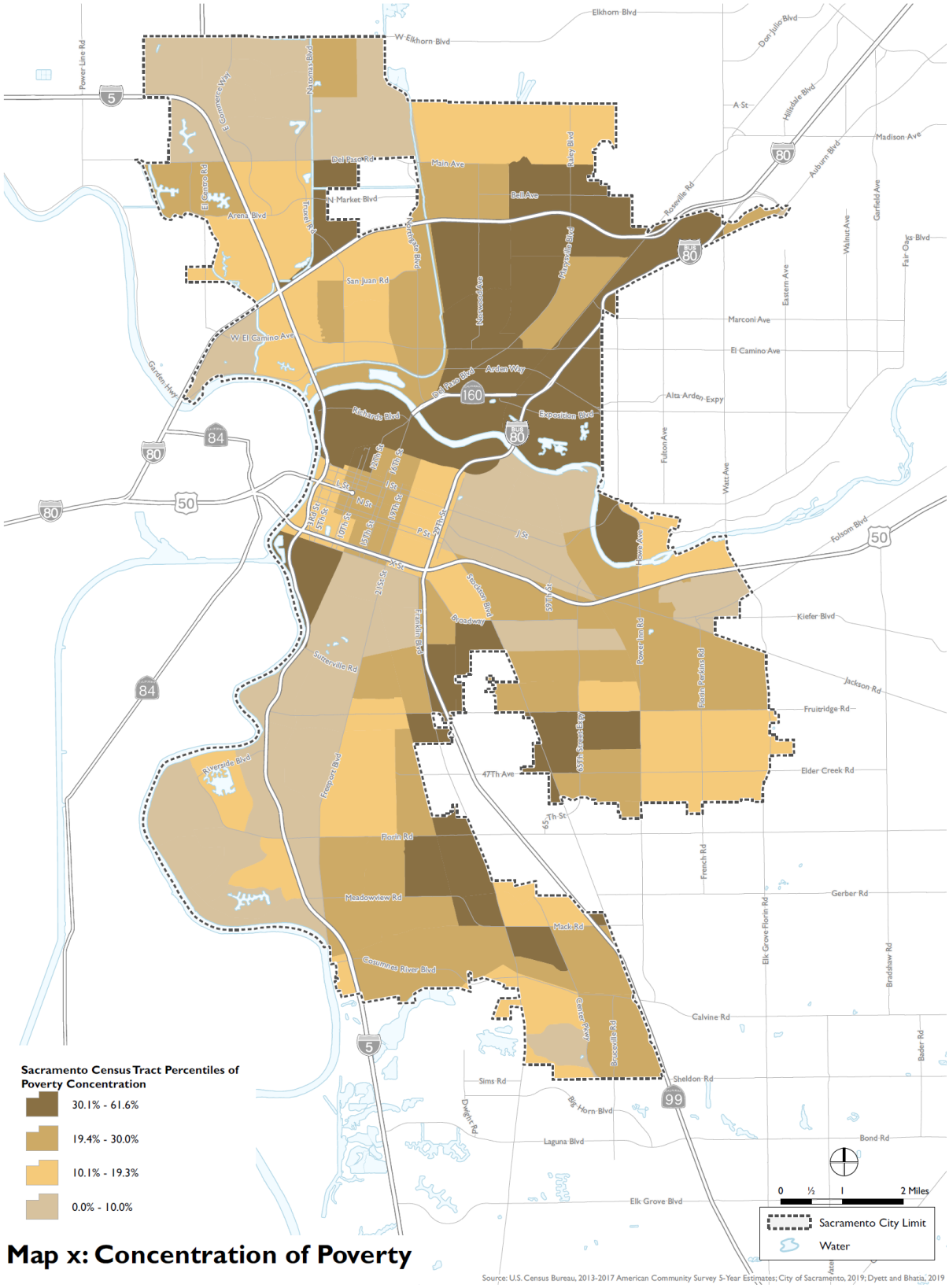
Source: City of Sacramento

Figure F-10 City of Sacramento – Distribution of Population Defined as Disabled



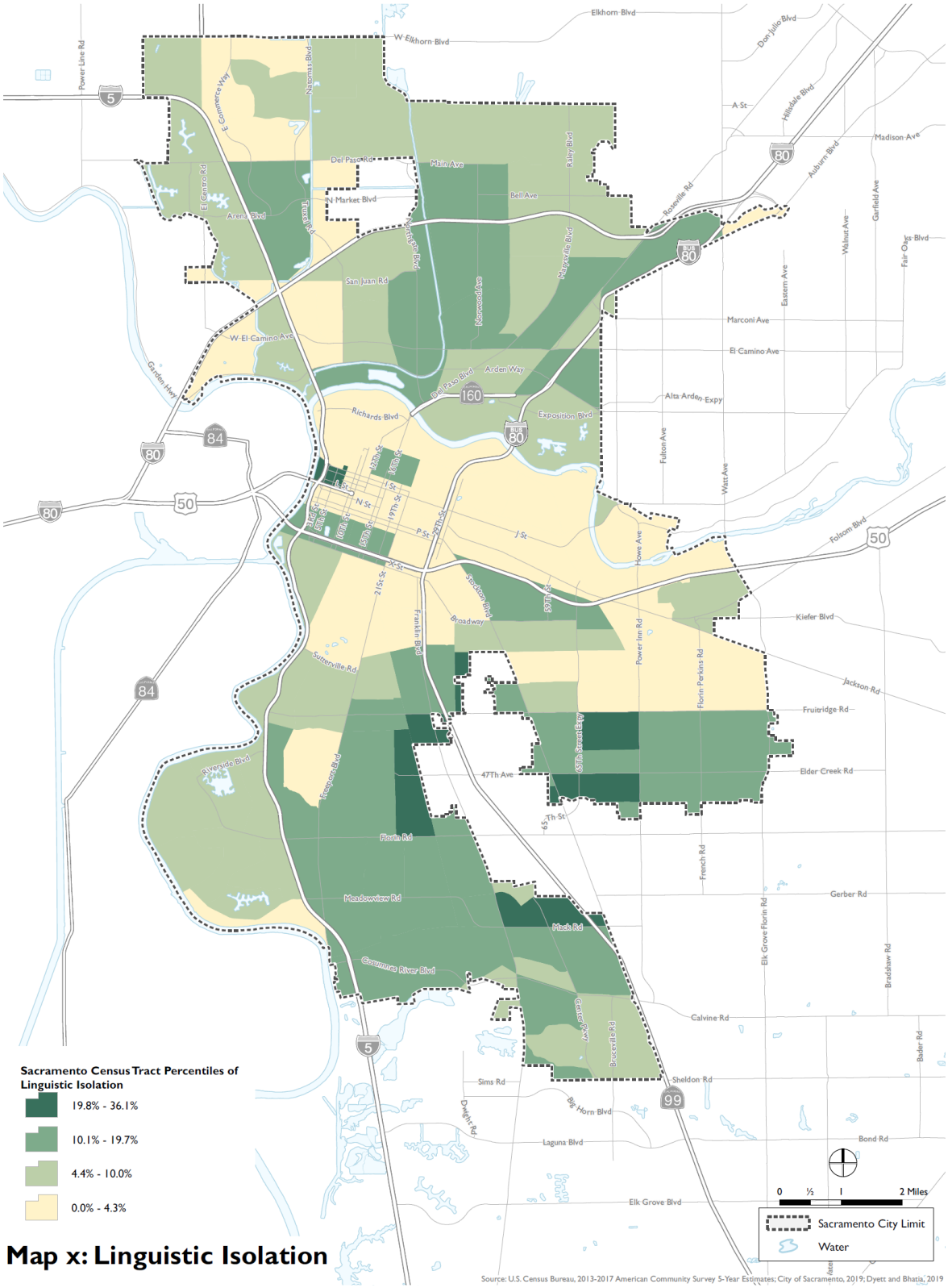
Source: City of Sacramento

Figure F-11 City of Sacramento – Distribution of Population under Federal Poverty Level



Source: City of Sacramento

Figure F-12 City of Sacramento – Distribution of Population Defined as Linguistically Isolated



Map x: Linguistic Isolation

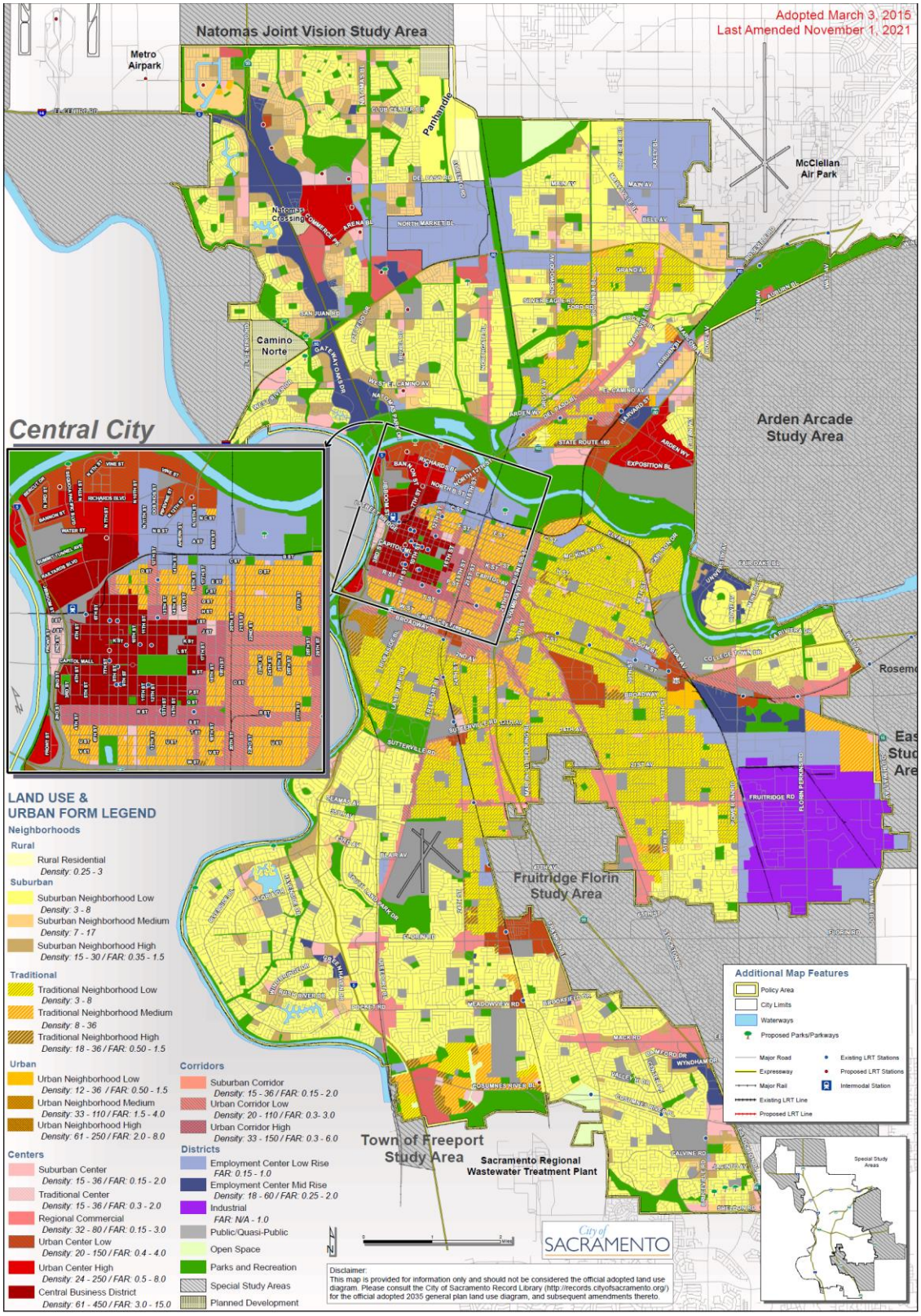
Source: City of Sacramento

Land Use

State planning law requires that the land use element of a general plan include a statement of the standard population density, building intensity, and allowed uses for the various land use designations in the plan (Government Code Section 65302(a)). The City's existing land use designations from the 2035 City of Sacramento General Plan are generally described below and detailed on the Land Use Map (Figure F-13), and in Table F-12. The Sacramento Municipal Code provides detailed land use and development standards for development.

With the 2035 General Plan, a variety of new land use designations were established to reflect the more mixed and, in some cases, more intense land uses envisioned for Sacramento. New mixed-use designations provide the opportunity for a combination of residential, commercial, and office uses on a single site, depending on the designation. The City is currently working on their 2040 General Plan which will be adopted in 2022 and will include a new Land Use map to guide development. This is detailed further below in the Future Development section.

Figure F-13 City of Sacramento – 2035 General Plan Land Use Designations



Source: City of Sacramento 2035 Adopted General Plan Land Use Map

Table F-12 Land Use Designations from the 2035 General Plan

Land Use	Acres	Percent of City's Total[4]
Neighborhoods[1]	34,880	54%
Centers[2]	4,658	7%
Corridors[3]	3,111	5%
Employment Center/Industrial	9,163	14%
Public/Quasi Public	4,716	7%
Open Space, Parks, Recreation	8,554	13%
Total	**65,082**	**100%**

Source: City of Sacramento, GIS Database, 2012.

Notes:

[1] Includes all residential designations including Planned Development/Special District, Rural Residential, Suburban Low Density, Suburban Medium Density, Suburban High Density, Traditional Low Density, Traditional Medium Density, Traditional High Density, Urban Low Density, Urban Medium Density, and Urban High Density.

[2] Includes Suburban Center, Traditional Center, Urban Center Low and High and CBD.

[3] Includes Suburban Corridor and Urban Corridor High and Low.

[4] Due to rounding the City's total % may be slightly higher than 100%.

Development since 2016 Plan

As discussed in Section 4.3.1 of the Base Plan, future development has occurred in the County since the last plan. Some of this has occurred in hazard prone areas. The City Building Department tracked total building permits issued since 2016 for the City. These are tracked by total development, property use type, and hazard risk area. These are shown in Table F-13 and Table F-14.

Table F-13 City of Sacramento – Total Development Since 2016

Property Use	2016	2017	2018	2019	2020
Residential	1141	1839	1691	1679	1029
Commercial*	76	93	71	119	151
Total	**1,217**	**1,932**	**1,762**	**1,798**	**1,180**

Source: City of Sacramento Building Department

*Issued Permit Residential/Commercial New Buildings – Accela Report

Table F-14 City of Sacramento – Development in Hazard Areas since 2016

Property Use	1% Annual Chance Flood	Area Protected by Levee	Wildfire Risk Area[1]	Other
Residential	34 Units	1,327 Units	671 Units	–
Commercial	78,336 Sq Ft	826,487 Sq Ft	360,764 Sq Ft	–
Industrial	117,617 Sq Ft	244,161 Sq Ft	185,675 Sq Ft	–
Office	2,454 Sq Ft	69,524 Sq Ft	112,370 Sq Ft	–
Total	**198,407 Sq Ft**	**1,140,172 Sq Ft**	**658,809 Sq Ft**	**–**

Source: City of Sacramento Building Department

[1]Moderate or higher wildfire risk area

In Sacramento, development occurred in the flood, levee, and wildfire risk areas. While the data shows changes in development in the City since the 2016, including development in mapped hazard areas, all development is subject to current building standards to include any requirements for building in hazard areas which act to mitigate hazard exposure. Further development in hazard areas is only one factor of many that contribute to an overall change in hazard vulnerability. Based on these considerations, it cannot be definitively stated as to whether the development or even lack of development contributed to an increase or decrease in vulnerability for Sacramento.

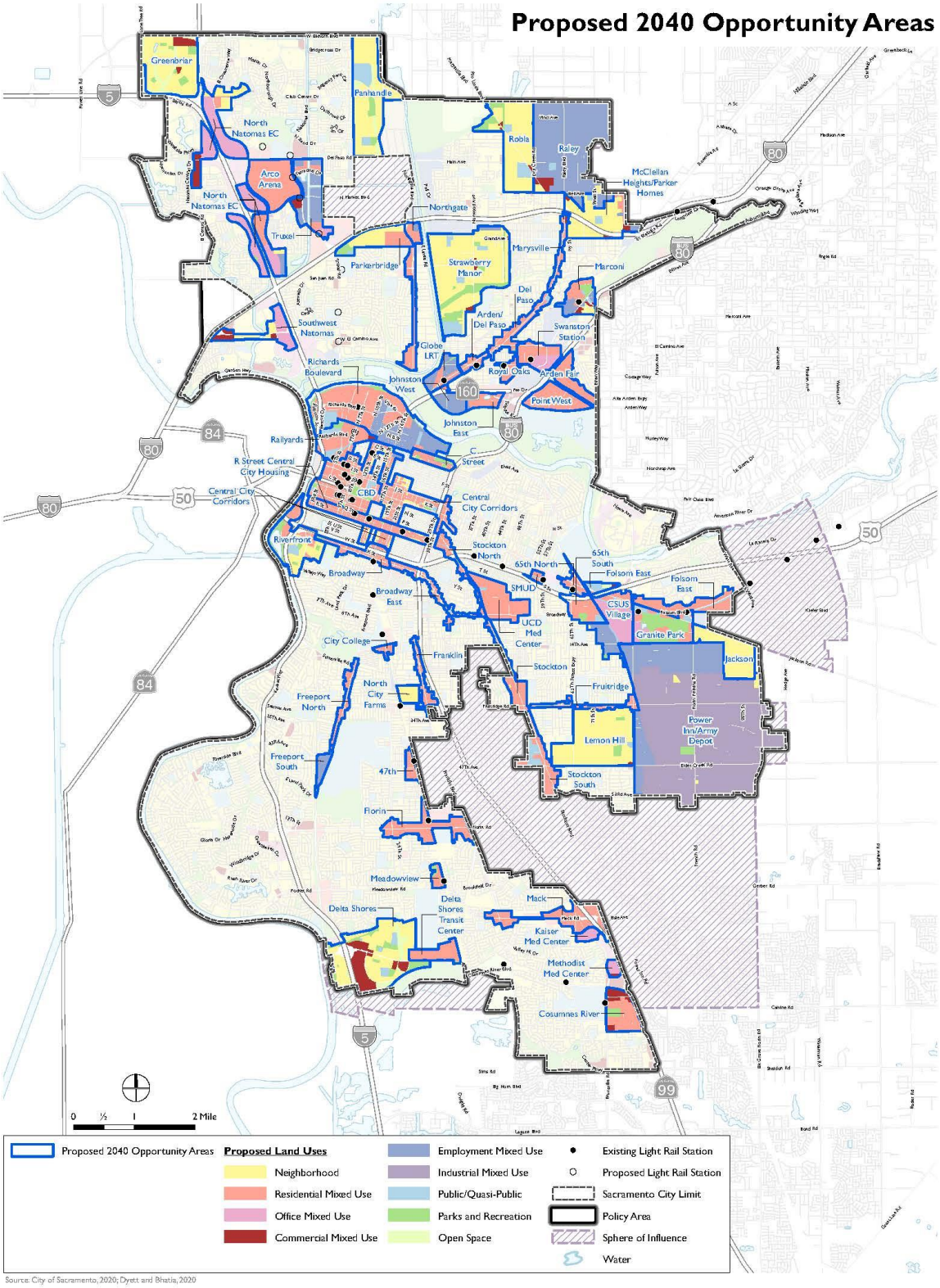
Future Development

The Sacramento Council of Governments (SACOG) and Bay Area Economics (BAE) modeled household and employment projections for the City of Sacramento and other areas of the region in 2018 for a Metropolitan Transportation Plan/Sustainable Communities Strategy update. Bay Area Economics (BAE) refined these projections further to be used for the City's 2040 General Plan Update. According to the City's Draft 2040 General Plan Update:

> ***It is anticipated that by the year 2040, Sacramento will have added 76,612, jobs; and 69,012 residential units. The City has historically relied on Greenfield development to meet the housing, retail, and service needs generated by growth. The City's Draft 2040 General Plan, (anticipated adoption in December 2021), takes a different approach and focuses growth inward, encouraging infill development.***

Figure F-14 is the Draft 2040 General Plan Land Use Map that also details Opportunity Areas identified by the City. These Opportunity Areas are those areas where future development is anticipated to occur over the next 25 years in different parts of the City.

Figure F-14 Sacramento Draft 2040 General Plan Land Use Map with Opportunity Areas



(Draft 2040 General Plan land use map (January 19, 2021). The final 2040 General Plan land use map is anticipated to be adopted by Council in mid 2022.

Table F-15 shows allocations of projected housing and jobs growth throughout the City based on the Draft 2040 General Plan Land Use and Opportunity Areas.

Table F-15 City of Sacramento – Citywide and Opportunity Area Growth Projection

Opportunity Areas	Housing Units	Jobs
47th	49	24
65th North	2,644	2,037
65th South	1,699	2,382
Arco Arena	2,097	2,467
Arden Fair	801	1,126
Arden/Del Paso	433	62
Broadway	942	247
Broadway East	234	100
C Street	493	180
CBD	7,452	6,298
Central City Corridors	5,685	1,247
City College	150	15
Cosumnes River	521	420
CSUS Village	185	2,439
Del Paso	194	402
Delta Shores	5,855	1,698
Delta Shores Transit Center	372	620
Florin	1,302	246
Folsom East	634	132
Franklin	126	27
Freeport North	99	43
Freeport South	0	6
Fruitridge	41	3
Globe LRT	448	54
Granite Park	774	1,243
Greenbriar	2,757	810
Jackson	1,537	483
Johnston East	13	875
Johnston West	29	479
Kaiser Med Center	0	500
Lemon Hill	585	76
Mack	254	405
Marconi	139	94

Opportunity Areas	Housing Units	Jobs
Marysville	198	126
McClellan Heights/Parker Homes	373	1
Meadowview	631	11
Methodist Med Center	88	834
North City Farms	36	26
North Natomas EC	53	4,157
Northgate	275	45
Panhandle	894	611
Parkebridge	629	3
Point West	0	40
Power Inn/Army Depot	0	4,615
R Street Central City Housing	1,781	480
Railyards	7,299	10,603
Raley	41	1,359
Richards Boulevard	1,358	8,895
Riverfront	5,646	3,599
Robla	225	26
Royal Oaks	352	338
SMUD	940	30
Southwest Natomas	696	153
Stockton	918	110
Stockton North	484	89
Stockton South	265	183
Strawberry Manor	915	25
Swanston Station	51	178
Truxel	295	1,009
UCD Med Center	303	5,143
Total	**63,290**	**69,929**

Source: City of Sacramento

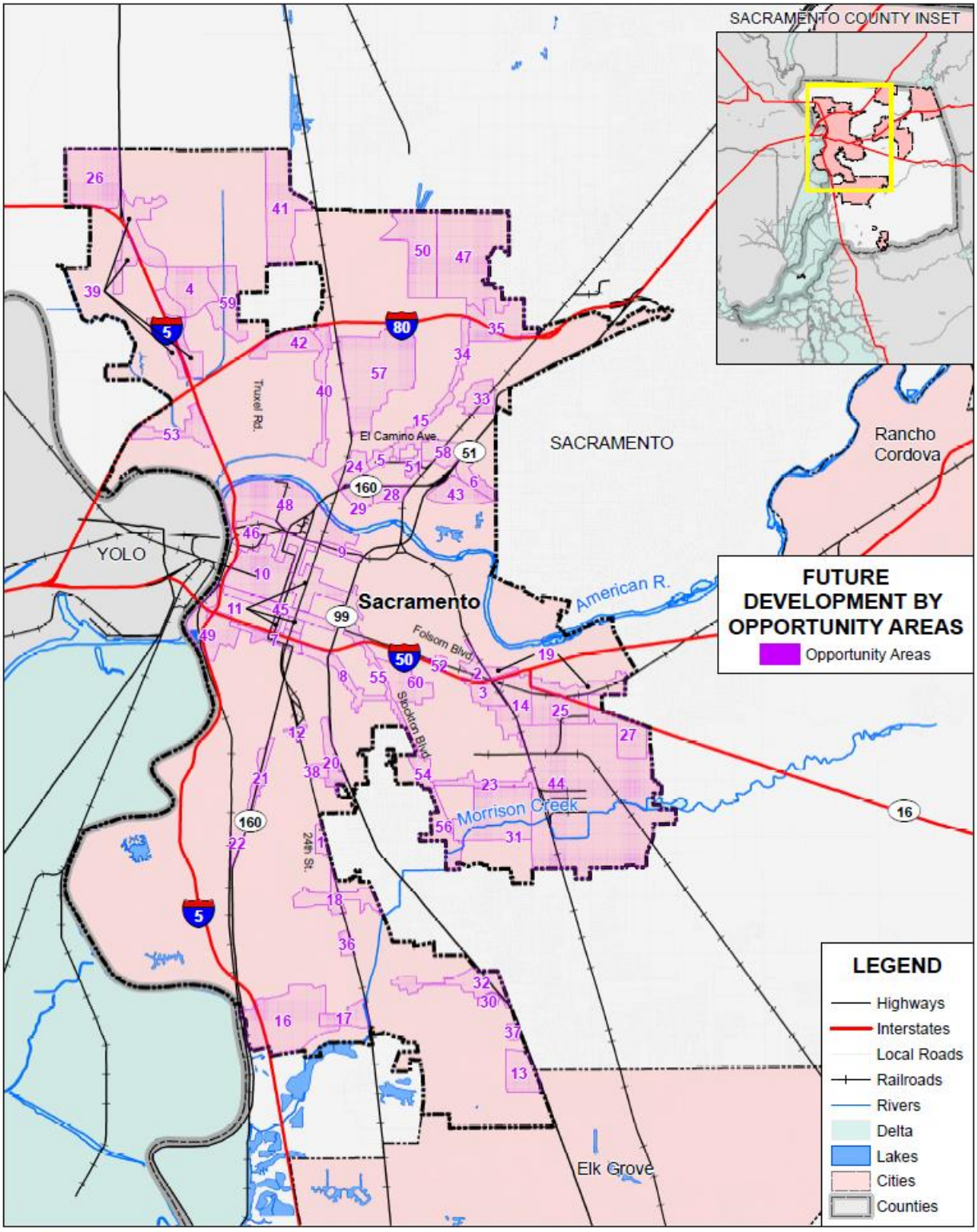
More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

GIS Analysis

The Draft 2040 General Plan Land Use Map identifies 60 Opportunity Areas where future growth and development is expected to occur. The following methodology was used in determining parcel counts and acreages within the 60 future development Opportunity Areas identified in the City of Sacramento. Using

the GIS spatial file for each of these areas as provided by the City, the 60 Opportunity Areas were identified and intersected with the Countywide parcel layer to determine the parcel counts and acreage within each Opportunity Area. Figure F-15 shows the locations of the future development Opportunity Areas. Figure F-16 is a legend for Figure F-15 that shows the names of the numbered Opportunity Areas. Table F-16 shows the summary of parcels and acreages of each Opportunity Area in the City. Table F-17 shows the detail of parcels and acreages of each Opportunity Area in the City by Development Type.

Figure F-15 City of Sacramento – Future Development Opportunity Areas



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 11/2021.

Figure F-16 City of Sacramento – Future Development Opportunity Areas Legend

Table F-16 City of Sacramento – Future Development Opportunity Areas with Parcel Counts and Acreage

Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
47th	25	11	14	12.65
65th North	31	19	12	18.43
65th South	9	7	2	17.68
Arco Arena	18	7	11	55.13
Arden Fair	21	15	6	71.74
Arden/Del Paso	55	29	26	20.47
Broadway	74	52	22	16.33
Broadway East	140	63	77	23.95
C Street	15	5	10	33.65
CBD	99	59	40	33.67
Central City Corridors	397	272	125	68.70
City College	54	26	28	8.64
Cosumnes River	38	14	24	67.50
CSUS Village	83	42	41	159.78
Del Paso	98	60	38	33.67

Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Delta Shores	31	10	21	691.60
Delta Shores Transit Center	2		2	49.02
Florin	75	45	30	109.87
Folsom East	44	33	11	91.88
Franklin	104	63	41	38.72
Freeport North	50	43	7	24.99
Freeport South	20	12	8	28.91
Fruitridge	33	20	13	14.45
Globe LRT	89	39	50	46.27
Granite Park	26	9	17	82.67
Greenbriar	1		1	252.14
Jackson	14	3	11	395.74
Johnston East	28	17	11	46.52
Johnston West	27	19	8	67.39
Kaiser Med Center	2	2		0.72
Lemon Hill	124	21	103	74.50
Mack	56	42	14	112.68
Marconi	71	34	37	39.79
Marysville	86	34	52	25.26
McClellan Heights/Parker Homes	54	3	51	51.51
Meadowview	6		6	11.31
Methodist Med Center	3		3	7.02
North City Farms	20	1	19	8.56
North Natomas EC	65	25	40	576.83
Northgate	104	76	28	102.07
Panhandle	8	1	7	297.72
Parkebridge	18	8	10	138.48
Parkerbridge	1		1	0.46
Point West	45	45		129.56
Power Inn/Army Depot	424	224	200	1,298.33
R Street Central City Housing	113	55	58	25.69
Railyards	30	4	26	28.79
Raley	183	48	135	576.24
Richards Boulevard	160	49	111	415.14
Riverfront	58	28	30	59.17
Robla	94	9	85	129.80

Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Royal Oaks	29	18	11	13.33
Southwest Natomas	25	10	15	68.21
Stockton	35	24	11	55.54
Stockton North	88	53	35	23.02
Stockton South	46	30	16	57.96
Strawberry Manor	277	75	202	177.02
Swanston Station	107	55	52	51.15
Truxel	40	26	14	87.59
UCD Med Center	117	2	115	5.38
Grand Total	**4,190**	**1,996**	**2,194**	**7,230.98**

Source: City of Sacramento GIS

Table F-17 City of Sacramento – Future Development Opportunity Areas by Parcel Count and Acreage with Development Types

Opportunity Area / Future Development Type	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
47th				
Neighborhood	5	0	5	0.90
Residential Mixed Use	20	11	9	11.75
47th Total	**25**	**11**	**14**	**12.65**
65th North				
Residential Mixed Use	31	19	12	18.43
65th North Total	**31**	**19**	**12**	**18.43**
65th South				
Residential Mixed Use	9	7	2	17.68
65th South Total	**9**	**7**	**2**	**17.68**
Arco Arena				
Residential Mixed Use	18	7	11	55.13
Arco Arena Total	**18**	**7**	**11**	**55.13**
Arden Fair				
Residential Mixed Use	21	15	6	71.74
Arden Fair Total	**21**	**15**	**6**	**71.74**
Arden/Del Paso				
Employment Mixed Use	4	1	3	0.62
Neighborhood	2	0	2	6.33
Residential Mixed Use	49	28	21	13.52
Arden/Del Paso Total	**55**	**29**	**26**	**20.47**

Opportunity Area / Future Development Type	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Broadway				
Neighborhood	1	1	0	0.13
Residential Mixed Use	73	51	22	16.20
Broadway Total	**74**	**52**	**22**	**16.33**
Broadway East				
Commercial Mixed Use	1	1	0	0.13
Neighborhood	4	2	2	0.53
Residential Mixed Use	135	60	75	23.29
Broadway East Total	**140**	**63**	**77**	**23.95**
C Street				
Employment Mixed Use	2	0	2	14.73
Residential Mixed Use	13	5	8	18.92
C Street Total	**15**	**5**	**10**	**33.65**
CBD				
Public/Quasi-Public	1	0	1	1.97
Residential Mixed Use	98	59	39	31.70
CBD Total	**99**	**59**	**40**	**33.67**
Central City Corridors				
Employment Mixed Use	13	3	10	2.74
Neighborhood	2	2	0	0.29
Residential Mixed Use	382	267	115	65.67
Central City Corridors Total	**397**	**272**	**125**	**68.70**
City College				
Residential Mixed Use	54	26	28	8.64
City College Total	**54**	**26**	**28**	**8.64**
Cosumnes River				
Commercial Mixed Use	24	12	12	30.72
Residential Mixed Use	14	2	12	36.78
Cosumnes River Total	**38**	**14**	**24**	**67.50**
CSUS Village				
Employment Mixed Use	20	10	10	46.78
Neighborhood	5	0	5	4.13
Office Mixed Use	48	25	23	96.88
Residential Mixed Use	10	7	3	12.00
CSUS Village Total	**83**	**42**	**41**	**159.78**

Opportunity Area / Future Development Type	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Del Paso				
Neighborhood	1	0	1	0.14
Residential Mixed Use	97	60	37	33.52
Del Paso Total	**98**	**60**	**38**	**33.67**
Delta Shores				
Commercial Mixed Use	13	6	7	108.45
Neighborhood	16	4	12	498.69
Residential Mixed Use	2	0	2	84.45
Delta Shores Total	**31**	**10**	**21**	**691.60**
Delta Shores Transit Center				
Neighborhood	1	0	1	11.50
Residential Mixed Use	1	0	1	37.51
Delta Shores Transit Center Total	**2**	**0**	**2**	**49.02**
Florin				
Neighborhood	2	0	2	0.83
Residential Mixed Use	73	45	28	109.03
Florin Total	**75**	**45**	**30**	**109.87**
Folsom East				
Residential Mixed Use	44	33	11	91.88
Folsom East Total	**44**	**33**	**11**	**91.88**
Franklin				
Neighborhood	7	0	7	0.95
Residential Mixed Use	97	63	34	37.77
Franklin Total	**104**	**63**	**41**	**38.72**
Freeport North				
Neighborhood	3	1	2	0.52
Parks and Recreation	1	1	0	5.17
Residential Mixed Use	46	41	5	19.30
Freeport North Total	**50**	**43**	**7**	**24.99**
Freeport South				
Employment Mixed Use	17	12	5	15.26
Neighborhood	2	0	2	4.74
Parks and Recreation	1	0	1	8.90
Freeport South Total	**20**	**12**	**8**	**28.91**
Fruitridge				
Residential Mixed Use	33	20	13	14.45

Opportunity Area / Future Development Type	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Fruitridge Total	**33**	**20**	**13**	**14.45**
Globe LRT				
Employment Mixed Use	55	22	33	28.99
Residential Mixed Use	34	17	17	17.28
Globe LRT Total	**89**	**39**	**50**	**46.27**
Granite Park				
Office Mixed Use	6	5	1	12.65
Residential Mixed Use	20	4	16	70.02
Granite Park Total	**26**	**9**	**17**	**82.67**
Greenbriar				
Neighborhood	1	0	1	252.14
Greenbriar Total	**1**	**0**	**1**	**252.14**
Jackson				
Employment Mixed Use	1	0	1	1.60
Industrial Mixed Use	1	1	0	172.75
Neighborhood	12	2	10	221.39
Jackson Total	**14**	**3**	**11**	**395.74**
Johnston East				
Employment Mixed Use	13	10	3	14.40
Residential Mixed Use	15	7	8	32.12
Johnston East Total	**28**	**17**	**11**	**46.52**
Johnston West				
Employment Mixed Use	27	19	8	67.39
Johnston West Total	**27**	**19**	**8**	**67.39**
Kaiser Med Center				
Office Mixed Use	2	2	0	0.72
Kaiser Med Center Total	**2**	**2**	**0**	**0.72**
Lemon Hill				
Commercial Mixed Use	4	3	1	2.74
Neighborhood	114	15	99	67.62
Residential Mixed Use	6	3	3	4.15
Lemon Hill Total	**124**	**21**	**103**	**74.50**
Mack				
Neighborhood	1	0	1	3.75
Residential Mixed Use	55	42	13	108.94
Mack Total	**56**	**42**	**14**	**112.68**

Opportunity Area / Future Development Type	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Marconi				
Commercial Mixed Use	10	7	3	2.97
Employment Mixed Use	41	24	17	30.91
Neighborhood	2	1	1	0.40
Residential Mixed Use	18	2	16	5.52
Marconi Total	**71**	**34**	**37**	**39.79**
Marysville				
Commercial Mixed Use	5	2	3	3.42
Neighborhood	1	0	1	0.06
Residential Mixed Use	80	32	48	21.78
Marysville Total	**86**	**34**	**52**	**25.26**
McClellan Heights/Parker Homes				
Commercial Mixed Use	5	2	3	1.30
Employment Mixed Use	9	0	9	30.15
Neighborhood	31	0	31	12.81
Residential Mixed Use	9	1	8	7.25
McClellan Heights/Parker Homes Total	**54**	**3**	**51**	**51.51**
Meadowview				
Residential Mixed Use	6	0	6	11.31
Meadowview Total	**6**	**0**	**6**	**11.31**
Methodist Med Center				
Commercial Mixed Use	2	0	2	5.94
Office Mixed Use	1	0	1	1.08
Methodist Med Center Total	**3**	**0**	**3**	**7.02**
North City Farms				
Neighborhood	19	1	18	7.68
Residential Mixed Use	1		1	0.88
North City Farms Total	**20**	**1**	**19**	**8.56**
North Natomas EC				
Commercial Mixed Use	2	1	1	46.34
Employment Mixed Use	4	2	2	21.00
Neighborhood	28	19	9	83.59
Office Mixed Use	27	2	25	349.97
Residential Mixed Use	4	1	3	75.93
North Natomas EC Total	**65**	**25**	**40**	**576.83**

Opportunity Area / Future Development Type	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Northgate				
Employment Mixed Use	1	1	0	4.70
Residential Mixed Use	103	75	28	97.37
Northgate Total	**104**	**76**	**28**	**102.07**
Panhandle				
Neighborhood	5	1	4	247.56
Open Space	1	0	1	34.76
Public/Quasi-Public	2	0	2	15.40
Panhandle Total	**8**	**1**	**7**	**297.72**
Parkebridge				
Neighborhood	5	0	5	63.46
Residential Mixed Use	13	8	5	75.02
Parkebridge Total	**18**	**8**	**10**	**138.48**
Parkerbridge				
Neighborhood	1	0	1	0.46
Parkerbridge Total	**1**	**0**	**1**	**0.46**
Point West				
Residential Mixed Use	45	45	0	129.56
Point West Total	**45**	**45**	**0**	**129.56**
Power Inn/Army Depot				
Employment Mixed Use	182	83	99	181.87
Industrial Mixed Use	241	140	101	1,115.42
Residential Mixed Use	1	1	0	1.04
Power Inn/Army Depot Total	**424**	**224**	**200**	**1,298.33**
R Street Central City Housing				
Residential Mixed Use	113	55	58	25.69
R Street Central City Housing Total	**113**	**55**	**58**	**25.69**
Railyards				
Public/Quasi-Public	9	0	9	10.36
Residential Mixed Use	21	4	17	18.43
Railyards Total	**30**	**4**	**26**	**28.79**
Raley				
Commercial Mixed Use	5	2	3	13.82
Employment Mixed Use	163	42	121	554.89
Neighborhood	15	4	11	7.53
Raley Total	**183**	**48**	**135**	**576.24**

Opportunity Area / Future Development Type	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Richards Boulevard				
Employment Mixed Use	75	23	52	92.74
Parks and Recreation	6	2	4	6.03
Residential Mixed Use	79	24	55	316.37
Richards Boulevard Total	**160**	**49**	**111**	**415.14**
Riverfront				
Neighborhood	24	15	9	22.24
Parks and Recreation	1	0	1	1.94
Residential Mixed Use	33	13	20	34.98
Riverfront Total	**58**	**28**	**30**	**59.17**
Robla				
Commercial Mixed Use	11	0	11	3.04
Neighborhood	83	9	74	126.76
Robla Total	**94**	**9**	**85**	**129.80**
Royal Oaks				
Residential Mixed Use	29	18	11	13.33
Royal Oaks Total	**29**	**18**	**11**	**13.33**
Southwest Natomas				
Commercial Mixed Use	8	2	6	32.38
Office Mixed Use	17	8	9	35.83
Southwest Natomas Total	**25**	**10**	**15**	**68.21**
Stockton				
Residential Mixed Use	35	24	11	55.54
Stockton Total	**35**	**24**	**11**	**55.54**
Stockton North				
Neighborhood	3	0	3	0.26
Residential Mixed Use	85	53	32	22.76
Stockton North Total	**88**	**53**	**35**	**23.02**
Stockton South				
Neighborhood	1	0	1	0.20
Public/Quasi-Public	2	0	2	8.84
Residential Mixed Use	43	30	13	48.92
Stockton South Total	**46**	**30**	**16**	**57.96**
Strawberry Manor				
Commercial Mixed Use	12	5	7	10.87
Employment Mixed Use	17	5	12	11.68

Opportunity Area / Future Development Type	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Neighborhood	243	65	178	127.00
Public/Quasi-Public	3	0	3	27.05
Residential Mixed Use	2	0	2	0.42
Strawberry Manor Total	**277**	**75**	**202**	**177.02**
Swanston Station				
Neighborhood	2		2	0.20
Office Mixed Use	17	15	2	16.71
Residential Mixed Use	88	40	48	34.23
Swanston Station Total	**107**	**55**	**52**	**51.15**
Truxel				
Commercial Mixed Use	4	1	3	12.12
Employment Mixed Use	25	21	4	38.18
Office Mixed Use	8	4	4	19.21
Public/Quasi-Public	1	0	1	0.39
Residential Mixed Use	2	0	2	17.70
Truxel Total	**40**	**26**	**14**	**87.59**
UCD Med Center				
Neighborhood	9	0	9	0.33
Residential Mixed Use	108	2	106	5.05
UCD Med Center Total	**117**	**2**	**115**	**5.38**
Grand Total	**4,190**	**1,996**	**2,194**	**7,230.98**

Source: City of Sacramento GIS

F.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table F-6 as high or medium significance hazards. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, populations at risk, critical facilities and infrastructure, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power shortage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power shortage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

Climate Change

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

Hazard Profile and Problem Description

Climate change adaptation and mitigation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing. For a more detailed analysis of climate change hazards and impacts, see the City of Sacramento's Climate Change Vulnerability Assessment, which will be adopted as part of the 2040 General Plan and Climate Action and Adaptation Plan in 2022.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the City, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the City declared a climate emergency in December 2019, no specific impacts of climate change could be recalled. The City and HMPC members noted that the strength of storms does seem to be increasing and the temperatures are getting hotter. A study on the American River Basin Study shows that the City may experience an increase of up to 8°F and up to 58 days with temperatures above 100°F by 2070. The American River temperature may rise up to 7°F, affecting its ecosystem. Flows from the Sierra Nevada snowpack to Folsom Reservoir, which have typically peaked in May, will instead peak earlier in January, February, and March.

Vulnerability to and Impacts from Climate Change

The California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the City and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Heightened Precipitation Variability
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

There are several concerns the City has – these include extreme heat days and its impact on local ecosystems and human life; changes in precipitation patterns leading to flooding and dry seasons; wildfire events; and climate equity (i.e. considering both protection from environmental hazards as well as access to environmental benefits for all people, regardless of income, race, location, and other characteristics).

Future Development

The City could see population fluctuations as a result of climate impacts relative to those experienced in other regions, and these fluctuations are expected to impact demand for housing and other development. While there are currently no formal studies of specific migration patterns expected to impact the City and County region, climate-induced migration was recognized within the UNFCCC Conference of Parties Paris Agreement of 2015 and is expected to be the focus of future studies.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most likely happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and

land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

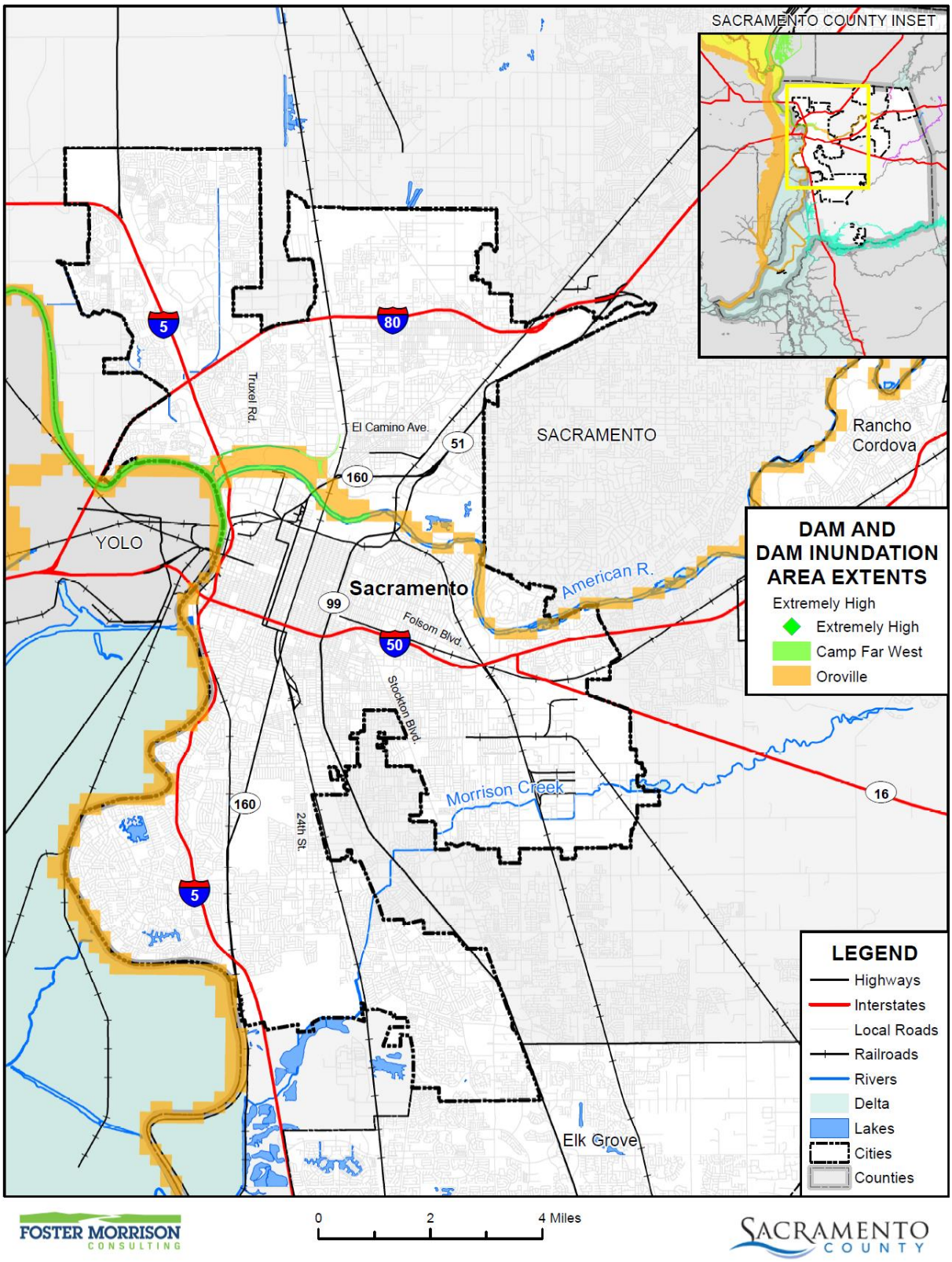
While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The City would be affected for as long as the flood waters from the dam failure took to drain downstream.

Geographic flood extent from the DWR DSOD and Cal OES dam inundation areas is shown in the following:

- Figure F-17 shows dam inundation areas in the City from dams inside Sacramento County.
- Figure F-18 shows dam inundation areas in the City from dams outside Sacramento County.
- Table F-18 delineates geographical extents of the inundation areas from dams both inside and outside the County.
- Figure F-19 shows dam inundation areas in the City from the Folsom Dam 235,000 cfs Scenario (as discussed in Section 4.3.7 of the Base Plan).
- Table F-19 delineates geographical extents of the inundation areas the Folsom Dam 235,000 cfs Scenario.

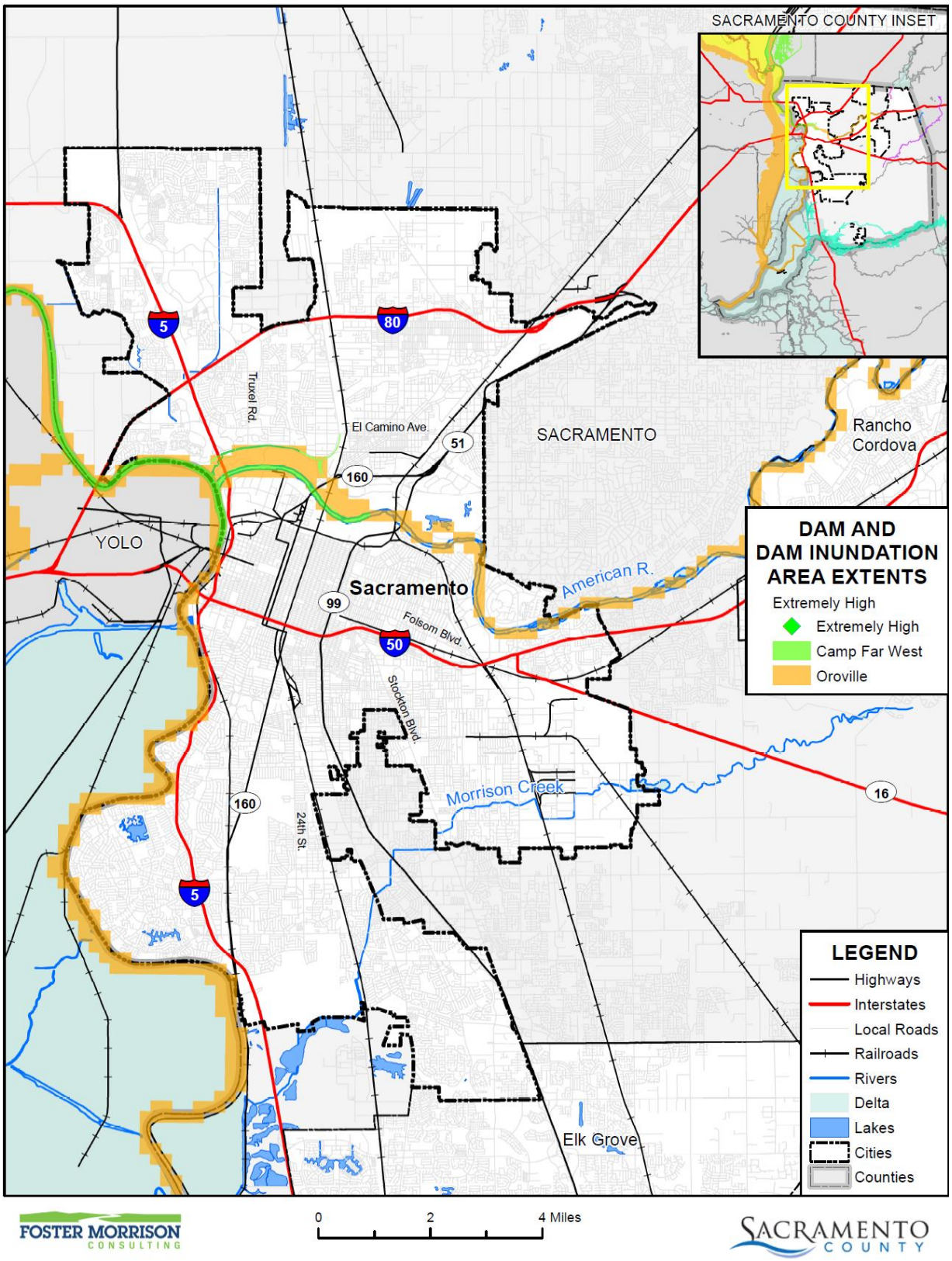
Note, the Cal OES and DSOD dam inundation data did not include inundation mapping of all dams that could affect the Sacramento County Planning Area and the City; thus, the below analysis reflects information based on available data. Other dams may be identified as a concern to the City. Based on available data, the City falls within the inundation areas of Camp Far West, Folsom, and Oroville dams.

Figure F-17 City of Sacramento – Dam Inundation Areas from Dams Inside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Figure F-18 City of Sacramento – Dam Inundation Areas from Dams Outside the County



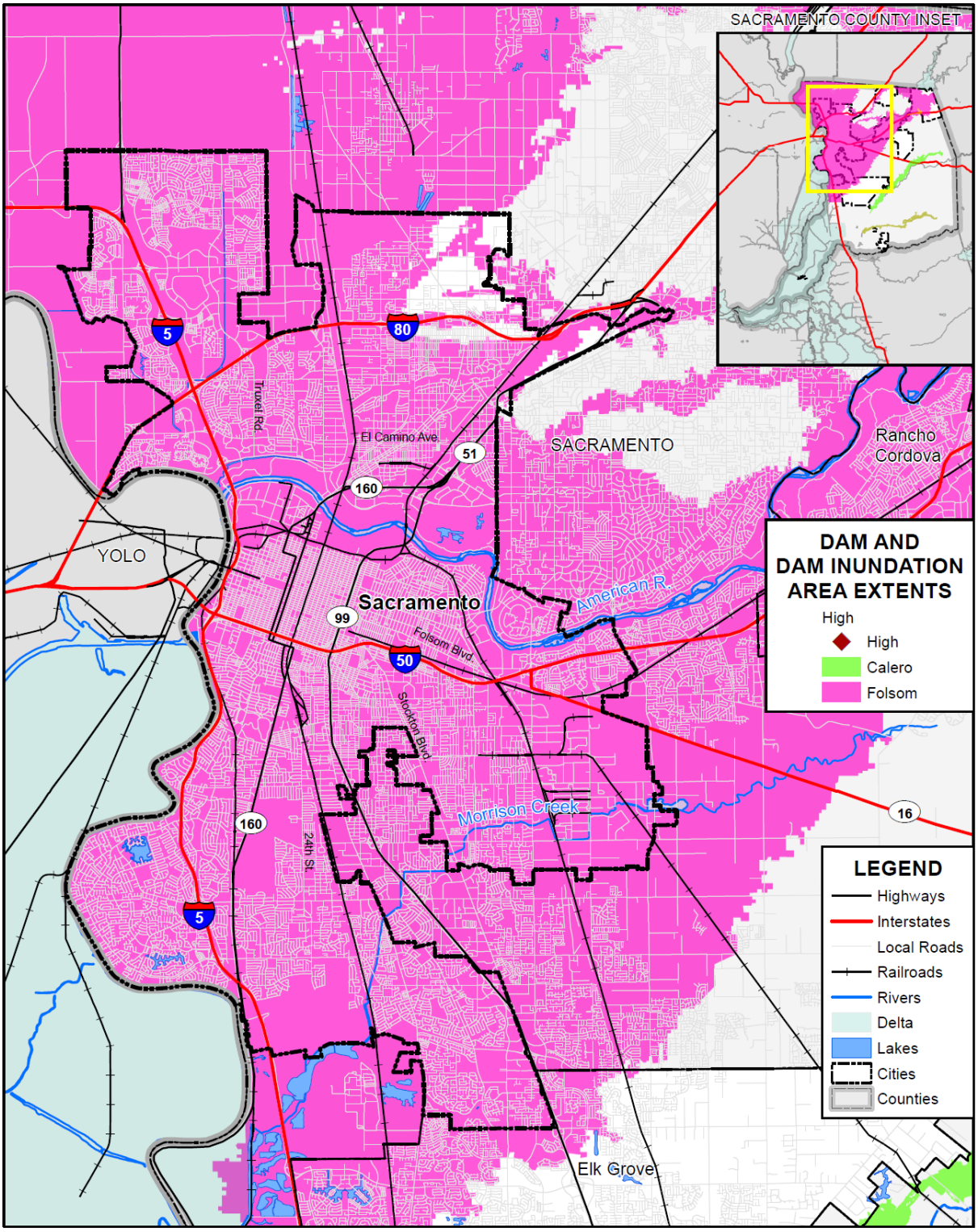
Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Table F-18 City of Sacramento – Geographical Dam Inundation Extents

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Extremely High Hazard Dams Outside the County							
Camp Far West	City of Sacramento	110.08	0.15%	5.86	0.01%	104.22	0.40%
Oroville	City of Sacramento	1,727.40	2.34%	256.54	0.53%	1,470.86	5.69%
High Hazard Dams Outside the County							
–	–	–	–	–	–	–	–
High Hazard Dams Inside the County							
Folsom	City of Sacramento	72,486.45	98.01%	47,239.98	98.19%	25,246.47	97.68%

Source: Cal OES, DSOD

Figure F-19 City of Sacramento – Inundation Areas from Folsom Dam 235,000 cfs Scenario



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 2/2021.

Table F-19 City of Sacramento – Geographic Dam Inundation Extent of Folsom 235,000 cfs Scenario

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Folsom 235,000 CFS Scenario	City of Sacramento	66,339.94	10.26%	43,402.39	12.01%	22,937.55	8.04%

Source: Cal OES, DSOD

Past Occurrences

There has been no state or federal disaster declarations for dam failure in the County. The City noted the following past occurrence.

July 17, 1995: Folsom Dam Spillway Gate Failure – The failure resulted in the uncontrolled release of nearly 40 percent of Folsom Lake at a peak rate of approximately 40,000 cubic feet per second (1,100 m^3/s). The freshwater reaching San Francisco Bay was atypical for the summer season and confused salmon and striped bass, whose instincts told them that fall rains had arrived; they began their annual fall migrations months ahead of schedule.

February 2017: Oroville Dam Spillway – On Feb. 12, the Lake Oroville Dam emergency spillway structure suffered potentially catastrophic damage as a result of erosion secondary to water flow. The California Department of Water Resources increased exhaust water flow from the Gated Spillway to 100,000 cubic feet per second in an attempt to decrease Lake Oroville water levels. In response, the California Governor's Office of Emergency Services activated the State Operations Center in Sacramento in support of the Oroville Dam emergency spillway incident. Immediate evacuations were ordered for counties and cities near Lake Oroville, and Governor Brown issued state of emergency to help mobilize disaster response resources and support the local evacuations. The Sacramento Fire Department warned residents that the spillway failure could have effects, including flash flooding, downstream in Sacramento. The City also prepared to receive evacuees from Yuba and Butte counties. Ultimately, the dam held (though the spillway was damaged) and the City suffered no ill effects.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Folsom and Nimbus Dams are the two major dams which affect the City of Sacramento and the populations in their respective inundation areas. Of prime concern are the failures of the Folsom and/or Nimbus Dams, which are owned by the US Bureau of Reclamation. The flood waters from either dam would affect the City of Sacramento and the surrounding unincorporated areas.

The Sacramento Municipal Utility District (SMUD) inundation map indicates that a failure of the Rancho Seco Dam would flow to the Laguna Creek Basin and stop approximately at Stockton Boulevard. Failure of Shasta Dam would affect populations south along the Sacramento River basin to about Knights Landing

where the water would lose momentum. An Oroville Dam failure would impact populations southwest along the Feather River basin to about the Yolo Bypass.

Warning ability is generally determined by the frequency of inspections for structural integrity, the flood wave arrival time (the time it takes for the flood wave to reach its maximum distance of inundation), or the ability to notify persons downstream and their ability to evacuate. Having an evacuation plan that is updating and exercised frequently assists in the warning and evacuation functions.

A dam failure will cause loss of life, damage to property, and other ensuing hazards, as well as the displacement of persons residing in the inundation path. Damage to electric generating facilities and transmission lines could also impact life support systems in communities outside the immediate hazard areas.

A catastrophic dam failure, depending on size of dam and population downstream, could exceed the response capability of local communities. Damage control and disaster relief support would be required from other local governmental and private organizations, and from the state and federal governments. Mass evacuation of the inundation areas would be essential to save lives, if warning time should permit. Extensive search and rescue operations may be required to assist trapped or injured persons. Emergency medical care, food, and temporary shelter would be required for injured or displaced persons. These and other emergency operations could be seriously hampered by the loss of communications, damage to transportation routes, and the disruption of public utilities and other essential services.

Governmental assistance could be required and may continue for an extended period. These efforts would be required to remove debris and clear roadways, demolish unsafe structures, assist in re-establishing public services and utilities, and provide continuing care and welfare for the affected population including, as required, temporary housing for displaced persons.

Impacts to the City from a dam failure flood include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

Assets at Risk

Based on the vulnerability of Sacramento to the dam failure hazard, the sections that follow describes significant assets at risk in the City of Sacramento. This section includes the values at risk, inundated acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Sacramento. The methodology described in Section 4.3.9 of the Base Plan was followed in determining structures and values at risk to dam failure. Table F-20 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in dam inundation areas in the City. Table F-21 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in the Folsom Dam 235,000 cfs Scenario inundation areas in the City

Table F-20 City of Sacramento – Count and Values of Parcels at Risk by Dam Inundation Area and Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Oroville (Extremely High Hazard Dam Outside the County)						
Church / Welfare	1	0	$10	$0	$0	$10
Miscellaneous	54	0	$301,456	$0	$0	$301,456
Office	4	3	$3,638,276	$10,693,990	$10,693,990	$25,026,256
Public / Utilities	17	0	$9	$0	$0	$9
Recreational	6	2	$925,915	$4,836,004	$4,836,004	$10,597,923
Residential	17	15	$3,233,349	$9,739,067	$4,869,534	$17,841,950
Vacant	14	0	$936,909	$0	$0	$936,909
City of Sacramento Total	**113**	**20**	**$9,035,924**	**$25,269,061**	**$20,399,528**	**$54,704,513**
Camp Far West (Extremely High Hazard Dam Outside the County)						
Church / Welfare	5	2	$2,351,656	$8,702,321	$8,702,321	$19,756,298
Industrial	17	12	$12,299,672	$38,798,046	$58,197,071	$109,294,788
Miscellaneous	201	0	$400,747	$0	$0	$400,747
Office	62	54	$41,652,929	$152,379,420	$152,379,420	$346,411,769
Public / Utilities	40	0	$9	$0	$0	$9
Recreational	13	2	$925,945	$4,836,004	$4,836,004	$10,597,953
Residential	823	789	$140,746,021	$468,991,846	$234,495,919	$844,233,805
Retail / Commercial	7	5	$1,787,493	$1,629,566	$1,629,566	$5,046,625
Vacant	78	0	$46,340,148	$0	$0	$46,340,148
City of Sacramento Total	**1,246**	**864**	**$246,504,620**	**$675,337,203**	**$460,240,301**	**$1,382,082,142**
Folsom Dam (High Hazard Dam Inside the County)						
Agricultural	14	2	$3,766,304	$623,292	$623,292	$5,012,888
Care / Health	155	129	$101,429,760	$1,648,454,989	$1,648,454,989	$3,398,339,738
Church / Welfare	520	422	$107,593,040	$513,340,064	$513,340,064	$1,134,273,168
Industrial	1,923	1,715	$687,351,014	$2,125,937,429	$3,188,906,135	$6,002,194,595
Miscellaneous	3,022	9	$3,759,124	$320,049	$320,049	$4,399,222
Office	1,789	1,445	$1,193,706,107	$5,060,985,045	$5,060,985,045	$11,315,676,197

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Public / Utilities	753	1	$1,177,449	$31,233	$31,233	$1,239,915
Recreational	135	79	$90,797,481	$471,484,271	$471,484,271	$1,033,766,023
Residential	136,513	134,294	$11,749,622,712	$30,529,316,646	$15,264,657,894	$57,543,597,902
Retail / Commercial	2,914	2,316	$1,333,991,116	$2,575,284,728	$2,575,284,728	$6,484,560,572
Unknown	2	1	$0	$86,693	$0	$86,693
Vacant	5,228	184	$899,079,311	$35,918,638	$0	$934,997,949
City of Sacramento Total	**152,968**	**140,597**	**$16,172,273,418**	**$42,961,783,077**	**$28,724,087,700**	**$87,858,144,862**

Source: CAL OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data

Table F-21 City of Sacramento – Count and Values of Parcels at Risk by Folsom Dam 235,000 cfs Scenario and Property Use

Property Use / Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Total Value
Agricultural	13	1	$3,422,972	$165,516	$3,588,488
Care / Health	134	112	$87,807,902	$1,496,333,030	$1,584,140,932
Church / Welfare	472	388	$97,221,229	$483,905,448	$581,126,677
Industrial	1,480	1,295	$509,432,078	$1,502,213,168	$2,011,645,246
Miscellaneous	2,790	8	$3,541,786	$136,288	$3,678,074
Office	1,697	1,368	$1,162,547,570	$4,918,640,334	$6,081,187,904
Public / Utilities	594	1	$312,134	$31,233	$343,367
Recreational	125	72	$89,591,717	$468,724,683	$558,316,400
Residential	126,382	124,262	$10,991,435,497	$28,437,470,147	$39,428,905,644
Retail / Commercial	2,706	2,123	$1,225,593,496	$2,371,742,203	$3,597,335,699
Unknown	2	1	$0	$86,693	$86,693
Vacant	4,606	164	$803,172,368	$31,538,113	$834,710,481
City of Sacramento Total	**141,001**	**129,795**	**$14,974,078,749**	**$39,710,986,856**	**$54,685,065,605**

Source: CAL OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data

Population at Risk

The DSOD and Cal OES dam inundation areas were overlayed on the parcel layer. Those residential parcel centroids that intersect the dam inundation areas were counted and multiplied by the Census Bureau average household factors for Sacramento – 2.76. This is shown in Table F-35.

Table F-22 City of Sacramento – Count of Improved Residential Parcels and Population by Dam Inundation Area

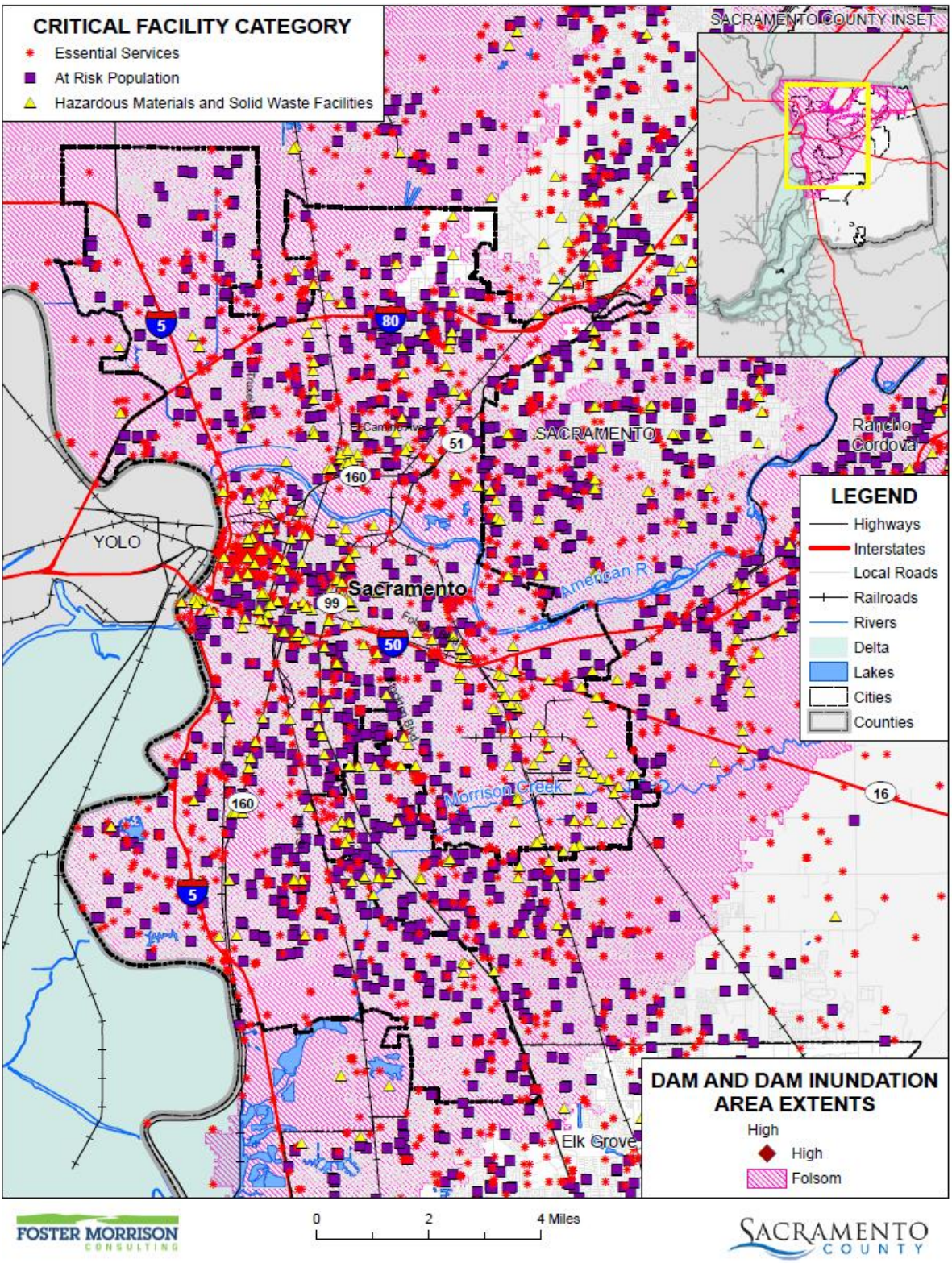
Dam Inundation Area	Improved Residential Parcels	Population
Oroville	15	41
Camp Far West	789	2,178
Folsom	134,294	370,651

Source: Cal OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

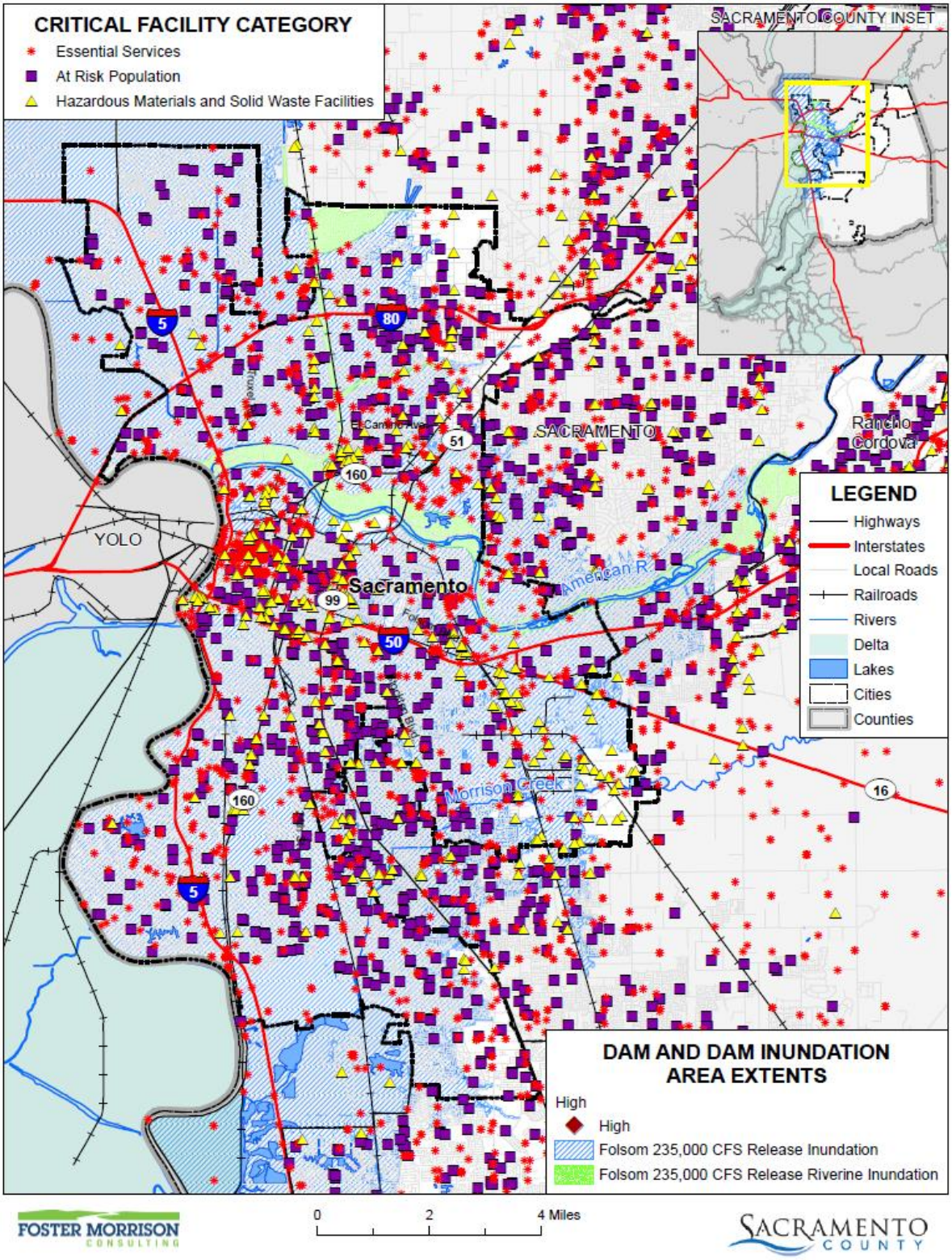
An analysis was performed on the critical facility inventory in Sacramento in identified dam inundation areas. GIS was used to determine whether the critical facility locations intersect a DSOD or Cal OES dam inundation area. Details of critical facilities in mapped dam inundation areas in the City of Sacramento are shown in Figure F-20 for dams inside the County, Figure F-20 for the Folsom Dam 235,000 cfs Scenario, and detailed in Table F-23. Details of critical facility definition, type, name and address and jurisdiction by dam inundation area are listed in Appendix F.

Figure F-20 City of Sacramento – Critical Facilities in Dam Inundation Areas from Dams Inside the County



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Figure F-21 City of Sacramento – Critical Facilities in Folsom Dam 235,000 cfs Scenario



Data Source: County-provided dam inundation data (CA_DWR_200YEAR_FLOODPLAIN.zip 2020), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table F-23 City of Sacramento – Critical Facilities in Dam Inundation Areas

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
Folsom Dam (High Hazard Dam Inside the County)		
Essential Services Facilities	Airport	1
	Bridge	26
	Cellular Tower	2
	Emergency Evacuation Center	91
	EMS Stations	25
	FDIC Insured Banks	82
	Fire Station	21
	Floodgate	43
	Hospital or Urgent Care	16
	Law Enforcement	26
	Microwave Service Towers	496
	Power Plants	7
	Public Transit Stations	41
	Pump Stations	200
	Sewage Treatment Plan	8
	State Government Building	33
	Water Well	145
	Total	**1,269**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	11
	Community Center	2
	Day Care Center	138
	Major Sports Venues	3
	Mobile Home Park	21
	Places of Worship	416
	School	231
	Total	**822**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	2
	EPA ER TRI Facility	38
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	171
	Solid Waste Facility Total	23
	Tank Farm	4
	Waste Transfer Station	5
	Total	**246**

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
Folsom Dam Total		**2,337**
Camp Far West (Extremely High Hazard Dam Ouside the County)		
Essential Services Facilities	Bridge	2
	Microwave Service Towers	1
	Port Facilities	1
	Water Well	1
	Total	**5**
At Risk Population Facilities	–	–
	Total	**0**
Hazardous Materials and Solid Waste Facilities	–	–
	Total	**0**
Camp Far West Dam Total		**3**
Oroville Dam (Extremely High Hazard Dam Outside the County)		
Essential Services Facilities	Bridge	6
	Floodgate	1
	Law Enforcement	1
	Microwave Service Towers	4
	Port Facilities	5
	Pump Stations	11
	Sewage Treatment Plan	3
	Water Well	3
	Total	**34**
At Risk Population Facilities	Day Care Center	1
	School	1
	Total	**2**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	Solid Waste Facility Total	1
	Tank Farm	2
	Total	**4**
Oroville Dam Total		**40**
Folsom Dam 235,000 cfs Scenario		
Essential Services Facilities	Airport	1
	Bridge	23
	Cellular Tower	2
	Emergency Evacuation Center	83
	EMS Stations	25
	FDIC Insured Banks	80

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
	Fire Station	21
	Floodgate	39
	Hospital or Urgent Care	12
	Law Enforcement	22
	Microwave Service Towers	444
	Power Plants	6
	Public Transit Stations	34
	Pump Stations	188
	Sewage Treatment Plan	7
	State Government Building	33
	Water Well	115
	Total	**1,141**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	9
	Community Center	2
	Day Care Center	123
	Major Sports Venues	2
	Mobile Home Park	16
	Places of Worship	383
	School	211
	Total	**746**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	2
	EPA ER TRI Facility	28
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	162
	Solid Waste Facility Total	14
	Tank Farm	4
	Waste Transfer Station	2
	Total	**215**
Folsom Dam 235,000 cfs Scenario Total		**2,102**

Source: Cal OES, DSOD, Sacramento County GIS

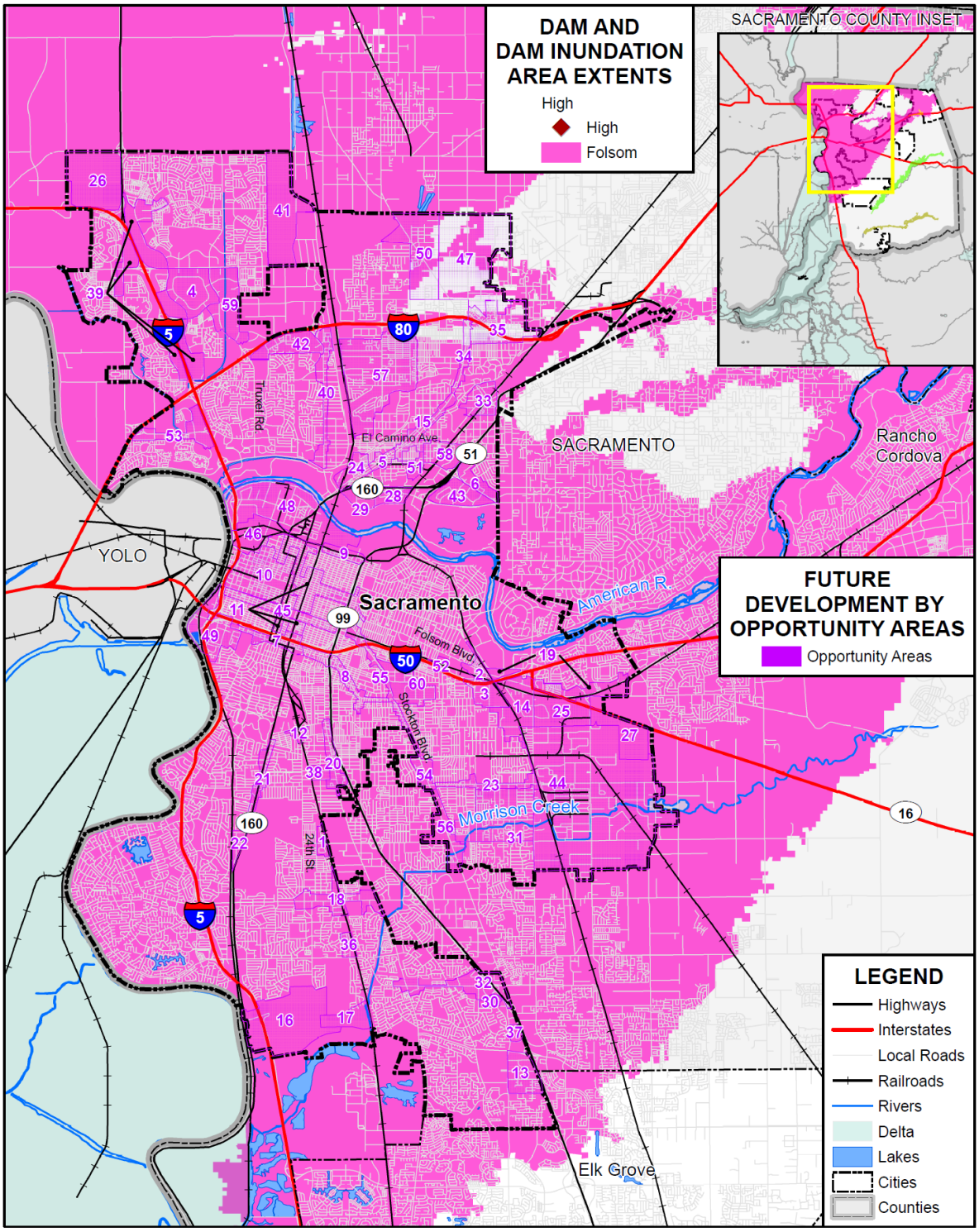
Future Development

Future dam failures are considered unlikely. However, given the high number of affected parcels, future development in the City could be affected by dam failures and associated flooding. The City enforces its floodplain ordinance, which helps to reduce risk of flooding by requiring structures in the 1% annual chance floodplains to be above the base flood elevation, which depending on inundation depths and affected areas may provide some relief. Siting of future development areas should take dam failure flooding into account.

GIS Analysis

The City provided 60 Opportunity Areas as part of their Draft 2040 General Plan Land Use map which were used as the basis for the inventory of future development areas for the City. Utilizing the Opportunity Areas spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each area. Figure F-22 (with a legend shown on Figure F-23) shows the locations of these Opportunity Areas overlayed on the dam inundation zones from dams inside the County. Table F-24 shows the parcels and acreages of each Opportunity Area in the City in the dam inundation areas from dams inside the County. Figure F-24 (with a legend shown on Figure F-25) shows the locations of the Opportunity Areas overlayed on the dam inundation zones from dams outside the County. Table F-25 shows the parcels and acreages of each Opportunity Area in the City in the dam inundation areas from dams outside the County. Figure F-26 (with a legend shown on Figure F-27) shows the locations of Opportunity Areas within the Folsom Dam 235,000 cfs scenario inundation zones. Table F-26 shows the parcels and acreages of each Opportunity Area in the City within the Folsom 235,000 cfs release inundation area.

Figure F-22 City of Sacramento – Future Development Opportunity Areas and Dam Inundation Areas from Dams Inside the County



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 11/2021.

Figure F-23 City of Sacramento – Future Development Opportunity Areas Legend

Table F-24 City of Sacramento – Future Development Opportunity Areas and Dam Inundation Areas from Dams Inside the County

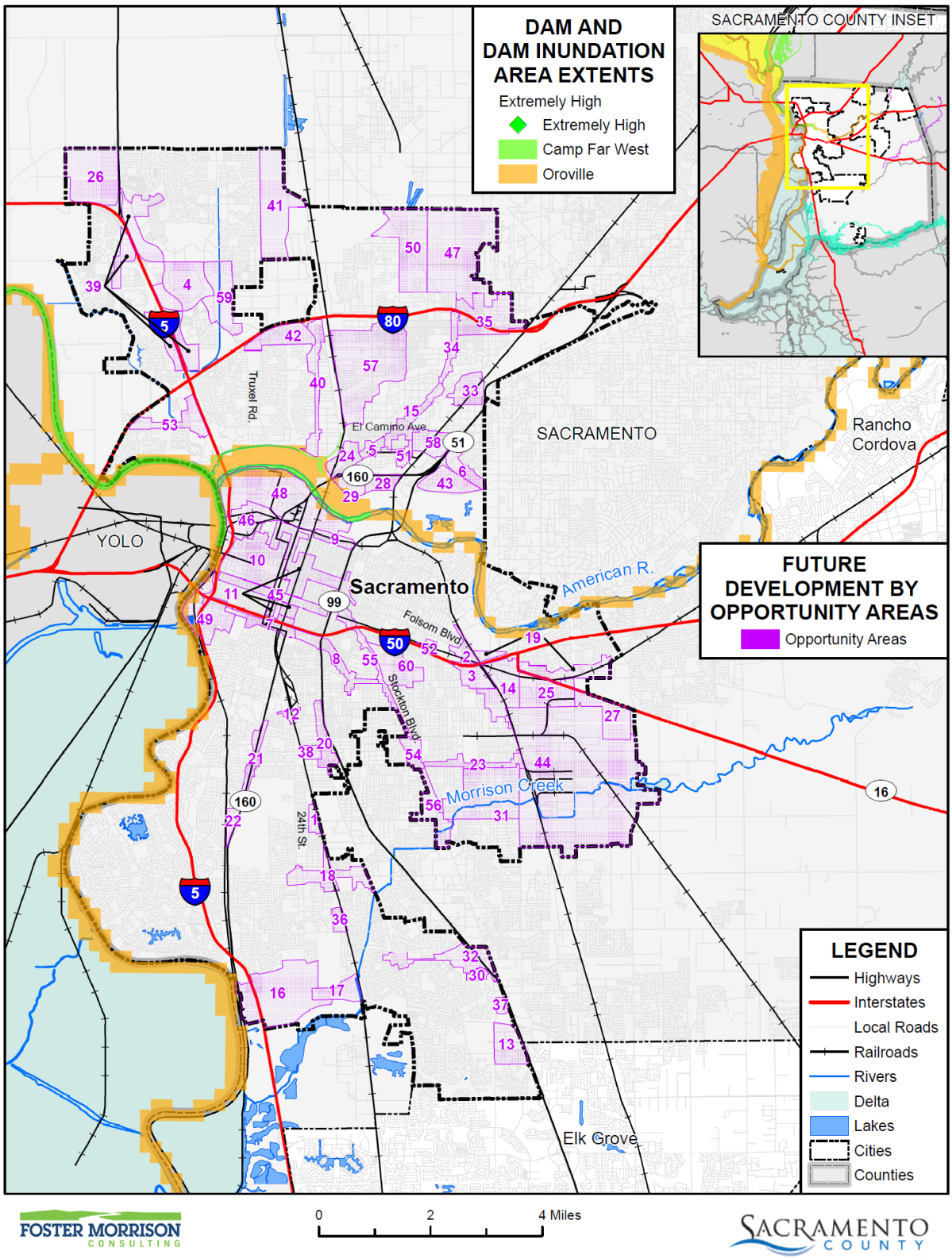
Dam Inundation Areas / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Folsom				
47th	25	11	14	12.65
65th North	31	19	12	18.43
65th South	9	7	2	17.68
Arco Arena	18	7	11	55.13
Arden Fair	21	15	6	71.74
Arden/Del Paso	55	29	26	20.47
Broadway	74	52	22	16.33
Broadway East	140	63	77	23.95
C Street	15	5	10	33.65
CBD	99	59	40	33.67
Central City Corridors	397	272	125	68.70
City College	54	26	28	8.64

Dam Inundation Areas / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Cosumnes River	38	14	24	67.50
CSUS Village	83	42	41	159.78
Del Paso	98	60	38	33.67
Delta Shores	31	10	21	691.60
Delta Shores Transit Center	2	0	2	49.02
Florin	75	45	30	109.87
Folsom East	44	33	11	91.88
Franklin	104	63	41	38.72
Freeport North	50	43	7	24.99
Freeport South	20	12	8	28.91
Fruitridge	33	20	13	14.45
Globe LRT	89	39	50	46.27
Granite Park	26	9	17	82.67
Greenbriar	1	0	1	252.14
Jackson	14	3	11	395.74
Johnston East	28	17	11	46.52
Johnston West	27	19	8	67.39
Kaiser Med Center	2	2		0.72
Lemon Hill	124	21	103	74.50
Mack	56	42	14	112.68
Marconi	71	34	37	39.79
Marysville	59	21	38	15.97
McClellan Heights/Parker Homes	31	2	29	17.08
Meadowview	6	0	6	11.31
Methodist Med Center	3	0	3	7.02
North City Farms	20	1	19	8.56
North Natomas EC	65	25	40	576.83
Northgate	104	76	28	102.07
Panhandle	8	1	7	297.72
Parkebridge	18	8	10	138.48
Parkerbridge	1		1	0.46
Point West	45	45		129.56

Dam Inundation Areas / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Power Inn/Army Depot	424	224	200	1,298.33
R Street Central City Housing	113	55	58	25.69
Railyards	30	4	26	28.79
Raley	46	5	41	191.12
Richards Boulevard	160	49	111	415.14
Riverfront	58	28	30	59.17
Robla	72	6	66	98.09
Royal Oaks	29	18	11	13.33
Southwest Natomas	25	10	15	68.21
Stockton	35	24	11	55.54
Stockton North	88	53	35	23.02
Stockton South	46	30	16	57.96
Strawberry Manor	277	75	202	177.02
Swanston Station	107	55	52	51.15
Truxel	40	26	14	87.59
UCD Med Center	117	2	115	5.38

Source: Cal OES, DSOD, City of Sacramento GIS

Figure F-24 City of Sacramento – Future Development Opportunity Areas and Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 11/2021.

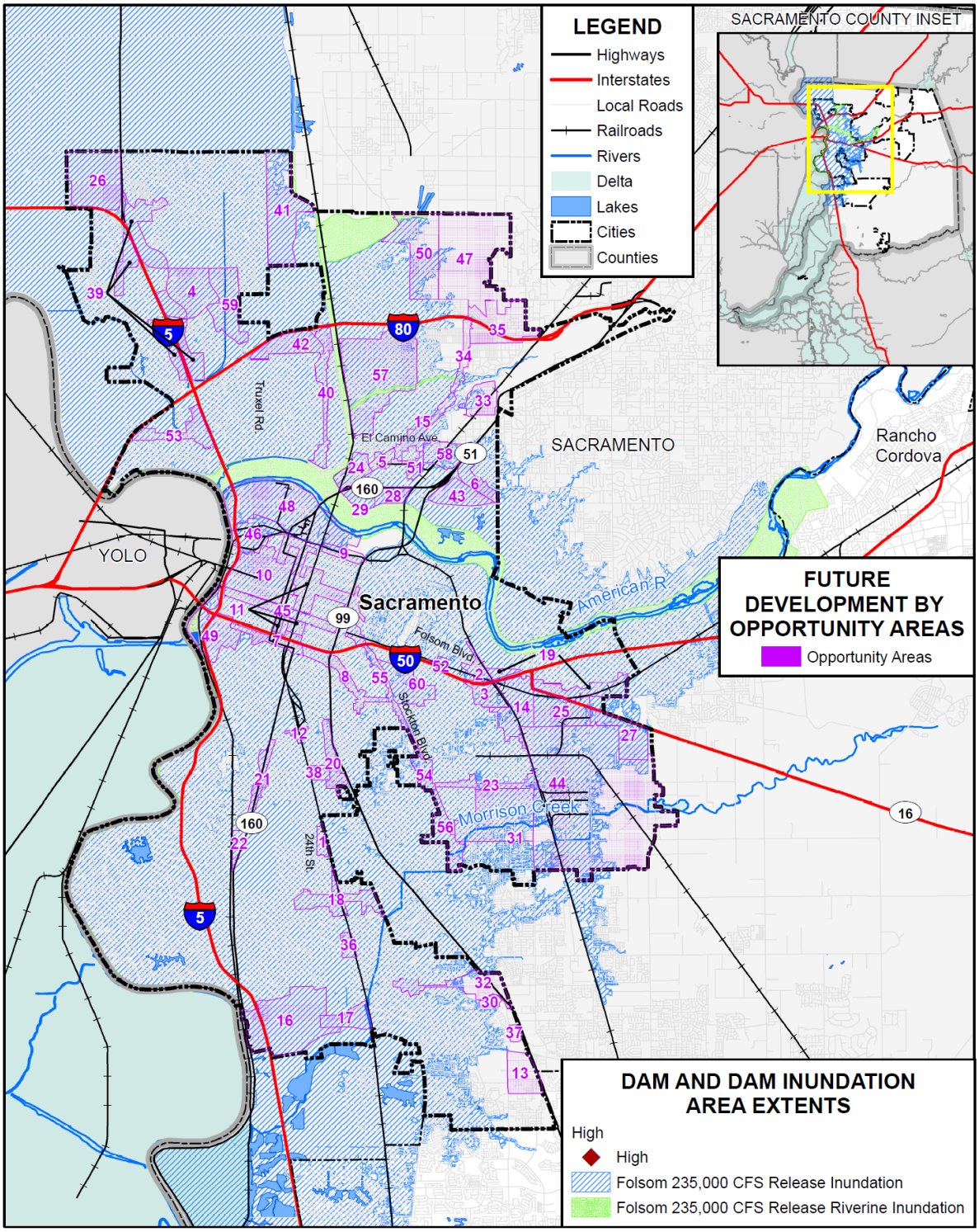
Figure F-25 City of Sacramento – Future Development Opportunity Areas legend

Table F-25 City of Sacramento – Future Development Opportunity Areas and Dam Inundation Areas from Dams Outside the County

Dam Inundation Areas / Opportunity Area	Total Parcel Count	Improved Parcel Count		Total Acres
Camp Far West				
–	–	–	–	–
Oroville				
Johnston West	4		4	4.25
Richards Boulevard	6	1	5	17.14
Riverfront	4	1	3	4.26

Source: Cal OES, DSOD, City of Sacramento GIS

Figure F-26 City of Sacramento – Future Development Opportunity Areas and Folsom Dam 235,000 cfs Scenario Dam Inundation Areas



FOSTER MORRISON CONSULTING

SACRAMENTO COUNTY

Data Source: County-provided dam inundation data (CA_DWR_200YEAR_FLOODPLAIN.zip 2020), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 11/2021.

Figure F-27 City of Sacramento – Future Development Opportunity Areas

Table F-26 City of Sacramento – Future Development Opportunity Areas and Dam Inundation Areas from Folsom Dam 235,000 cfs Scenario

Dam Inundation Areas / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Folsom 235K CFS Release Inundation				
47th	25	11	14	12.65
65th North	31	19	12	18.43
65th South	9	7	2	17.68
Arco Arena	18	7	11	55.13
Arden Fair	21	15	6	71.74
Arden/Del Paso	55	29	26	20.47
Broadway	74	52	22	16.33
Broadway East	138	61	77	23.79
C Street	14	5	9	33.31
CBD	99	59	40	33.67
Central City Corridors	395	272	123	68.32
City College	54	26	28	8.64

Dam Inundation Areas / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
CSUS Village	83	42	41	159.78
Del Paso	85	54	31	31.06
Delta Shores	31	10	21	691.60
Delta Shores Transit Center	2	0	2	49.02
Florin	75	45	30	109.87
Folsom East	44	33	11	91.88
Franklin	101	61	40	38.02
Freeport North	50	43	7	24.99
Freeport South	20	12	8	28.91
Fruitridge	31	18	13	12.71
Globe LRT	89	39	50	46.27
Granite Park	22	9	13	80.92
Greenbriar	1	0	1	252.14
Jackson	10	2	8	219.44
Johnston East	28	17	11	46.52
Johnston West	27	19	8	67.39
Lemon Hill	117	18	99	71.49
Mack	17	13	4	48.25
Marconi	9	3	6	6.38
Marysville	17	9	8	5.63
Meadowview	6	0	6	11.31
North City Farms	20	1	19	8.56
North Natomas EC	65	25	40	576.83
Northgate	104	76	28	102.07
Panhandle	7	0	7	179.32
Parkebridge	18	8	10	138.48
Parkerbridge	1	0	1	0.46
Point West	44	44	0	128.85
Power Inn/Army Depot	267	136	131	788.16
R Street Central City Housing	113	55	58	25.69
Railyards	30	4	26	28.79
Raley	7	0	7	9.96
Richards Boulevard	159	48	111	398.70
Riverfront	58	28	30	59.17

Dam Inundation Areas / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Robla	74	6	68	119.64
Royal Oaks	29	18	11	13.33
Southwest Natomas	25	10	15	68.21
Stockton	34	23	11	53.65
Stockton North	75	44	31	19.05
Stockton South	46	30	16	57.96
Strawberry Manor	265	72	193	173.13
Swanston Station	82	37	45	36.72
Truxel	40	26	14	87.59
UCD Med Center	117	2	115	5.38

Source: Cal OES, DSOD, City of Sacramento GIS

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the City, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long

period of time, water shortage becomes a larger issue. Current drought conditions in the City and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There have been three state and one federal disaster declaration from drought. This can be seen in Table F-27.

Table F-27 Sacramento County – State and Federal Drought Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	3	2008, 2014, 2021	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the City are the same as those for the County and includes 4 multi-year droughts since 1950. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

As dry conditions persist throughout the State the City's Department of Utilities is proactively making changes to the way it produces drinking water and is increasing outreach to customers about water use efficiency.

- The City is shifting its drinking water productions to divert less water from the American River and more from the Sacramento River and previously stored water from its groundwater wells. Along with water conservation, this will reduce water diversions on the Lower American River (LAR) by about 30 percent from historic practice, which leaves more water in the river, keeping water levels higher and temperatures cooler to help fish populations.
- City of Sacramento customers currently use an average of 25 percent less water per person than before the drought in 2013, partially because the City has kept a two-day-per-week watering schedule since after the drought emergency ended in 2017.
- The City is asking that residents continue – and increase – their efforts to use water efficiently by following the watering schedule, avoiding water waste and taking advantage of water-efficiency rebates and programs available at SacWaterWise.com. Increased outreach campaigns include radio spots, digital and billboard ads, utility bill inserts and educational webinars.
- The City has increased water patrols that focus on educating residents about using water efficiently and adhering to watering day schedules. Fines will only be issued for egregious violations. If fines are issued, most customers are eligible to have fees waived by participating in City water conservation education and participating in rebate programs.

During the previous 2012-2016 drought the City maintained a reliable water supply, but instituted changes during and after that period to increase reliability.

- The City commissioned a study to model the correlation between river flows on the Sacramento and American River and the level of water above the diversion structures.
- The City commissioned a study to assimilate all physical information about its intakes, including sending divers into submerged areas to take physical measurements, create a three-dimension fluid dynamic model, determine the safety factor between design and likely failure point, and finally to recommend improvements to increase security.

- The City installed vortex breaker devices following those studies to improve hydraulics inside the facility, which allows select pumps to continue to operate at water levels below that seen in history.
- The City installed vibration monitoring technology on all to vortex breaker device to allow select pumps to continue to operate at water levels below diversion pumps to identify any adverse conditions.
- The City returned many groundwater wells to service, and is continuing to reinvest in future wells.

The City also coordinates with USBR so that they know how their release pattern affects our facilities on the Sacramento and American Rivers (particularly minimum release patterns), and so they can make decisions. Partly this is to ensure Reclamation is mindful of the City and its customers, but also to provide Reclamation an understanding of the City's flexibility as they endeavor to meet the myriad of needs in totality of California's water system.

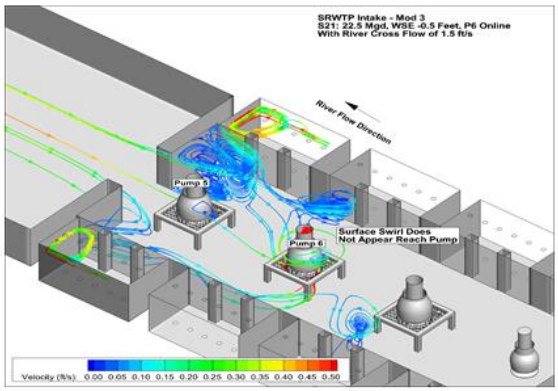
For example, the City needs a minimum flow of 500 cfs on the American to operate the intake. City water rights provide a diversion limitation of 64-100 mgd during low flow conditions on the river and a total limit of 50,000 acre-feet during year when inflow into Folsom Reservoir is particularly low.

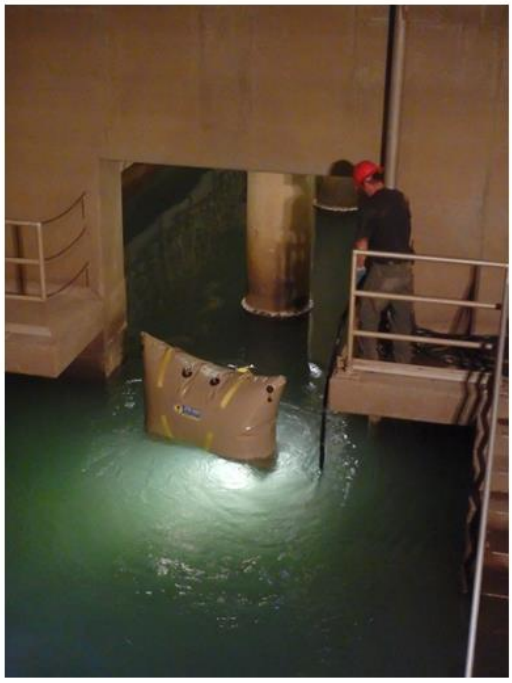
With the resiliency of the City water system, and the desire to benefit the Lower American River, the City will likely reduce its diversion requirements by half of the limiting factors stated above. The EAF Water Treatment Plant facility on the LAR will essentially be idling at a low rate to make sure the City meets level of service needs for its customers.

The Sacramento River is more challenging to predict given the tidal influence. In the 2012 – 2016 drought water level at I street dropped to elevation 1-ft Mean Sea Level (MSL) at an approximate river flow of 5000 cfs, which was a foot below design level of the City intake. The facility continued to perform. The facility evaluations suggest the actual point of failure (before installing improvements) is closer to 3600 CFS after removing all safety factors. With improvements (see Figure F-28) select pumps have the potential to operate down to 0.5 feet below MSL. Aside from greater reliance on stored groundwater, the Sacramento River facility is planned to be the lead plant this year. Again, the goal is to meet all the level of service needs of its customers, but utilize operation flexibility to benefit the environment and State/Federal operation of the water system.

The latest release projections by the State/Federal agencies provide for flow patterns that allow operation of City treatment facilities. The City will continue to monitor conditions.

Figure F-28 City of Sacramento – Intake Modifications





Source: City of Sacramento

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the City, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users.

The vulnerability of the City to drought is City-wide, but impacts may vary and include reduction in water supply and an increase in dry fuels. The potential for a reduction in water supply during drought conditions generally leads to both mandated and voluntary conservations measures during extended droughts. During these times, the costs of water can also increase. The increased dry fuels and fuel loads associated with drought conditions can also result in an increased fire danger. In areas of extremely dry fuels, the intensity and speed of fires can be significant. Water supply and flows for fire suppression can also be an issue during extended droughts.

There has been an increase in the occurrence of harmful algal blooms (HABs) in the stormwater detention basins, channels such as Pocket Canal, and City Park ponds such as McKinley Park and others. This is primarily due to low flows, stagnant water and increased temperatures, all conditions that are more common with increased average temperatures and decreased precipitation. HABs have the potential to produce algal toxins that pose a risk to drinking water, as well as people and pets recreating in the waterbodies. Once

established, these blooms are difficult to treat, and require monitoring and public outreach to mitigate the risks they pose.

Other qualitative impacts associated with drought in the City and Sacramento County Planning Area are those related to water intensive activities such as, municipal usage, commerce, tourism, recreation and agricultural use. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

With more precipitation likely falling as rain instead of snow in the Sierra's, and warmer temperatures causing decreased snowfall to melt faster and earlier, water supply is likely to become more unreliable. In addition, drought and water shortage is predicted to become more common. This means less water available for use over the long run, and additional challenges for water supply reliability, especially during periods of extended drought.

Drought conditions lead to worse flooding in the future ground hardens. Drought also causes City parks issues with landscaping of grasses, trees, and bushes.

Future Development

As the population in the area continues to grow, so will the demand for water. Ongoing planning will be needed by the City and water agencies to account for population growth and increased future water demands.

Earthquake

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

Since earthquakes are regional events, the whole of the City is at risk to earthquake. Sacramento and the surrounding area are at limited risk from significant seismic and geologic hazards. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the

Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on a 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time.

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The City is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the City fall within a low to moderate shake risk.

Past Occurrences

The City noted the following past occurrences of earthquakes that had some effect on the City

- 1892: Winters Earthquake (Magnitude 6.6) – Undetermined fault
- 1906: San Francisco Earthquake (Magnitude 7.8) – San Andreas Fault
- 1989 Loma Prieta Earthquake (Magnitude 6.9) – San Andreas Fault
- 2014 Napa Earthquake (Magnitude 6.0) - West Napa Fault
- 2021 Truckee Earthquake (Magnitude 4.7) - West Tahoe Fault

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future.

There are no known faults within the City of Sacramento. However, significant earthquakes have occurred on previously undetected faults. Known faults located nearest to Sacramento are Foothills fault system to the east, the Midland Fault to the west, and the Dunnigan Hills Fault to the northwest.

The Foothills fault system is located on the western edge of the Sierra Nevada Range over 20 miles from the Policy Area and consists of a complex of north-south trending faults. The active Bear Mountain fault zone is at the western edge of the system (California Division of Mines and Geology 1978). The anticipated

maximum magnitude of an earthquake originating from this fault zone is 6.5 moment magnitude (Mw). The Sacramento region has experienced groundshaking originating from faults in the Foothills fault system in the past. The Midland fault zone is considered to be a deep pre-Pleistocene subsurface feature extending nearly 50 miles along the west side of the Sacramento Valley, from the Delta to Lake Berryessa. This fault has been only approximately located from natural gas exploration work. Subsurface data indicate that there has been no appreciable movement on the Midland fault in the last 24 to 36 million years, and no evidence of surface expression has yet been found (Harwood and Helley 1987). The Dunnigan Hills Fault is located approximately 20 miles northwest of the City of Sacramento. The active fault is not within an Alquist-Priolo Earthquake Fault Zone.

Other faults in the region include the Great Valley fault (segments 3 and 4), located over 25 miles from the Policy Area and capable of producing a 6.5 – 6.8 Mw earthquake. The Concord-Green Valley fault and Hunting Creek-Berryessa fault are both located approximately 40 miles from the Policy Area and are capable of producing 6.9 Mw earthquakes. The Greenville fault is located approximately 50 miles from the Policy Area and is capable of producing a 6.8 Mw earthquake. The West Napa fault is also located approximately 50 miles from the Policy Area and could produce a 6.5 Mw earthquake.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured housing is very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. The City does not have an inventory of URM or soft story buildings. It is thought that some may exist in the historic districts in the City.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The City of Sacramento is within the less hazardous Zone 3.

Earthquake vulnerability is primarily based on population and the built environment. Urban areas in high seismic hazard zones are the most vulnerable, while uninhabited areas are less vulnerable.

Impacts from earthquake in the City will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

Earthquake Analysis

Due to the regional effects of an earthquake, a Hazus earthquake analysis was performed on a countywide basis. This can be found in Section 4.3.11 of the Base Plan. While these runs were not done specific to the City, maps showing damage in the County show greater areas of damage near the cities in the County.

Future Development

Although new growth and development corridors would fall in the area affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in areas prone to earthquakes will continue to occur. The City enforces the state building code, which mandates construction techniques that minimize seismic hazards. Future development in the City is subject to these building codes.

Earthquake Liquefaction

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

Liquefaction during major earthquakes has caused severe damage to structures on level ground as a result of settling, titling, or floating. Such damage occurred in San Francisco on bay-filled areas during the 1989 Loma Prieta earthquake, even though the epicenter was several miles away. If liquefaction occurs in or under a sloping soil mass, the entire mass may flow toward a lower elevation. Also of particular concern in terms of developed and newly developing areas are fill areas that have been poorly compacted.

Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the county are rebuilt or leveed areas are dewatered and the levees rebuilt. In Sacramento County, the Delta and areas of downtown Sacramento are at risk to liquefaction.

Past Occurrences

The City noted no past events of liquefaction that affected the City.

Vulnerability to and Impacts from Earthquake: Liquefaction

Earthquake is discussed in the section above, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas.

A geological and seismological study in 1972 indicated that the Housing and Redevelopment Agency building site located downtown at the intersection of 7th and I Streets has a potential for liquefaction. This study also concluded that potential liquefaction problems may exist throughout the downtown area where loose sands and silts are present below the ground water table. Exact property value estimates are not available. Due to the fact that downtown Sacramento is located away from active faults, there may be limited vulnerability to damage from liquefaction.

Future Development

Although new growth and development corridors would fall in the area affected by earthquake, given the small chance of major earthquake and the building codes in effect, development in areas prone to earthquakes will continue to occur. The City enforces the state building code, which mandates construction techniques that minimize seismic hazards. Future development in the City is subject to these building codes.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the City, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the City. Historically, the City has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the City of Sacramento have been subject to historical flooding. Sacramento is traversed by several stream systems and is at risk to the 1% and 0.2% flood.

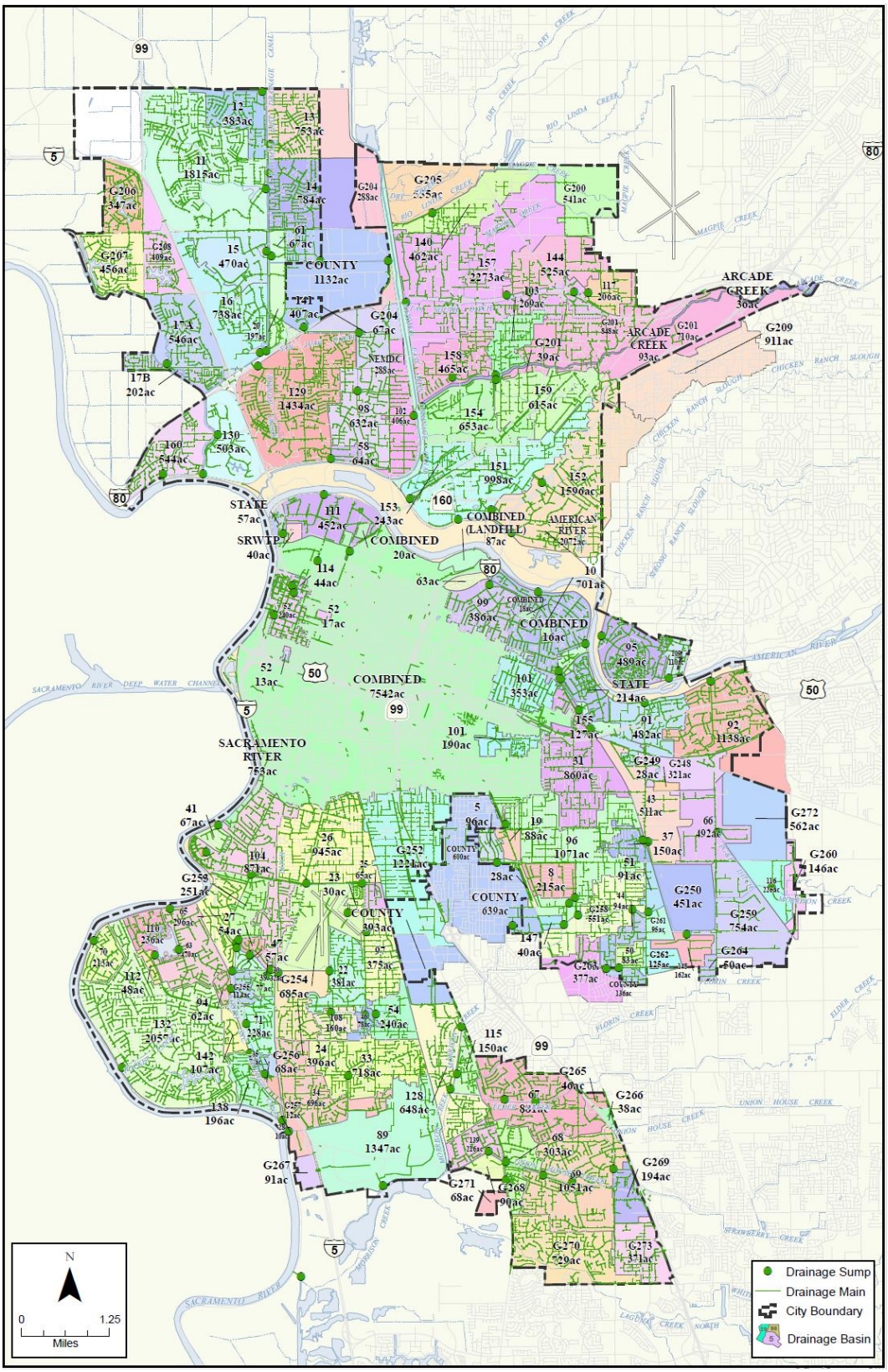
Location and Extent

The City of Sacramento is traversed by several stream systems and is at risk to both riverine flooding and localized stormwater flooding. As previously described in Section 4.2.14 of the main plan, the Sacramento County Planning Area and the City of Sacramento have been subject to previous occurrences of flooding.

In the City of Sacramento, much of the riverine flood damage occurs in the floodplains of the Sacramento River and the American River.

Six small tributaries of the Sacramento River pass through and provide drainage for the City of Sacramento. These tributaries are Dry Creek, Magpie Creek, and Arcade Creek in the northern portion of the city (north of the American River), and Morrison Creek, Elder Creek, Florin Creek, Unionhouse Creek, and Laguna Creek in the southern portion of the city (south of the American River). Waterways and drainages in the City are shown on Figure F-29.

Figure F-29 City of Sacramento Waterways and Drainage

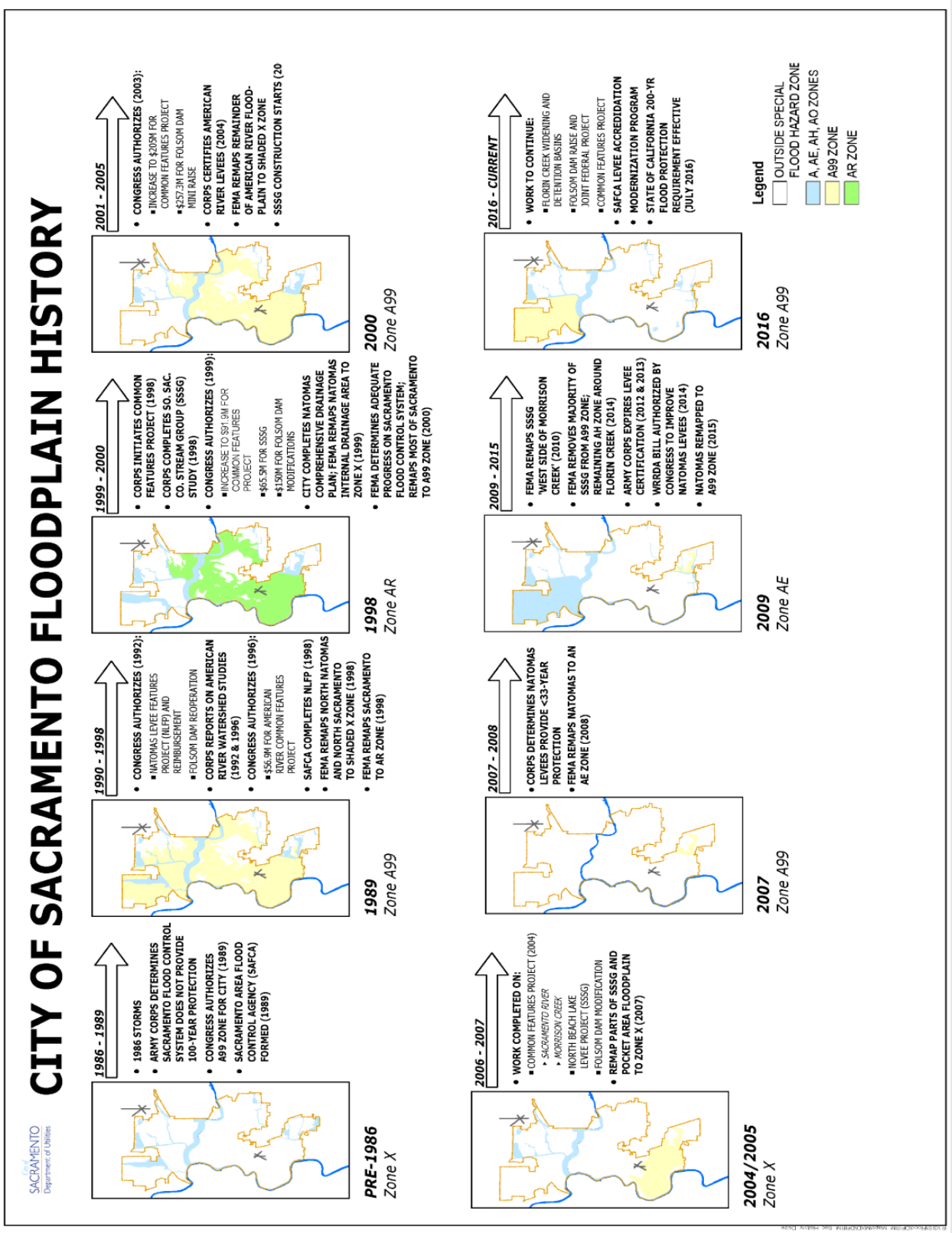


Source: City of Sacramento Department of Utilities

The City Planning Area contains many natural and man-made drainage features that ultimately drain into the Sacramento River. In addition to those listed above, local surface water drainages or creeks such as Chicken Ranch and Strong Ranch sloughs, Florin Creek, and Robla Creek are additional major natural drainages within the Policy Area. Man-made drainage canals, such as the Natomas East Main Drain Canal and the East, West, and Main Drainage Canals provide drainage for a large portion of the urbanized areas within the Policy Area that are not served by the City's combined sewer system or the City's storm drainage collection system.

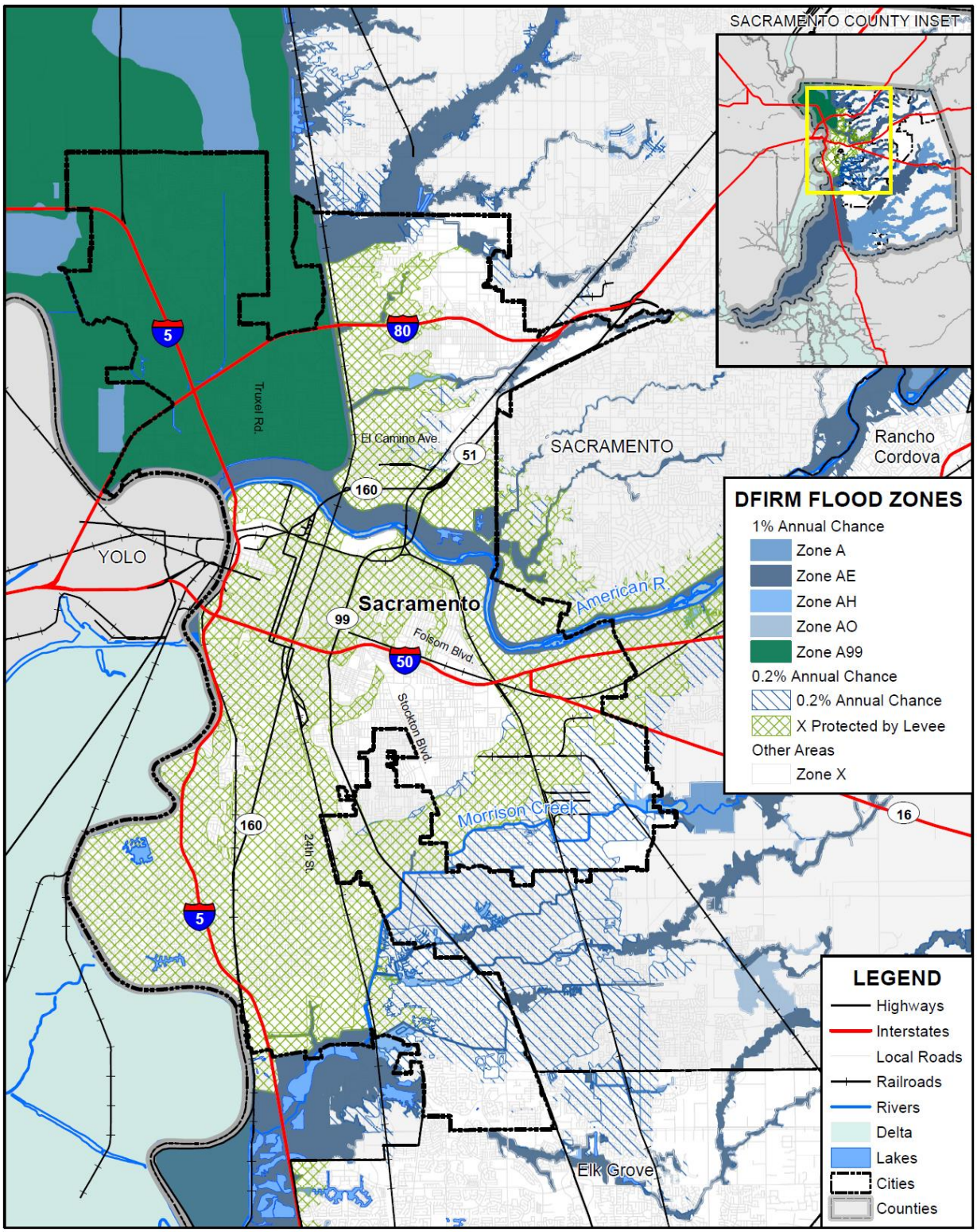
The City Planning area has had many changes to the designated floodplain since the 1986 flooding base on Flood Insurance Rate Maps provided by FEMA. These changes are shown in Figure F-30.

Figure F-30 City of Sacramento Floodplain History



The City of Sacramento has areas located in the 1% and 0.2% annual chance flood zones. This is seen in Figure F-31.

Figure F-31 City of Sacramento – FEMA DFIRM Flood Zones



FOSTER MORRISON CONSULTING

SACRAMENTO COUNTY

Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table F-28 details the DFIRM mapped flood zones located within the City.

Table F-28 City of Sacramento– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in City
A	1% annual chance flooding: No base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AE	1% annual chance flooding: Base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood. Flood insurance is not mandatory but is available.	X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	X
X (unshaded)	No flood hazard	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the City vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the City tends to have a shorter speed of onset, due to the amount of water that flows through the City.

Geographical flood extent for the City from the FEMA DFIRMs are shown in Table F-29.

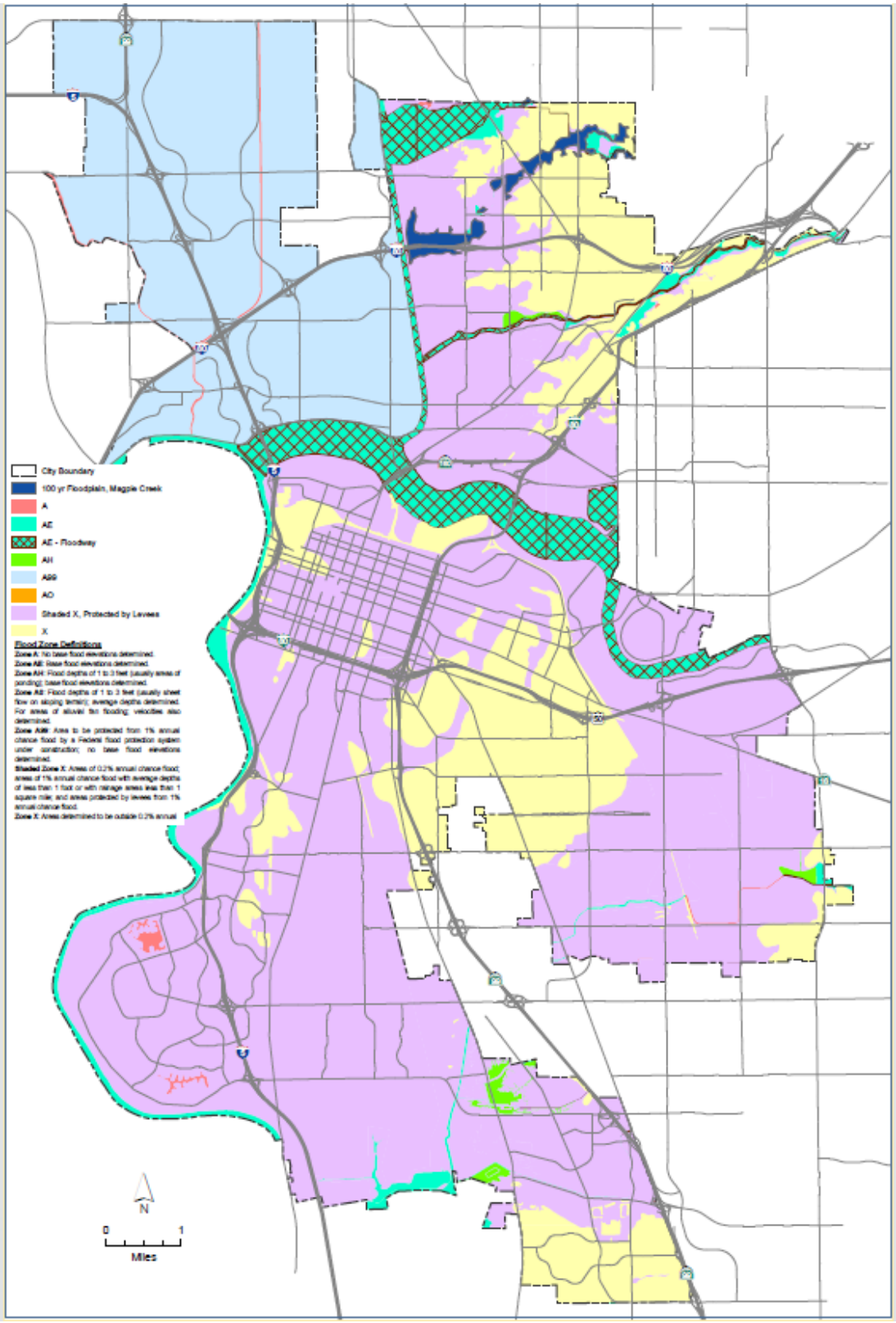
Table F-29 City of Sacramento – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance	34,002	45.98%	20,537	42.69%	13,465	52.10%
0.2% Annual Chance	30,304	40.98%	21,078	43.81%	9,226	35.70%
Other Areas	9,649	13.05%	6,496	13.50%	3,154	12.20%
Total	**73,956**	**100.00%**	**48,110**	**100.00%**	**25,845**	**100.00%**

Source: FEMA DFIRM 11/2/2018

In addition to FEMA floodplains, the City also regulates a local floodplain. FEMA floodplains and local floodplains are shown on Figure F-32. For purposes on analysis in this plan, only FEMA floodplains are analyzed.

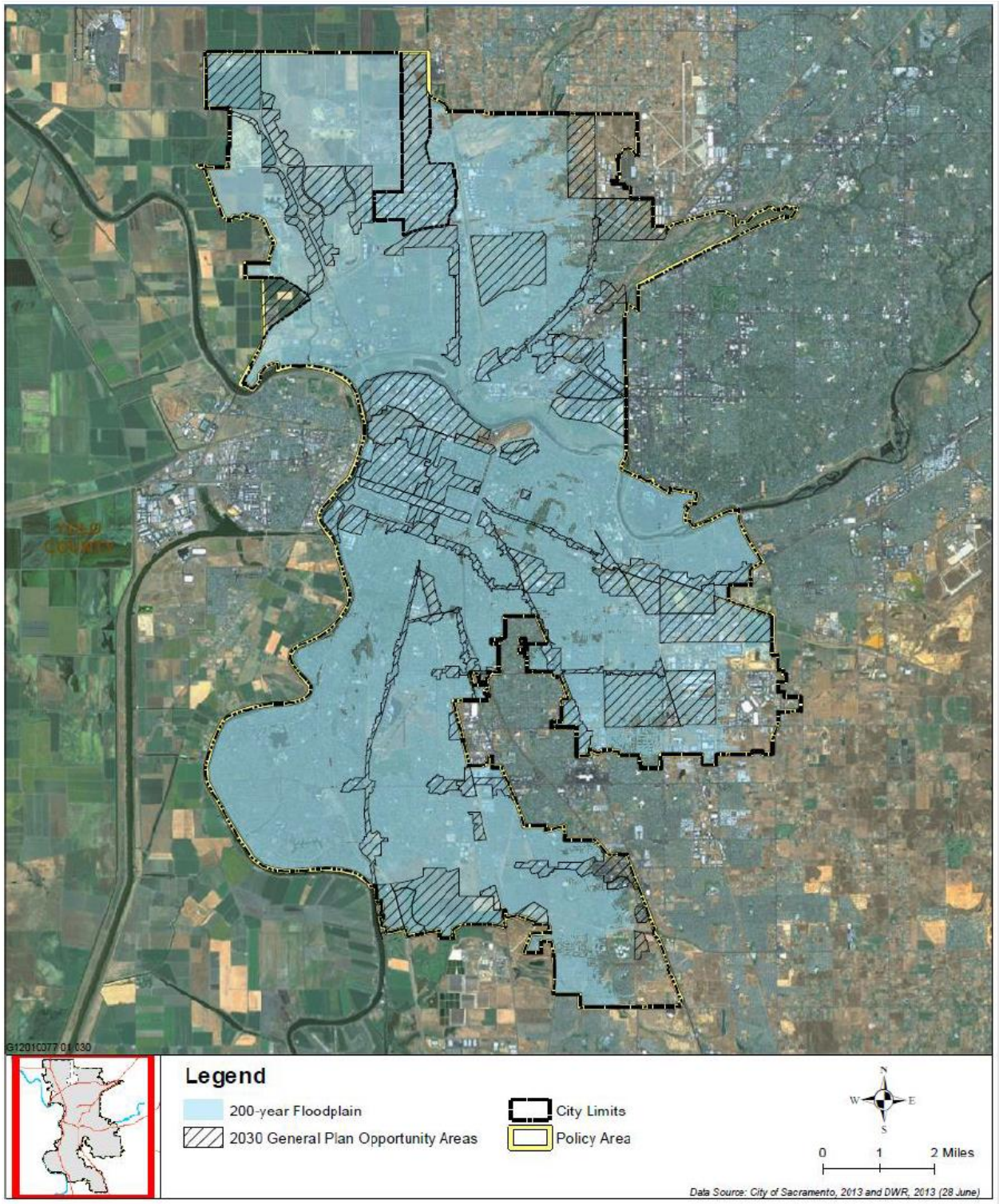
Figure F-32 City of Sacramento – FEMA and Local Floodplains



Source: City of Sacramento Department of Utilities GIS

An estimation of the City's 200-year floodplain can be seen in Figure F-33. While no analysis was performed using 200-year flood layer, it is presented here for informational purposes.

Figure F-33 City of Sacramento 200-year Floodplain



Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table F-30. These events also likely affected the City to some degree.

Table F-30 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The City noted other past occurrences of flooding.

Sacramento experienced great floods in 1850, 1852, 1862, 1911, 1913, 1951, 1956, 1963, 1964, 1986, 1995, 1997, 2005, and 2016. Record breaking flood events are detailed further below:

1850 Flood - During the night of January 7, 1850, a great storm swept in from the west. Almost overnight the water posed a grave threat to life and property. Within two days of the storms beginnings, downpours that reached an inch an hour, had transformed the rivers into raging torrents. There was no levee protecting the new city which started right at the river banks. Within hours, the entire community, for a mile back from the river, was deep under rushing waters. Houses were toppled; businessmen watched as thousands of dollars in inventory was washed out their doors; and a small steamboat navigated the town's streets to deliver goods. Very few homes escaped having water on the first floors. Many were swept from their underpinnings.

Figure F-34 Sketch of the City of Sacramento during the Flood of 1850

Source: California State Library

1852-53 Flood – In December of 1852, the Sacramento Valley was again inundated, even more deeply than they had in the high water of 1850. On March 29, 1853, the Sacramento River rose twelve feet within twenty-four hours. When the water finally broke through the levees, it was at a point south of the city,

toward Sutterville. The out rush of waters on the flatlands were sweeping and violent. By April 2, 1853, the water had backed up into the city. Again the City was under water. Sacramento was a city submerged. The City was a lake, boats were in the streets and the water didn't drain away for two months. The City had levees along both the Sacramento and American Rivers. Although levees served to prevent the rivers from invading the growing city, they also served to trap storm and refuse water that would otherwise drain directly into those rivers.

1861-1862 Flood – Sacramento had enjoyed eight winters of the rivers staying in-bank. The City had prospered and became the State capital. On December 9, 1861, at 8:00 A.M., the American River suddenly went over the levee at Smith's Gardens, about 31st & B Streets, in the northeastern part of the City. The water took its old channel, rushed through the slough west of the Fort and over its banks in less than 30 minutes, the low lots between 0 & R Streets were overflowed two to three feet deep. The R Street levee stopped its flow, causing it to back up into the City. By 9 A.M., the entire City, south of J Street, was inundated. By 11:30 A.M., only J, K and the levee streets (1, R, and Front) were above water. Within an hour and a half, J and K Streets were under water.

1951 Record Flood – Just after ground is broken on Folsom Dam, the American River watershed experiences the first of five record storms.

1956 Record Flood – Though engineers had been predicting it would take a year to fill the nearly completed upstream Folsom Dam, the second record storm filled the dam in a week and Sacramento is saved from flooding.

1964 Record Flood – the 3rd record flood in less than 15 years. Engineers concluded that Folsom Dam was only designed to handle a 120-year storm, not a 500-year storm.

1986 Record Flood: In February 1986, major storms in northern California caused record flood flows in the American River basin. Overflows from Folsom Reservoir, together with high flows in the Sacramento River, caused water levels to rise above the safety margin on levees protecting the Sacramento area. A series of tropical storms roared through the State that month. Ten inches of rain fell in 11 days. The levee overtopped in a low spot of Strawberry Manor, flooding approximately 500 homes. Outflows from Folsom Reservoir, together with high flows in the Sacramento River, caused water levels to rise above the safety margin on levees protecting the Sacramento area. The storm brought large flood flows into Folsom Reservoir with a maximum six-day record inflow of 1.14 million acre-feet, exceeding the six-day design inflow of 987,000 acre- feet. To relieve the pressure on the dam, 115,000 cubic feet per second (cfs), the design capacity of the levees downstream, was released from the reservoir for two days. As the rain continued, officials boosted those releases to 130,000 cfs for 24 hours. Officials considered increasing releases to 150,000 cfs, but the rain let up, and disaster was averted. At that point, it was estimated by flood officials that three more hours of rainfall would have overwhelmed the system, flooding thousands of homes. Runoff in the American River quickly filled the temporary diversion dam built at the Auburn Dam site, approximately ten years earlier, causing it to burst, and sending 100,000 acre feet of water rushing into Folsom Reservoir. Folsom Dam was downgraded to about a 60-year storm. The USACE determined that a majority of the City did not have 100-year level of flood protection.

Figure F-35 Ariel View of 1986 Flood

Source: SAFCA

1997 Record Flood: The fifth record flood in 46 years occurs over the New Year's holiday. Unprecedented flows from rain and melted snow surge into the Feather and the San Joaquin. Sacramento is spared when the fury of the storm hits 40 miles north in the Feather River. Levee failures flood Olivehurst, Adboga, Wilton, Manteca, and Modesto. By the end of January 1997, 48 counties were declared disaster areas and 290 square miles of property, valued at about $2 billion, including homes, farmlands, bridges, roads and flood management infrastructures were damaged. Nine people were killed and 120,000 people were evacuated from their homes.

Other large flood events will certainly occur in the future, leaving the City vulnerable to additional, potentially catastrophic flooding. Further localized flooding problems both in and outside of the natural floodplains are likely to continue as drainage channels are altered and confined with new development.

December 2012: McKinley Park Flooding - Several houses were flooded during a rain storm due to a failed programmable logic controller. DOC activation due to weather forecast.

Figure F-36 January 2003 Tower Bridge

Source: The Sacramento Area Flood Control Agency

Figure F-37 December 30, 2005 Pomegranate Avenue along Florin Creek in South Sacramento

Source: The Sacramento Area Flood Control Agency

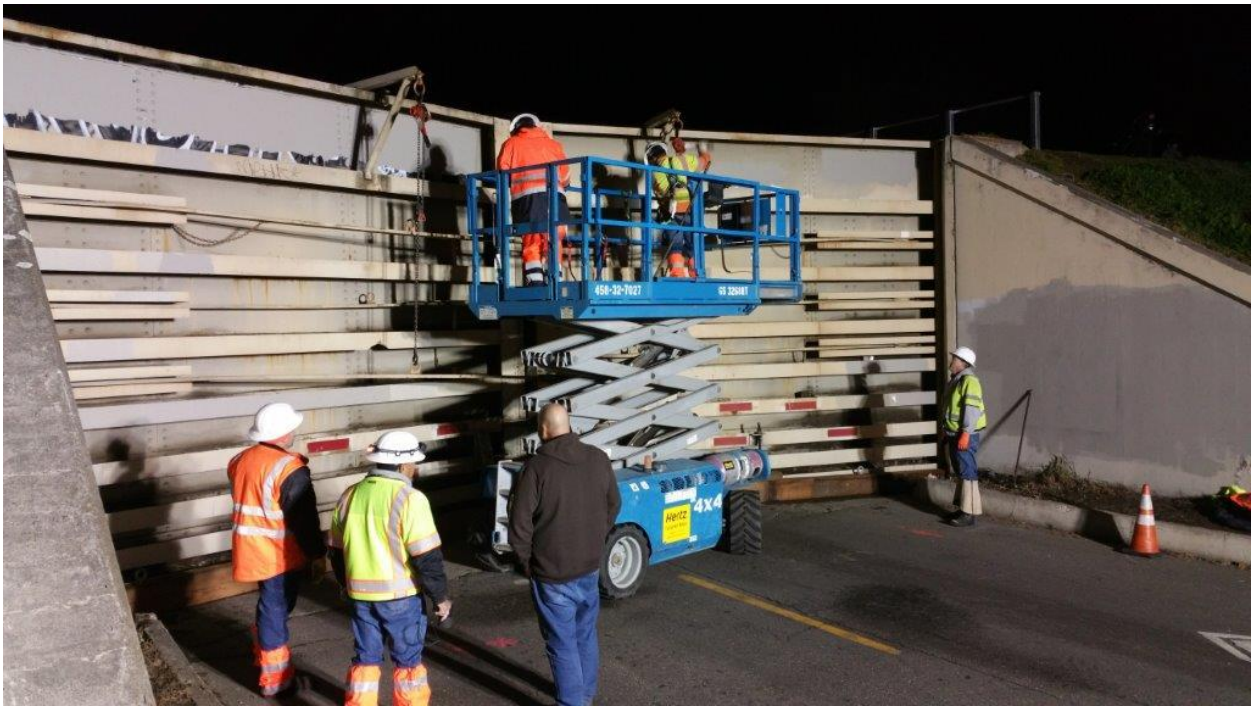
December 15, 2016 – The Natomas Four Season development was hit by flooding (see Figure F-38). Drainage backed up in the area due to raised floodgates. The City of Sacramento Department of Utilities had lowered floodgates in the area, but a private operator raised them later, causing flooding. Street flooding was reported, but no damages were suffered.

Figure F-38 City of Sacramento – December 2016 Flooding in Natomas Four Season Development

Source: City of Sacramento

January 6 to 12, 2017 – Heavy rains caused flooding throughout the City. In response, the EOC was activated. In anticipation of flooding, the Del Paso floodgates were raised. Floodgates were also raised at the Union Pacific Railway. Flooding occurred in the Garcia Bend Park. Sloughing occurred on the Executive Airport Canal. Floodwater temporarily threatened the I Street bridge. Flooding occurred an NEMDC and on Magpie Creek. Nimbus Dam was not in danger, but high flows were discharged down the spillway and into downstream rivers. High water was seen at the Sacramento weir.

Figure F-39 Del Paso Floodgate Closure



Source: City of Sacramento

Figure F-40 High Water at Sacramento Weir

Source: City of Sacramento

Figure F-41 Nimbus Dam in January 2017

Source: City of Sacramento

Vulnerability to and Impacts from Flood

Floods have been a part of the City's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Health Hazards from Flooding

Certain health hazards are also common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where cattle and other livestock are kept or their wastes are stored can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e. coli and other disease causing agents.

The second type of health problem arises after most of the flood water has subsided. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If a city or county water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

The HMPC for the City also noted another issue. When the City's combined sewer system is overloaded with stormwater, it frequently backs up into the streets causing a health hazard.

Warning and Evacuation Procedures

The City of Sacramento in conjunction with Sacramento County and other incorporated communities have a variety of systems and procedures established to protect its residents and visitors to plan for, avoid, and respond to a hazard event including those associated with floods and wildfires. This includes Pre-Disaster Public Awareness and Education information which is major component in successfully reducing loss of life and property in a community when faced with a potentially catastrophic incident. Much of this information is not specific to a given hazard event and is always accessible to the public on local City and County websites. Specific warning and evacuation systems and procedures include information relative to: Flood Forecasting (e.g., California Data Exchange Center), ALERT System, Warning Systems, dam protocols, evacuation procedures, and sheltering in place. Additional information on these warning and evacuation procedures as well as post-disaster mitigation policies and procedures can be found within the Capability Section of this Annex and in Section 4.4 of the Base plan and in the Emergency Management discussions in Appendix C.

Assets at Risk

Based on the vulnerability of Sacramento to the flood hazard, the sections that follow describes significant assets at risk in the City of Sacramento. This section includes the values at risk, flooded acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Sacramento. The methodology described in Section 4.3.12 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table F-31 is a summary table for the City of Sacramento. Parcel counts, values, estimated contents, and total values in the City are shown for the 1% and 0.2% annual chance flood zones, as well as for those properties that fall outside of the mapped FEMA DFIRM flood zones. Table F-32 breaks down Table F-31 and shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in FEMA flood zones in the City.

Table F-31 City of Sacramento – Count and Value of Parcels at Risk in Summary DFIRM Flood Zones

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard	34,612	30,884	$3,473,949,831	$10,066,624,818	$5,878,442,788	$19,419,017,610
0.2% Annual Chance Flood Hazard	90,649	84,438	$10,037,993,408	$26,076,921,127	$18,395,244,253	$54,510,159,160
Other Areas	30,329	27,574	$2,820,079,046	$7,249,889,826	$4,805,943,778	$14,875,912,816
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table F-32 City of Sacramento – Count and Values of Parcels at Risk by Detailed Flood Zone and Property Use

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	37	0	$918	$0	$0	$918
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	11	0	$0	$0	$0	$0
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	1	0	$10	$0	$0	$10
Zone A Total	**49**	**0**	**$928**	**$0**	**$0**	**$928**
Zone AE						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	1	1	$3,080,974	$17,467,737	$17,467,737	$38,016,448

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Church/Welfare	2	0	$20	$0	$0	$20
Industrial	7	5	$3,309,543	$5,474,577	$8,211,866	$16,995,985
Miscellaneous	330	0	$448,956	$0	$0	$448,956
Office	5	4	$3,763,605	$11,441,156	$11,441,156	$26,645,917
Public/Utilities	40	0	$9	$0	$0	$9
Recreational	17	3	$1,038,277	$5,930,196	$5,930,196	$12,898,669
Residential	86	79	$10,058,050	$20,754,434	$10,377,219	$41,189,704
Retail/ Commercial	12	10	$5,463,192	$7,693,547	$7,693,547	$20,850,286
Unknown	0	0	$0	$0	$0	$0
Vacant	81	0	$4,336,837	$0	$0	$4,336,837
Zone AE Total	**581**	**102**	**$31,499,463**	**$68,761,647**	**$61,121,721**	**$161,382,831**
Zone AH						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	8	8	$5,361,464	$17,610,653	$26,415,980	$49,388,099
Miscellaneous	27	0	$241	$0		$241
Office	0	0	$0	$0	$0	$0
Public/Utilities	3	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	166	162	$8,674,540	$19,190,390	$9,595,191	$37,460,126
Retail/ Commercial	5	4	$2,564,760	$2,583,690	$2,583,690	$7,732,140
Unknown	0	0	$0	$0	$0	$0
Vacant	14	0	$610,913	$0	$0	$610,913
Zone AH Total	**223**	**174**	**$17,211,918**	**$39,384,733**	**$38,594,861**	**$95,191,519**
Zone A99						
Agricultural	10	1	$3,414,513	$165,516	$165,516	$3,745,545
Care/Health	13	11	$14,098,088	$53,243,114	$53,243,114	$120,584,316
Church/Welfare	17	16	$14,902,100	$48,883,844	$48,883,844	$112,669,788
Industrial	49	45	$29,453,067	$121,659,409	$182,489,113	$333,601,589
Miscellaneous	937	0	$599,594	$0	$0	$599,594
Office	195	176	$187,192,861	$762,586,024	$762,586,024	$1,712,364,909
Public/Utilities	29	0	$83	$0	$0	$83
Recreational	11	9	$38,979,673	$49,605,218	$49,605,218	$138,190,109

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Residential	31,029	30,119	$2,720,832,858	$8,465,381,086	$4,232,690,505	$15,418,904,615
Retail/ Commercial	213	207	$197,459,470	$449,062,872	$449,062,872	$1,095,585,214
Unknown	1	1	$0	$86,693	$0	$86,693
Vacant	1,255	23	$218,305,215	$7,804,662	$0	$226,109,877
Zone A99 Total	**33,759**	**30,608**	**$3,425,237,522**	**$9,958,478,438**	**$5,778,726,206**	**$19,162,442,332**
1% Annual Chance Flood Hazard Total	**34,612**	**30,884**	**$3,473,949,831**	**$10,066,624,818**	**$5,878,442,788**	**$19,419,017,610**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	1	1	$343,332	$457,776	$457,776	$1,258,884
Care/Health	14	12	$10,053,253	$436,512,590	$436,512,590	$883,078,433
Church/Welfare	48	37	$9,595,334	$34,872,379	$34,872,379	$79,340,092
Industrial	468	444	$212,609,294	$831,052,142	$1,246,578,217	$2,290,239,651
Miscellaneous	154	0	$238,420	$0	$0	$238,420
Office	55	46	$20,865,031	$79,297,498	$79,297,498	$179,460,027
Public/Utilities	48	0	$47	$0	$0	$47
Recreational	2	2	$841,668	$1,817,754	$1,817,754	$4,477,176
Residential	10,573	10,361	$511,415,995	$1,535,215,644	$767,607,747	$2,814,239,489
Retail/ Commercial	173	151	$100,650,954	$189,065,272	$189,065,272	$478,781,498
Unknown	0	0	$0	$0	$0	$0
Vacant	348	20	$56,829,407	$12,432,868	$0	$69,262,275
0.2% Annual Chance Total	**11,884**	**11,074**	**$923,442,735**	**$3,120,723,923**	**$2,756,209,233**	**$6,800,375,992**
X Protected by Levee						
Agricultural	2	0	$4,382	$0	$0	$4,382
Care/Health	95	82	$56,338,066	$948,186,157	$948,186,157	$1,952,710,380
Church/Welfare	286	236	$58,219,993	$245,515,904	$245,515,904	$549,251,801
Industrial	1,066	927	$340,988,541	$868,045,887	$1,302,068,816	$2,511,103,265
Miscellaneous	1,148	6	$2,219,040	$134,491	$134,491	$2,488,022
Office	1,307	1,043	$834,541,039	$3,568,339,668	$3,568,339,668	$7,971,220,375
Public/Utilities	401	1	$311,958	$31,233	$31,233	$374,424
Recreational	83	46	$45,215,017	$402,974,334	$402,974,334	$851,163,685
Residential	70,328	69,537	$6,561,266,974	$15,479,336,428	$7,739,668,041	$29,780,271,693
Retail/ Commercial	1,853	1,383	$774,751,530	$1,432,116,376	$1,432,116,376	$3,638,984,282

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unknown	1	0	$0	$0	$0	$0
Vacant	2,195	103	$440,694,133	$11,516,726	$0	$452,210,859
X Protected by Levee Total	**78,765**	**73,364**	**$9,114,550,673**	**$22,956,197,204**	**$15,639,035,020**	**$47,709,783,168**
0.2% Annual Chance Flood Hazard Total	**90,649**	**84,438**	**$10,037,993,408**	**$26,076,921,127**	**$18,395,244,253**	**$54,510,159,160**
Other Areas						
Zone X						
Agricultural	1	0	$4,077			$4,077
Care/Health	35	26	$18,415,829	$195,496,844	$195,496,844	$409,409,517
Church/Welfare	186	151	$28,078,654	$218,645,794	$218,645,794	$465,370,242
Industrial	436	391	$124,051,987	$393,659,478	$590,489,221	$1,108,200,679
Miscellaneous	432	3	$265,439	$185,558	$185,558	$636,555
Office	234	183	$148,115,124	$641,971,564	$641,971,564	$1,432,058,252
Public/Utilities	247	0	$1,397,551			$1,397,551
Recreational	26	20	$4,940,327	$11,916,549	$11,916,549	$28,773,425
Residential	26,478	26,171	$2,037,791,411	$5,268,917,130	$2,634,458,401	$9,941,167,115
Retail/ Commercial	687	586	$260,234,690	$512,779,847	$512,779,847	$1,285,794,384
Unknown	0	0	$0	$0	$0	$0
Vacant	1,567	43	$196,783,957	$6,317,062	$0	$203,101,019
Zone X Total	**30,329**	**27,574**	**$2,820,079,046**	**$7,249,889,826**	**$4,805,943,778**	**$14,875,912,816**
Other Areas Total	**30,329**	**27,574**	**$2,820,079,046**	**$7,249,889,826**	**$4,805,943,778**	**$14,875,912,816**
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table F-33 summarizes Table F-32 above and shows City of Sacramento loss estimates and improved values at risk by FEMA 1% and 0.2% annual chance flood zones.

Table F-33 City of Sacramento – Flood Loss Estimates

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood Hazard	34,612	30,884	$10,066,624,818	$5,878,442,788	$15,945,067,606	$3,189,013,521	1.77%
0.2% Annual Chance Flood Hazard	90,649	84,438	$26,076,921,127	$18,395,244,253	$44,472,165,380	$8,894,433,076	4.95%
Grand Total	**125,261**	**115,322**	**$36,143,545,945**	**$24,273,687,041**	**$60,417,232,986**	**$12,083,446,597**	**6.72%**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table F-32 and Table F-33, the City of Sacramento has 30,884 parcels and $15.95 billion of structure and contents values or values in the 1% annual chance flood zone, and 84,438 improved parcels and $44.47 billion of structure and contents values in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.11 of the Base Plan, there is a 1% chance in any given year of a flood event causing $3.2 billion in damage and a 0.2% chance in any given year of a flood event causing $8.9 billion in damage in the City of Sacramento. The loss ratio of 1.77% and 4.95% indicates that flood losses for 1% and 0.2% annual chance flooding, respectively, would be sizable and difficult to recover from.

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits. The same methodology, as discussed in Section 4.3.12 of the Base Plan, was used for the City of Sacramento as well as for the County as a whole. Table F-34 represents a detailed and summary analysis of total acres for each FEMA DFIRM flood zone in the City.

Table F-34 City of Sacramento – Flooded Acres by Flood Zone and Property Use

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	2.3	0.00%	2.3	0.00%	0	0.00%
Care/Health	0	0.00%	0	0.00%	0	0.00%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Church/Welfare	0	0.00%	0	0.00%	0	0.00%
Industrial	13.3	0.00%	2.9	0.00%	10.4	0.00%
Miscellaneous	97.5	0.02%	0	0.00%	97.5	0.03%
Office	0.0	0.00%	0.0	0.00%	0	0.00%
Public/Utilities	10.8	0.00%	0	0.00%	10.8	0.00%
Recreational	1.7	0.00%	0	0.00%	1.7	0.00%
Residential	85.4	0.01%	8.6	0.00%	76.8	0.03%
Retail/ Commercial	0.0	0.00%	0.0	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	16.0	0.00%	0.0	0.00%	16.0	0.01%
Zone A Total	**227.1**	**0.04%**	**13.9**	**0.00%**	**213.2**	**0.08%**
Zone AE						
Agricultural	1.1	0.00%	0.5	0.00%	0.6	0.00%
Care/Health	7.1	0.00%	7.1	0.00%	0	0.00%
Church/Welfare	12.3	0.00%	1.3	0.00%	11.0	0.00%
Industrial	36.4	0.01%	32.9	0.01%	3.4	0.00%
Miscellaneous	2,147.1	0.33%	0	0.00%	2,147.1	0.76%
Office	8.3	0.00%	7.2	0.00%	1.2	0.00%
Public/Utilities	363.3	0.06%	0	0.00%	363.3	0.13%
Recreational	229.3	0.04%	5.0	0.00%	224.3	0.08%
Residential	151.6	0.02%	144.7	0.04%	7.0	0.00%
Retail/ Commercial	15.4	0.00%	13.5	0.00%	1.9	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	745.1	0.12%	0.3	0.00%	744.8	0.26%
Zone AE Total	**3,717.1**	**0.58%**	**212.5**	**0.06%**	**3,504.5**	**1.24%**
Zone AH						
Agricultural	0	0.00%	0	0.00%	0	0.00%
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	0.5	0.00%	0.5	0.00%	0	0.00%
Industrial	36.0	0.01%	35.9	0.01%	0.1	0.00%
Miscellaneous	22.1	0.00%	0	0.00%	22.1	0.01%
Office	0	0.00%	0	0.00%	0	0.00%
Public/Utilities	30.8	0.00%	0	0.00%	30.8	0.01%
Recreational	0	0.00%	0	0.00%	0	0.00%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Residential	33.6	0.01%	32.1	0.01%	1.5	0.00%
Retail/ Commercial	13.2	0.00%	10.6	0.00%	2.7	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	13.1	0.00%	0	0.00%	13.1	0.00%
Zone AH Total	**149.3**	**0.02%**	**79.1**	**0.02%**	**70.2**	**0.02%**
Zone A99						
Agricultural	159.6	0.02%	2.0	0.00%	157.7	0.06%
Care/Health	29.7	0.00%	22.8	0.01%	6.9	0.00%
Church/Welfare	57.6	0.01%	57.5	0.02%	0.1	0.00%
Industrial	132.2	0.02%	112.4	0.03%	19.8	0.01%
Miscellaneous	1,566.0	0.24%	0	0.00%	1,566.0	0.55%
Office	672.9	0.10%	524.3	0.15%	148.6	0.05%
Public/Utilities	235.7	0.04%	0	0.00%	235.7	0.08%
Recreational	216.8	0.03%	110.5	0.03%	106.3	0.04%
Residential	24,187.9	3.75%	18,670.4	5.17%	5,517.4	1.95%
Retail/ Commercial	368.3	0.06%	351.3	0.10%	17.0	0.01%
Unknown	0.0	0.00%	0.0	0.00%	0	0.00%
Vacant	2,282.3	0.35%	380.5	0.11%	1,901.8	0.67%
Zone A99 Total	**29,909.0**	**4.64%**	**20,231.7**	**5.60%**	**9,677.3**	**3.41%**
1% Annual Chance Flood Hazard Total	**34,002.5**	**5.28%**	**20,537.2**	**5.69%**	**13,465.3**	**4.75%**
0.2% Annual Chance Flood Hazard						
0.2% Annual Chance						
Agricultural	17.2	0.00%	17.2	0.00%	0	0.00%
Care/Health	72.5	0.01%	71.0	0.02%	1.5	0.00%
Church/Welfare	244.7	0.04%	93.9	0.03%	150.8	0.05%
Industrial	1,665.8	0.26%	1,538.7	0.43%	127.1	0.04%
Miscellaneous	265.6	0.04%	0	0.00%	265.6	0.09%
Office	123.4	0.02%	108.5	0.03%	14.9	0.01%
Public/Utilities	162.0	0.03%	0	0.00%	162.0	0.06%
Recreational	60.9	0.01%	3.3	0.00%	57.7	0.02%
Residential	2,307.1	0.36%	2,236.1	0.62%	71.0	0.03%
Retail/ Commercial	217.4	0.03%	205.6	0.06%	11.8	0.00%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	812.7	0.13%	58.7	0.02%	754.0	0.27%
0.2% Annual Chance Total	**5,949.2**	**0.92%**	**4,333.0**	**1.20%**	**1,616.2**	**0.57%**
X Protected by Levee						
Agricultural	0.3	0.00%	0	0.00%	0.3	0.00%
Care/Health	248.6	0.04%	231.1	0.06%	17.5	0.01%
Church/Welfare	681.7	0.11%	322.4	0.09%	359.4	0.13%
Industrial	2,148.0	0.33%	1,445.6	0.40%	702.4	0.25%
Miscellaneous	1,327.6	0.21%	0.5	0.00%	1,327.1	0.47%
Office	1,339.6	0.21%	866.1	0.24%	473.5	0.17%
Public/Utilities	1,301.3	0.20%	0.6	0.00%	1,300.6	0.46%
Recreational	511.9	0.08%	57.3	0.02%	454.6	0.16%
Residential	13,281.4	2.06%	12,788.3	3.54%	493.1	0.17%
Retail/ Commercial	1,165.9	0.18%	957.2	0.27%	208.7	0.07%
Unknown	1.2	0.00%	0	0.00%	1.2	0.00%
Vacant	2,347.3	0.36%	75.6	0.02%	2,271.6	0.80%
X Protected by Levee Total	**24,354.8**	**3.78%**	**16,744.7**	**4.64%**	**7,610.1**	**2.69%**
0.2% Annual Chance Flood Hazard Total	**30,304.0**	**4.70%**	**21,077.7**	**5.84%**	**9,226.3**	**3.26%**
Other Areas						
Zone X						
Agricultural	0.3	0.00%	0	0.00%	0.3	0.00%
Care/Health	110.0	0.02%	88.0	0.02%	22.0	0.01%
Church/Welfare	324.1	0.05%	247.5	0.07%	76.6	0.03%
Industrial	764.2	0.12%	677.7	0.19%	86.5	0.03%
Miscellaneous	303.5	0.05%	0.1	0.00%	303.4	0.11%
Office	279.6	0.04%	99.9	0.03%	179.7	0.06%
Public/Utilities	688.6	0.11%	0	0.00%	688.6	0.24%
Recreational	304.4	0.05%	22.0	0.01%	282.5	0.10%
Residential	5,036.2	0.78%	4,901.5	1.36%	134.7	0.05%
Retail/ Commercial	402.1	0.06%	319.3	0.09%	82.8	0.03%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	1,436.2	0.22%	139.7	0.04%	1,296.5	0.46%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Zone X Total	**9,649.1**	**1.50%**	**6,495.6**	**1.80%**	**3,153.5**	**1.11%**
Other Areas Total	**9,649.1**	**1.50%**	**6,495.6**	**1.80%**	**3,153.5**	**1.11%**
City of Sacramento Total	**73,955.6**	**11.48%**	**48,110.5**	**13.33%**	**25,845.1**	**9.12%**

Source: FEMA 11/2/2018 DFIRM

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Sacramento – 2.76. According to this analysis, there is a total population of 80,757 and 27,560 residents of the City at risk to flooding in the 1% and 0.2% annual chance floodplains, respectively. This is shown in Table F-35.

Table F-35 City of Sacramento – Count of Improved Residential Parcels and Population by Flood Zone

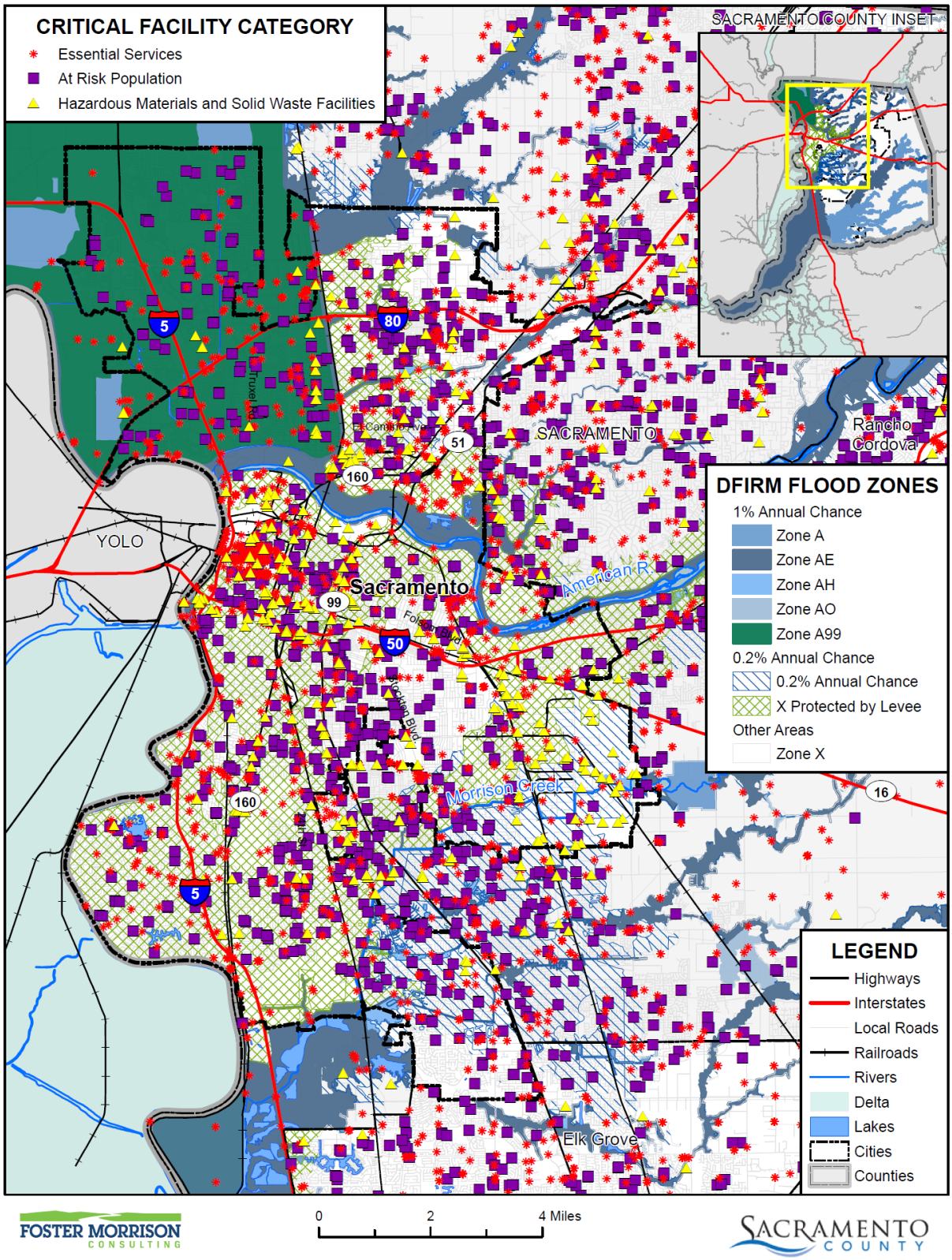
Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
City of Sacramento	30,360	80,757	10,361	27,560

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Sacramento in identified DFIRM flood zones. GIS was used to determine whether the critical facility locations intersect a DFIRM flood zone, and if so, which flood zone they intersect. Details of critical facilities in DFIRM flood zones in the City of Sacramento are shown in Figure F-42 for and detailed by dam inundation in Table F-36. Details of critical facility definition, type, name, and address and jurisdiction by DFIRM flood zones are listed in Appendix F.

Figure F-42 City of Sacramento – Critical Facilities in FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table F-36 City of Sacramento – Critical Facilities in FEMA DFIRM Flood Zones by Category and Type

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
1% Annual Chance Flood Hazard		
Essential Services Facilities	Bridge	6
	Cellular Tower	1
	Emergency Evacuation Center	11
	EMS Stations	2
	FDIC Insured Banks	14
	Fire Station	2
	Floodgate	16
	Microwave Service Towers	35
	Port Facilities	5
	Power Plants	2
	Public Transit Stations	1
	Pump Station	35
	Sewage Treatment Plant	1
	State Government Buildings	1
	Water Well	35
	Total	**167**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	3
	Day Care Center	20
	Major Sports Venues	1
	Mobile Home Parks	4
	Places of Worship	49
	School	26
	Total	**103**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	2
	Leaky Underground Storage Tank	13
	Solid Waste Facility	1
	Tank Farm	1
	Waste Transfer Station	1
	Total	**18**
1% Annual Chance Flood Hazard Total		**288**
0.2% Annual Chance Flood Hazard		
Essential Services Facilities	Airport	1
	Bridge	17

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
	Cellular Tower	1
	Emergency Evacuation Center	66
	EMS Stations	23
	FDIC Insured Banks	55
	Fire Station	19
	Floodgate	9
	Hospital or Urgent Care	9
	Law Enforcement	21
	Microwave Service Towers	314
	Power Plants	4
	Public Transit Stations	28
	Pump Station	136
	Sewage Treatment Plant	6
	State Government Buildings	29
	Water Well	78
	Total	**816**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	6
	Community Center	2
	Day Care Center	86
	Major Sports Venues	2
	Mobile Home Parks	10
	Places of Worship	290
	School	154
	Total	**550**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	31
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	123
	Solid Waste Facility	14
	Tank Farm	3
	Waste Transfer Station	3
	Total	**178**
0.2% Annual Chance Flood Hazard Total		**1,544**
Other Areas		
Essential Services Facilities	Bridge	3
	Emergency Evacuation Center	14

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
	EMS Stations	1
	FDIC Insured Banks	13
	Fire Station	1
	Floodgate	18
	Hospital or Urgent Care	7
	Law Enforcement	6
	Microwave Service Towers	152
	Port Facilities	1
	Power Plants	1
	Public Transit Stations	12
	Pump Station	29
	Sewage Treatment Plant	2
	State Government Buildings	3
	Water Well	38
	Total	**301**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	2
	Day Care Center	34
	Mobile Home Parks	8
	Places of Worship	88
	School	58
	Total	**190**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	6
	Leaky Underground Storage Tank	38
	Solid Waste Facility	8
	Waste Transfer Station	1
	Total	**54**
Other Areas Total		**545**
City of Sacramento Total		**2,377**

Source: City of Sacramento, FEMA 7/19/2018 DFIRM

Insurance Coverage, Claims Paid, and Repetitive Losses

Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures located within a 100-year floodplain – a requirement that affects nearly all mortgages financed through commercial

lending institutions. Flood insurance is also recommended for all structures protected by levees, even if not mapped within a floodplain.

The City of Sacramento joined the National Flood Insurance Program (NFIP) on September 15, 1978. The City participates in CRS program and is currently a CRS Class 3. Class 3 ratings provide a discount of 35% to those policies in the Special Flood Hazard Area. NFIP data indicates that as of March 24, 2020, there were 43,303 flood insurance policies in force in the City with $6,937,000 of coverage. Of the 43,303 policies, 42,269 were residential, while 1,034 were non-residential structures. Of the 43,303 policies, 26,639 were in A zones, while 16,664 were in B, C, and X zones. There have been 1,855 historical claims for flood losses totaling $9,852,037.68. The City has 106 RL structures and no Severe Repetitive Loss structures. There have been 158 RL claims totaling $2,110,551.25. There have been 43 substantial damage claims since 1978.

Based on this analysis of insurance coverage, the City has values at risk to the 1% annual chance and greater floods. Of the 30,884 improved parcels within the 1% annual chance flood zone, 26,596 (or 86.1 percent) of those parcels maintain flood insurance. This can be seen on Table F-37.

Table F-37 City of Sacramento – Percentage of Policy Holders to Improved Parcels in the 1% Annual Chance Floodplain

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Sacramento	30,884	26,596	86.1%

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, NFIP CIS data 3/2020.

2016 CFMP Flood Insurance Analysis

Most every primary building or substantial improvement within the City of Sacramento's SFHA must have a flood insurance policy if there is a federally-backed mortgage. The majority of mortgage loans are backed by the federal government through either Fannie Mae or Freddie Mac. Since flood insurance rates are driven by location of the building and the BFE, structures in the SFHA usually pay higher rates than do those buildings located outside the designated higher risk areas. Typically when BFEs increase, flood insurance premiums also increase, unless some type of mitigation is implemented on that building.

While flood insurance can do nothing to prevent actual flood damage or loss of life it can mitigate the economic risk associated with flooding to the insured in many ways. Flood insurance is a property owner's first line of defense against flood damage. A property which is damaged or destroyed can be replaced more quickly without using financial resources devoted to other things such as the mortgage, utilities or maintenance. Additionally, compensation for flood losses (through flood insurance payments) can help families get back on their feet with minimal financial hardship and can also aid businesses in getting back open to avoid potential financial ruin.

Table F-38 shows historically the number of flood insurance policies in the A, AE, AH and AO-Zones, the number of Standard X-Zone policies in AR, A99-Zones, and the number of Preferred Risk Policies in the

B, C or X-Zones. The table also shows the average number of flood insurance policies by flood zone from August 2008 through March of 2012.

Table F-38 Flood Insurance Policies in Sacramento by Zone and Year

Year	Zone A, AE, AH, AO	Zone AR, A99*	Zone B, C, X**	Total
Aug 2008	737	12,360	30,050	43,147
May 2009	1,318	16,984	30,107	48,409
Aug 2009	924	30,974	19,459	51,357
May 2010	1,047	15,091	33,434	49,572
Sept 2010	1,106	15,372	32,722	49,200
Jan 2011	708	4,656	40, 637	46,001
Mar 2012	791	10,676	36,459	47,926
Oct 2013	571	8,020	36,045	44,636
April 2015	372	13,350	28,245	41,967
Jan 2016	360	22,170	21,407	43,937
Average	**793**	**14,965**	**26,793**	**46,615**

Source: 2016 City of Sacramento Comprehensive Flood Management Plan * Standard X-Zone Policies ** Preferred Risk Policies

Table F-39 indicates that as of August 17, 2021, the City of Sacramento had 42,815 active flood insurance policies in force with total premiums of more than $21 million. These active polices represent more than $14 billion of insurance in place covering both structure and contents. Historically, the City has had 1,833 claims paid against the NFIP totaling $9.4 million in paid losses.

Table F-39 Flood Insurance Policies by Occupancy (Data as of 08/17/2021)

Property Type	Policies in Force	Premium + Policy Fee	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses
Single Family	36,873	$16,746,904	$12,536,393,399	1,569	$6,807,632
2-4 Family	1,103	$518,059	$333,830,900	118	$512,850
All Other Residential	3,833	$1,757,938	$1,186,921	48	$381,646
Non Residential	1,006	$2,031,060	$536,367,500	98	$1,741,966
Total	**42,815**	**$21,053,961**	**$13,407,778,720**	**1,833**	**$9,444,094**

Source: 2016 City of Sacramento Comprehensive Flood Management Plan – data updated by Sacramento DOU on 8/17/2021

Table F-40 presents the number of insurance policies in force, as of January 1, 2016, by occupancy type in relation to condominiums.

Table F-40 Flood Insurance Policies by Occupancy (Data as of 01/31/2016)

Property Type	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
Condo	3,391	$1,332,563	$733,995,500	28	$210,664.78	$11,403.89
Non Condo	40,546	$19,401,491	$13,621,083,000	939	$9,695,643.20	$423,963.56
Total	**43,937**	**$20,734,054**	**$14,355,078,500**	**967**	**$9,906,307.00**	**$435,366.00**

Source: 2016 City of Sacramento Comprehensive Flood Management Plan

Table F-41 indicates the number of flood insurance policies by flood zone as of January 31, 2016. The total number of flood insurance policies in the A, AE, AH and AO-zones decreased by 12 from 372 in April 2015 to 360 in January of 2016. The number of flood insurance policies in the A99, AR, and Standard X increased from 13,350 in April of 2015 to 22,170 in January of 2016. The total number of flood insurance policies dropped in the B, C and X-zones from 28,245 to 21,407, a net decrease of 6,838 policies or 24.2%. The total number of flood insurance policies in the City decreased from 2015 to 2016. In April 2015, the City had 41,967 flood insurance policies in force and in January of 2016 the total policies in force increased to 43,937 or 4.69%.

Table F-41 Flood Insurance Policies by Flood Zone (Data as of 01/31/2016)

Property Type	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
A01-30 & AE Zones	209	$300,475	$46,734,900	37	$465,140.87	$18,539.98
A Zones	9	$20,500	$2,736,500	21	$239,984.28	$9,972.87
AO Zones	43	$29,374	$9,776,600	16	$255,574.76	$7,775.00
AH Zones	99	$77,150	$21,666,400	14	$186,562.71	$6,975.00
AR Zones	152	$161,180	$35,614,900	15	$376,173.26	$14,557.02
A99 Zones	1,641	$1,556,635	$350,476,700	715	$6,265,285.28	$300,944.93
B, C & X Zones						
Standard	20,377	$9,610,229	$6,700,808,500	115	$1,764,167.91	$55,762.65
Preferred	21,407	$8,978,511	$12,122,796,000	27	$324,467.81	$17,800.00
Total	**43,937**	**$20,734,054**	**$14,355,078,500**	**960**	**$9,854,918.00**	**$432,324.00**

Source: 2016 City of Sacramento Comprehensive Flood Management Plan

As of January 31, 2016, the City of Sacramento had 14,768 pre-FIRM flood insurance policies in force as shown in Table F-42 These pre-FIRM policies in the AE, A, and AH zones have the potential to be affected by rate increases through the Biggert-Waters Flood Insurance Reform Act of 2012 and the Homeowner's Flood Insurance Affordability Act of 2014. The City does not have any AO or AR zone currently.

Table F-42 Pre-FIRM Flood Insurance Policies by Zone (Data as of 01/31/2016)

Property Use	Policies in Force	Premium	Insurance in Force	# of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
A01-30 & AE Zones	147	$249,203	$26,677,500	30	$413,959.08	$15,789.98
A Zones	7	$19,313	$1,986,500	20	$235,967.81	$9,622.87
AO Zones	31	$21,214	$7,075,900	7	$24,882.14	$2,300.00
AH Zones	58	$47,395	$11,846,600	3	$19,019.64	$1,275.00
AR Zones	66	$73,591	$14,424,200	11	$369,349.34	$13,802.02
A99 Zones	658	$670,171	$139,093,600	500	$3,298,247.38	$193,500.69
B, C & X Zones	13,801	$5,714,882	$4,561,985,200	111	$1,691,090.71	$58,807.65
Standard	1,582	$831,287	$494,537,200	91	$1,492,497.04	$45,252.65
Preferred	12,219	$4,883,595	$4,766,089,500	20	$198,116.67	$13,555.00
Total	**14,768**	**$6,795,769**	**$4,766,089,500**	**681**	**$6,052,243.00**	**$294,375.00**

Source: 2016 City of Sacramento Comprehensive Flood Management Plan

Table F-43 shows there were 42,815 post-FIRM flood insurance policies as of August 17, 2021.

Table F-43 Post-FIRM Flood Insurance Policies by Zone (Data as of 08/17/2021)

Flood Zone	Policies in Force		Premium + Policy Fee		Total Coverage Amount		# of Closed Paid Losses		$ of Closed Paid Losses	
	Res.*	Non-Res. & Business	Res.*	Non-Res. & Business	Res.*	Non-Res. & Business	Res.*	Non-Res. & Business	Res.*	Non-Res. & Business
A01-30 & AE Zones	39	15	$24,520	$21,059	$8,985,600	$7,963,700	40	10	$465,453	$38,138
A Zones	1	0	$943	$0	$350,000	$0	30	1	$228,659	$0
AO Zones	10	0	$2,579	$0	$2,503,800	$0	23	0	$126,205	$0
AH Zones	119	6	$80,059	$3,893	$27,809,300	$2,503,800	29	0	$186,563	$0
AR Zones	1	0	$1,659	$0	$300,000	$0	29	4	$74,477	$305,787
A99 Zones	26,400	576	$11,830,574	$1,021,252	$9,055,205,600	$278,387,400	1310	67	$4,640,365	$1,286,096
B, C & X Zones	15,239	409	$7,082,567	$984,856	$4,961,991,200	$247,062,800	274	16	$1,980,405	$111,944
Total	**41,809**	**1,006**	**$19,022,901**	**$2,031,060**	**$14,057,145,500**	**$536,367,500**	**1735**	**98**	**$7,702,127**	**$1,741,965**

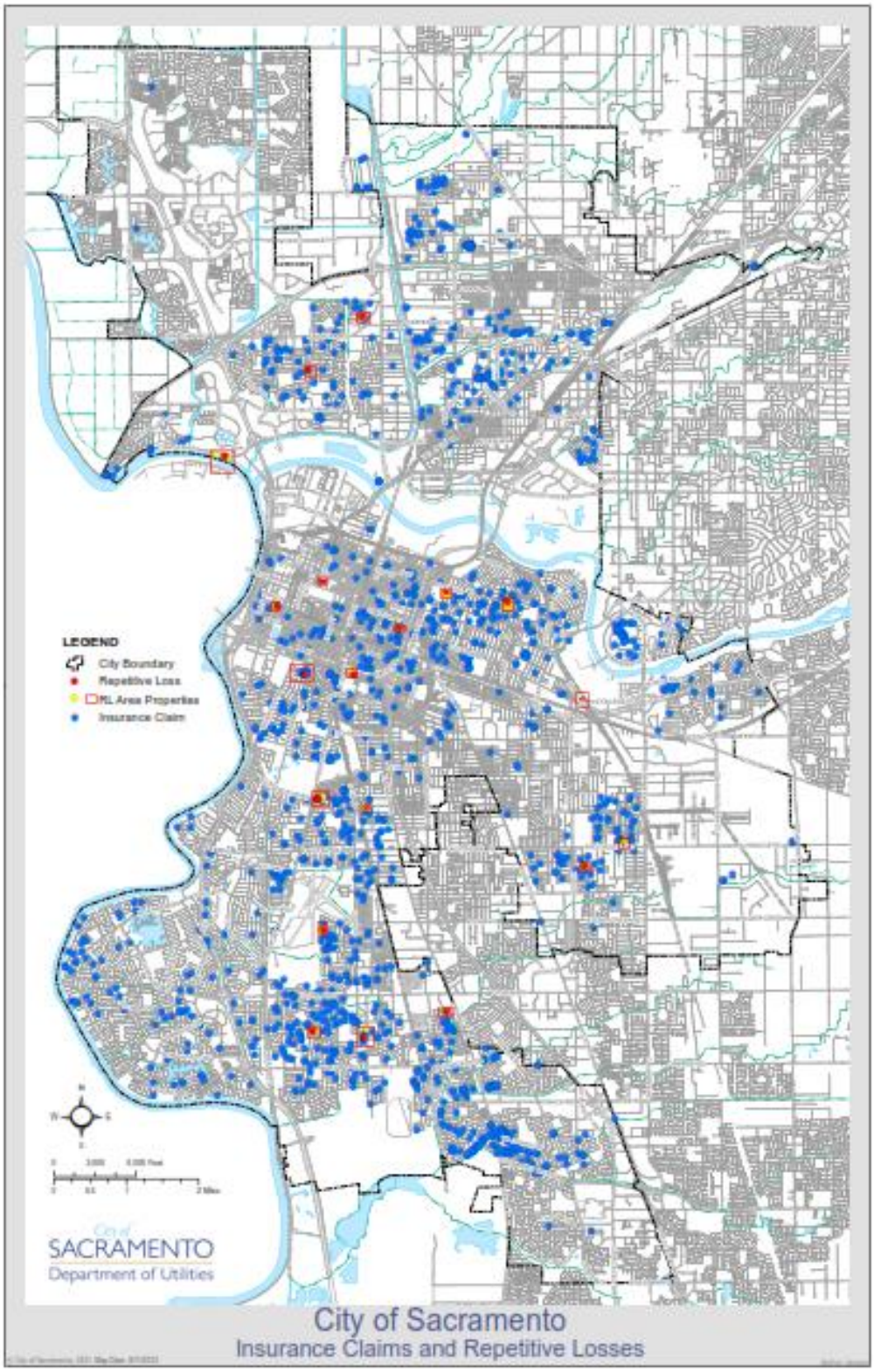
Source: 2016 City of Sacramento Comprehensive Flood Management Plan, updated by Sacramento DOU on 8/17/2021

Many factors change the number of flood insurance policies in the City. In 2015, the City saw a drop in the number of A99 policies in Pre-FIRM and Post-FIRM policies because over 3,000 residents were removed from the A99 Zone on May 12, 2014 in South Sacramento. Hopefully, the City will see an increase in PRP policies as residents convert in this area over the next few years. On another note, Natomas was remapped from an AE to A99 zone in June 2015, so the City expects to see an increase in A99 policies in the first part of 2016. Also, the numbers may conflict in the table above because Natomas residents have been in multiple subsidized programs since 2008 – Preferred Risk Policy Eligibility Extension and Properties Newly Mapped. Also, the numbers may conflict in the table above because the Natomas Basin was remapped from X to AE zone in 2008 and from AE to A99 zone in 2015 and has been in multiple subsidized programs since 2008 - Preferred Risk Policy Eligibility Extension, Properties Newly Mapped, and now PRP.

Repetitive Loss Analysis

The RL properties are located throughout the City. Repetitive flooding is generally a result of a combination of poor drainage and homes below the street elevation. Drainage improvements in the area have alleviated some of the flooding issues to these RL structures over the years. Citizens are required to have flood insurance in an A zone if they have a federally backed mortgage. Unmitigated repetitive loss properties are shown in Figure F-43 and detailed in Table F-44. A detailed repetitive loss area analyses of the City's repetitive loss properties is located in the City's Comprehensive Flood Management Plan (CFMP). The following provides additional information on RL properties in the City from the CFMP.

Figure F-43 Unmitigated Repetitive Loss Areas



Source: City of Sacramento, 2016 Comprehensive Flood Management Plan

Table F-44 Repetitive Loss Property Information (as of 2009)

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
14th St	01/10/1995 09/19/2004	$4,402.03 $1,582.67	$0.00 $0.00	X(s)	Investigated in 2008. Flooding from backed up combined system. Water came up to top step and flooded the resident's garage and basement.	Combined system	–
20th Av	01/10/1995 02/07/1996 01/22/1997	$10,792.02 $1,530.54 $21,271.07	$0.00 $0.00 $0.00	X(s)	These three addresses are individual structures within the same apartment complex, but on 3 separate flood policies. Property in low lying area with an undersized drainage conveyance system. Combined mailing	Leonardo Divinci basin was constucted in 2008 in Basin 26, but it is too far away from these properties to have a significant impact. Future projects with Land Park have been verbally discussed.	–
20th Av	01/10/1995 01/22/1997	$11,657.56 $20,903.32	$0.00 $0.00	–	–	–	–
20th Av	01/10/1995 01/22/1997	$5,169.30 $16,734.55	$0.00 $0.00	–	–	–	–
20th Av	03/25/1989 01/12/1990 01/13/1993 01/09/1995 02/20/1996 01/22/1997	$423(B/C?) $1,228(B/C?) $5,052.24 $7,566.43 $2,575.04 $7,838.39	$0.00 $0.00 $0.00 $0.00 $0.00 $0.00	X(s)	Property in low lying area with an undersized drainage conveyance system.	Drainage study is being conducted to determine a location for a drainage basin to reduce the flooding in the area.	–

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
21st St	01/10/95 01/26/97 9/19/2004	$24,938.03 $9,441.28 $26,963.58	$0.00 $0.00 $0.00	X(s)	Property located in the Combined Sewer System with an undersized drainage conveyance system.	Combined sewer main in the area was increased from a 12" to a 24" main in late 1997.	Flood Protection Provided - Reported 2007. Documentation provided to FEMA in August 2009.
21st Av	01/10/1995 03/11/1995	$2,878.36 $5,161.85	$0.00 $0.00	X(s)	According to owner structure has never flooded. Owner has installed a sump pump in a low area in the backyard to drain storm water away from residence in the rear.	Need pictures of sump pump	Flood Protection Provided - Reported 2007
24th St	02/23/2000 12/31/2005	$7,707.72 $80,632.86	$0.00 $0.00	X(s)	Property has been assessed using Lidar data and flooding source has been found.	In process.	In process.
36th St	01/09/95 01/22/97	$1,157.89 $1,926.32	$0.00 $0.00	X	Property located in the Combined Sewer System. Flooding caused by clogged storm drains and street flooding in the area.	Older street drain inlet in front of property replaced with current larger standard drain inlet as part of the McKinley sewer construction project in 2006 .	Flood Protection Provided - Reported 2007. Documentation provided to FEMA in August 2009.
37th Av	01/10/1995 01/22/1997 12/31/2005	$2,167.18 $1,670.55 $5,291.95	$1,850.00 $0.00 $0.00	X(s)	Flooding from adjacent vacant lot behind property.	Basin 96 Master Plan and pipe upsizing completed. A detention basin is still needed.	–

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
45th St	04/08/95 02/04/98	$4,411.79 $4,159.33	$0.00 $0.00	X	Property in low lying area of Basin 10 with an undersized drainage conveyance system	Basin 10 Drainage Master Plan completed. Currently determining projects to reduce flooding in the area.	–
48th Av	01/25/1997 12/23/2004	$15,391.57 $10,672.22	$0.00 $0.00	X(s)	Property has a drain in front, but is elevated way above the street. Looks like a partial new roof.	Flood source has been determined. Drainage improvements are being assessed.	–
68th Av	01/10/95 02/26/00	$4,164.52 $2,814.97	$0.00 $0.00	X(s)	Flood sources has been recently identified.	Drainage basin is currently being studied to develop a plan to reduce flooding in the area.	–
Alcedo Cr	01/10/95 01/27/95	$1,911.80 $5,661.33	$0.00 $0.00	X	Source of flooding is unknown. Lowest floor of the structure appears to be higher than adjacent structures that have not flooded.	Need to investigate further.	–
Arabella Wy	03/23/1995 01/04/1997	$3,556.23 $3,634.90	$0.00 $0.00	X(s)	Property adjacent to the Sac. River levee. Flooding of house from levee seepage.	USACE & SAFCA did levee work in this area. The work was completed at the end of 2006.	Flood Protection Provided - Reported 2007. Documentation provided in 2009.

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
Berthoud St	01/13/93 01/10/95	$1,465.21 $7,777.06	$0.00 $480.55	X(s)	Higher adjacent lot was draining onto subject property.	Drainage ditch was constructed on adjacent lot to divert drainage to Norwood Avenue. Older street drain inlets replaced with current larger standard drain inlets. SEE 1996 MEMO. School was built across the street.	Flood Protection Provided - Reported 2007 - Report in 2011 that ditch was built for this house and 329.
Berthoud St	1/13/93 1/9/95	$2,583.22 $5,278.40	$0.00 $0.00	X(s)	Higher adjacent lot was draining onto subject property.	Berthoud Street Drainage Extension was completed in 2005. Stormwater diversion pipeline basin was installed.	Flood Protection Provided - Reported 2007. Documentation provided to FEMA in August 2009.
Binghamton Dr	1/10/1995 1/24/2010	$3,177.02 $2,590.42	$0.00 $0.00	X(s)	Water seeps through landscaping into sunken living room and gets the carpet wet.	Need to elevate living room.	–
E Curtis Dr	01/10/1995 01/26/1997	$17,370.04 $2,663.91	$0.00 $595.40	X(s)	Basement flooding. Flooding caused by clogged storm drains and street flooding in the area.	Older street drain inlet in front of property replaced with current larger standard drain inlet. Very low spot - Sump 4 pumps this ara in a circle. Once the Curtis Park Regional Storage Project is constructed, this property can be taken out.	Flood Protection Provided - Reported 2007, but documentation not submitted in 2009.

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
Custis Av	01/10/1995 01/22/1997	$1,261.74 $8,058.51	01/10/1995 01/22/1997	X(s)	Lot lower than adjacent lots. Drainage from adjacent lots was going into garage which was converted to living quarters.	Garage portion of structure will be raised with HUD Grant funds. Elevation of structure expected to completed in November 2001.	Flood Protection Provided - Reported 2007. Documentation provided to FEMA in August 2009.
Elvas Av	02/18/1986 06/04/1993 01/22/1997	$13,179.30 $12,556.61 $38,718.83	02/18/1986 06/04/1993 01/22/1997	X(s)	These three addresses are individual structures within the same apartment complex, but on 3 separate flood policies. Property in low lying area with an undersized drainage conveyance system. Combined mailing	Leonardo Divinci basin was constucted in 2008 in Basin 26, but it is too far away from these properties to have a significant impact. Future projects with Land Park have been verbally discussed.	–
Folsom Blvd	01/04/1998 01/15/1990	–	01/04/1998 01/15/1990		–	–	–
Folsom Blvd Unit 9c	02/12/2000 09/19/2004	–	02/12/2000 09/19/2004		–	–	–
Frienza Av	01/04/82 01/13/83	$1,002.46 $3,594.28	01/04/82 01/13/83	X(s)	Property in low lying area with an undersized drainage conveyance system.	Drainage study is being conducted to determine a location for a drainage basin to reduce the flooding in the area.	–

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
Garden Hwy	01/09/95 01/01/97	$6,100.00 $7,594.96	01/09/95 01/01/97	X(s)	Property located in an area with an undersized drainage conveyance system.	Drain pipe in the area was increased from a 12" to a 24" main in late 1997.	Flood Protection Provided - Reported 2007. Documentation provided to FEMA in August 2009.
Henrietta Dr	01/12/1993 01/10/1995 01/25/1997	$8,660.85 $6,272.51 $3,292.51	$0.00 $0.00 $0.00	X(s)	According to owner structure has never flooded. Owner has installed a sump pump in a low area in the backyard to drain storm water away from residence in the rear.	Need pictures of sump pump	Flood Protection Provided - Reported 2007
Henrietta Dr	01/10/1995 01/22/1997	$19,725.94 $13,741.60	$0.00 $0.00	X(s)	Need to investigate!	–	–
K St, Suite 1517	01/09/1995 01/01/1997	$5,195.74 $9,535.42	$0.00 $0.00	X	Property located in the Combined Sewer System. Flooding caused by clogged storm drains and street flooding in the area.	Older street drain inlet in front of property replaced with current larger standard drain inlet as part of the McKinley sewer construction project in 2006 .	Flood Protection Provided - Reported 2007. Documentation provided to FEMA in August 2009.
Johns Dr	01/13/1993 01/11/1995 01/03/1997	$2,489.90 $1,977.43 $2,427.86	$0.00 $0.00 $0.00	X(s)	Flooding from adjacent vacant lot behind property.	Basin 96 Master Plan and pipe upsizing completed. A detention basin is still needed.	–
La Almendra Wy (Srl)	01/10/1995 01/27/1997	$29,693.68 $48,733.49	$0.00 $0.00	X	Property in low lying area of Basin 10 with an undersized drainage conveyance system	Basin 10 Drainage Master Plan completed. Currently determining projects to reduce flooding in the area.	–

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
La Almendra Wy	01/10/1995 01/22/1997	$29,662.06 $26,811.07	$0.00 $22,679.58	X(s)	Property has a drain in front, but is elevated way above the street. Looks like a partial new roof.	Need to investigated flood source further	–
Las Palmas Av (Srl)	01/13/93 01/20/93 01/09/95 01/22/97 02/06/98 01/24/00	$1,336.55 $8,891.96 $28,803.57 $19,291.63 $10,068.13 $4,898.80	$0 $1,776.88 $5,637.45 $11,972.96 $2,750.00 $0	X(s)	Source of flooding is unknown. Property is on the highest portion of the street. No reported flooding of adjacent properties which are lower.	Drainage basin is currently being studied to develop a plan to reduce flooding in the area.	–
Las Palmas Av	01/09/95 01/26/97	$11,395.87 $7,497.82	$0.00 $0.00	A99	Source of flooding is unknown. Lowest floor of the structure appears to be higher than adjacent structures that have not flooded.	Need to investigate further.	–
Manacor Dr	12/28/1996 01/28/1997 12/30/2005	$2,198.26 $2,581.42 $2,606.40	$0.00 $0.00 $1,985.00	X(s)	Property adjacent to the Sac. River levee. Flooding of house from levee seepage.	USACE & SAFCA did levee work in this area. The work was completed at the end of 2006.	Flood Protection Provided - Reported 2007. Documentation provided in 2009.

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
N St	01/10/1995 01/25/1997 09/19/2004	$5,588.09 $1,344.59 $8,884.87	$0.00 $0.00 $0.00	X(s)	Higher adjacent lot was draining onto subject property.	Drainage ditch was constructed on adjacent lot to divert drainage to Norwood Avenue. Older street drain inlets replaced with current larger standard drain inlets. SEE 1996 MEMO. School was built across the street.	Flood Protection Provided - Reported 2007 - Report in 2011 that ditch was built for this house and 329.
N St	01/09/1995 09/19/2004	$3,302.60 $8,948.96	$0.00 $0.00	X(s)	Higher adjacent lot was draining onto subject property.	Berthoud Street Drainage Extension was completed in 2005. Stormwater diversion pipeline basin was installed.	Flood Protection Provided - Reported 2007. Documentation provided to FEMA in August 2009.
Norwood Av	1/10/1995 1/22/1997 2/2/1998	$10,000.76 $4,440.26 $2,951.82	$0.00 $1,528.55 $246.50	X(s)	Water seeps through landscaping into sunken living room and gets the carpet wet.	Need to elevate living room.	–
Oak Nob Wy	01/05/97 02/04/98	$8,005.41 $3,797.03	$0.00 $2,030.00	X(s)	Basement flooding. Flooding caused by clogged storm drains and street flooding in the area.	Older street drain inlet in front of property replaced with current larger standard drain inlet. Very low spot - Sump 4 pumps this ara in a circle. Once the Curtis Park Regional Storage Project is constructed, this property can be taken out.	Flood Protection Provided - Reported 2007, but documentation not submitted in 2009.

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
Ortega St	01/14/1995 01/25/1997	$1,321.05 $1,692.08	$0.00 $0.00	X(s)	Lot lower than adjacent lots. Drainage from adjacent lots was going into garage which was converted to living quarters.	Garage portion of structure will be raised with HUD Grant funds. Elevation of structure expected to completed in November 2001.	Flood Protection Provided - Reported 2007. Documentation provided to FEMA in August 2009.
Ortega St	01/09/95 01/25/97	$3,485.33 $5,333.80	$0.00 $0.00	X(s)	These three addresses are individual structures within the same apartment complex, but on 3 separate flood policies. Property in low lying area with an undersized drainage conveyance system. Combined mailing	Leonardo Divinci basin was constucted in 2008 in Basin 26, but it is too far away from these properties to have a significant impact. Future projects with Land Park have been verbally discussed.	–
Park Wy	01/10/1995 12/21/1996 01/22/1997	$2,186.10 $2,195.02 $13,779.28	$0.00 $0.00 $0.00		–	–	–
Priscilla Ln	03/02/95 01/25/97 09/19/2004	$0.00 $903.00 $5,716.00	40,161.00 9,474.00 26,909.64		–	–	–
Q St	1/10/1995 1/22/97			X(s)	Property in low lying area with an undersized drainage conveyance system.	Drainage study is being conducted to determine a location for a drainage basin to reduce the flooding in the area.	–

Street	Dates of Losses	Building Payment	Contents Payment	Flood Zone (2009)	Investigation of Flooding	Status of Drainage Improvements Provided to Reduce Flooding	Submitted to FEMA/ Changes Requested
Rio Linda Blvd	01/10/1995 01/22/1997	$2,186.10 $13,779.28	$0.00 $0.00	X(s)	Property located in an area with an undersized drainage conveyance system.	Drainage main in the area was increased from a 12" to a 24" main in late 1997.	Flood Protection Provided - Reported 2007. Documentation provided to FEMA in August 2009.
Ventura St	01/14/1995 01/25/1997	$1,321.05 $1,692.08	$0.00 $0.00	X(s)	According to owner structure has never flooded. Owner has installed a sump pump in a low area in the backyard to drain storm water away from residence in the rear.	Need pictures of sump pump	Flood Protection Provided - Reported 2007

Source: City of Sacramento

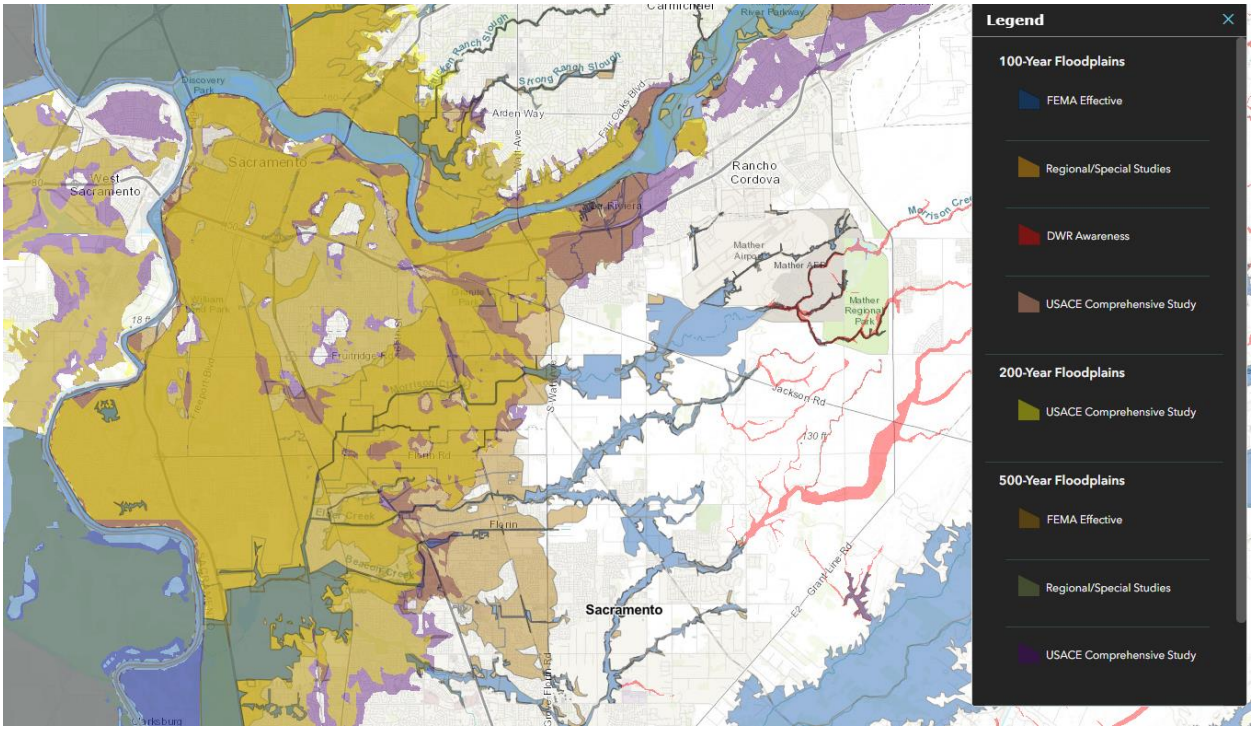
California Department of Water Resources Best Available Maps (BAM)

The FEMA regulatory maps provide just one perspective on flood risks in Sacramento County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Nevada-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-(as applicable), and 500-year event risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the City than that provided in the FEMA DFIRMs. The BAM map for Sacramento is shown in Figure F-44.

Figure F-44 City of Sacramento – Best Available Map



Source: California DWR

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1%r (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2% (2002 Sac and San Joaquin River Basins Comp Study).

Future Development

The potential for flooding may increase as floodwaters are channeled due to land development. Such changes can exacerbate flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning should be based on build out property use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the overall floodplain.

Future Development: General Considerations

Communities that participate in the NFIP adopt regulations and codes that govern development in special flood hazard areas, and enforce those requirements through their local floodplain management ordinances through the issuance of permits. The City of Sacramento's floodplain management ordinance provides standards for development, subdivision of land, construction of buildings, and improvements and repairs to buildings that meet or exceed the minimum requirements of the NFIP.

The International Residential Code (IRC) and International Building Code (IBC), by reference to ASCE 24, include requirements that govern the design and construction of buildings and structures in flood hazard

areas. FEMA has determined that the flood provisions of the I-Codes are consistent with the requirements of the NFIP (the I-Code requirements shown either meet or exceed NFIP requirements). ASCE 24, a design standard developed by the American Society of Civil Engineers, expands on the minimum NFIP requirements with more specificity, additional requirements, and some limitations.

With the adoption of the 2015 International Code, communities will be moving towards a more stringent approach to regulatory floodplain management. The adoption and enforcement of disaster-resistant building codes is a core community action to promote effective mitigation. When communities ensure that new buildings and infrastructure are designed and constructed in accordance with national building codes and construction standards, they significantly increase local resilience now and in the future. With continued advancements in building codes, local ordinances should be reviewed and updated to meet and exceed standards as practicable to protect new development from future flood events and to further promote disaster resiliency.

Master planning will also be necessary to assure that open channel flood flow conveyances serving the smaller internal streams and drainage areas are adequately prepared to accommodate the flows. Preservation and maintenance of natural and riparian areas should also be an ongoing priority to realize the flood control benefits of the natural and beneficial functions of these areas. Also to be considered in reducing flooding in areas of existing and future development is to promote implementation of stormwater program elements and erosion and sediment controls, including the clearing of vegetation from natural and man-made drains that are critical to flood protection. Both native and invasive species can clog drains, and reduce flows of floodwaters, which slow that natural drainage process and can exacerbate flooding.

One of the most effective ways to reduce vulnerability to potential flood damage is through careful land use planning that fully considers applicable flood management information and practices. California's 2007 flood legislation (Senate Bill 5) directly linked system-wide flood management planning to local land use planning, requiring local jurisdictions to demonstrate an urban level of flood protection before approving new development in urban and urbanizing areas. "Urban level of flood protection" means the level of protection necessary to withstand flooding that has a 1-in-200 chance of occurring in any given year (California Government Code Section 65007). DWR has been developing criteria to guide local jurisdiction compliance with the new requirements. In addition to developing criteria to help local jurisdictions in their land use planning, DWR is preparing criteria for use in the design of levees protecting urban and urbanizing areas. DWR is also working with local partners to develop guidance related to nonurban flood protection levels.

As of July 2, 2016 these standards became effective, and cities and counties within the Sacramento-San Joaquin Valley cannot enter into development agreements or issue a permit to construct a new structure in areas located within a flood hazard zone unless the following is established:

- Find that existing facilities protect urban and urbanizing areas to a 1-in 200 chance of flooding in any given year or the FEMA standard of flood protection in non-urbanized areas, or
- Find that the local flood management agency has made adequate progress on the construction of the flood protection system to provide the required level of protection, or
- Impose conditions on the development agreement that will provide the required level of protection.

City of Sacramento SB 5 Compliance

Senate Bills (SB) 5 and 17 and Assembly Bills (AB) 5, 70, 156, and 162 (Legislation) were signed into law in 2007 to address flood problems. As part of this Legislation, DWR was required to develop a Central Valley Flood Protection Plan (CVFPP). The CVFPP was adopted in 2012 and will be updated every 5 years. In 2012, SB1278 and AB1965 were enacted, revising provisions related to planning and zoning for flood protection.

The City will be required to make findings related to an urban level of flood protection (200-year) as stipulated in California Government Code Sections 65865.5, 65962, and 66474.5, using criteria consistent with, or developed by DWR. DWR has developed draft criteria, *Urban Level of Flood Protection* (ULOP) (November 2013).

The ULOP requires a minimum urban level of 200-year flood protection before a community can issue a building permit or approve a parcel map. This requirement affects areas in the Sacramento-San Joaquin Valley where flood depths are anticipated to exceed three feet and are in a watershed greater than 10 square miles for the 200-year flood event. If a ULOP plan is in place to reach 200-year flood protection and adequate progress is shown annually, then these requirements can be delayed until 2025. SAFCA will have a ULOP plan by the July deadline.

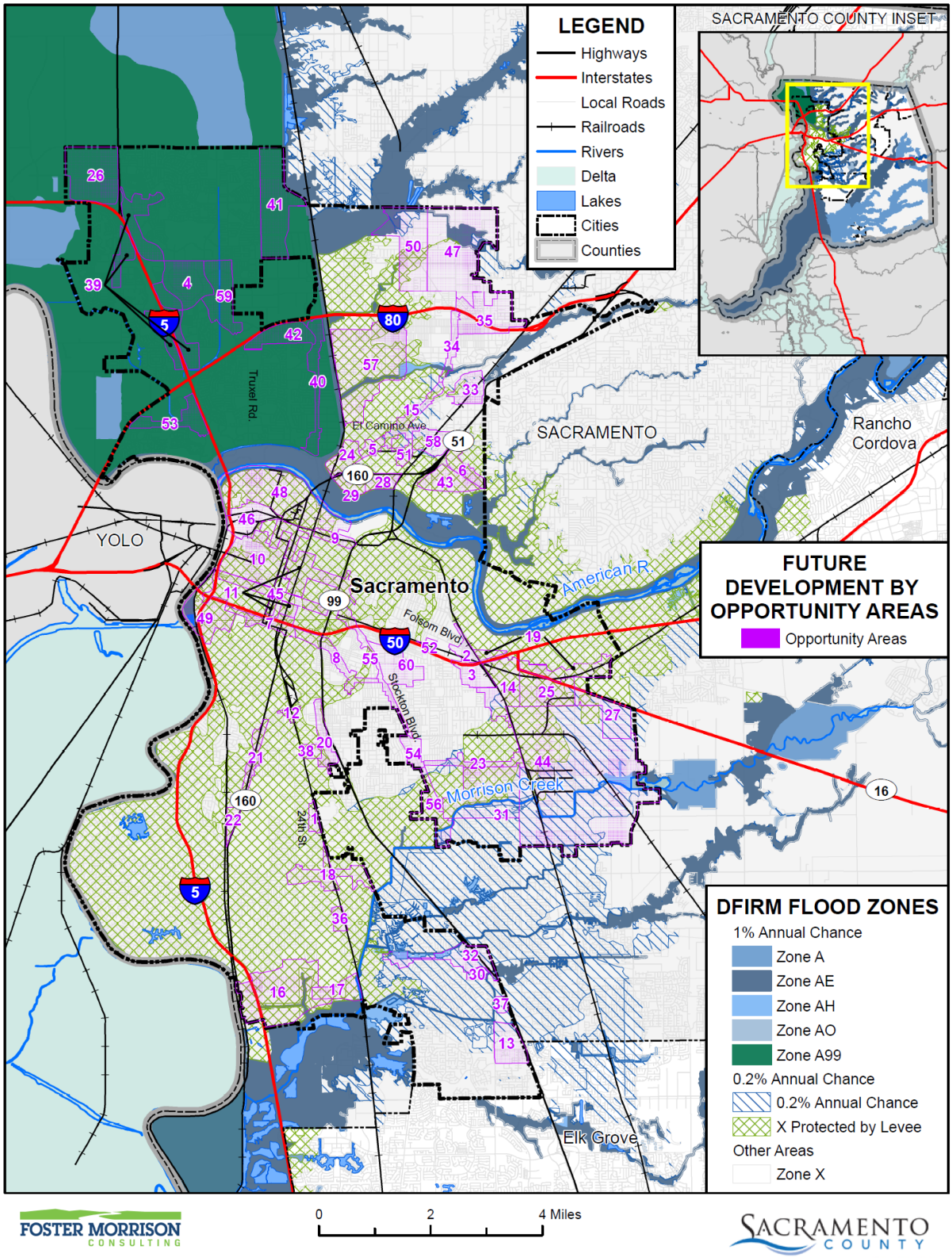
Many areas of the City that are in watersheds greater than 10 square miles and exceed three feet in depth will not be covered by the ULOP plan. The 200-year floodplain in these areas were mapped and will be utilized for development purposes.

The City enforces the floodplain ordinance. If any development is to occur in the FEMA 100-year flood hazard area or the 200-year flood hazard area not covered by the ULOP plan, it will have to conform to the elevation or floodproofing standards of the floodplain ordinance.

GIS Analysis

The City provided 60 Opportunity Areas as part of their Draft 2040 General Plan Land Use map which were used as the basis for the inventory of future development areas for the City. Utilizing the Opportunity Areas spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each area. Figure F-45 (with a legend shown on Figure F-46) shows the locations of the Opportunity Areas overlayed on the DFIRM flood zones. Table F-45 shows the parcels and acreages of each Opportunity Area in the City by DFIRM flood zones.

Figure F-45 City of Sacramento – Future Development Opportunity Areas and FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 11/2021.

Figure F-46 City of Sacramento – Future Development Opportunity Areas Legend

Table F-45 City of Sacramento – Future Development Opportunity Areas by FEMA DFIRM Flood Zones

Flood Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
1% Annual Chance Flood Hazard				
Arco Arena	18	7	11	55.13
Delta Shores Transit Center	1	0	1	11.50
Greenbriar	1	0	1	252.14
Mack	4	3	1	3.38
Marysville	5	5	0	2.04
North Natomas EC	65	25	40	576.83
Northgate	104	76	28	102.07
Panhandle	8	1	7	297.72
Parkebridge	18	8	10	138.48
Parkerbridge	1	0	1	0.46
Power Inn/Army Depot	4	3	1	20.21
Raley	4	0	4	36.72

Flood Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Robla	19	0	19	17.31
Southwest Natomas	25	10	15	68.21
Strawberry Manor	5	0	5	0.65
Truxel	40	26	14	87.59
1% Annual Chance Flood Hazard Total	**322**	**164**	**158**	**1,670.45**
0.2% Annual Chance Flood Hazard				
47th	25	11	14	12.65
Arden Fair	18	13	5	69.88
Arden/Del Paso	55	29	26	20.47
Broadway	71	49	22	15.53
Broadway East	88	42	46	14.91
C Street	13	5	8	31.14
CBD	47	27	20	24.84
Central City Corridors	381	258	123	66.00
City College	51	24	27	8.30
Cosumnes River	23	12	11	25.70
CSUS Village	74	38	36	134.84
Del Paso	84	54	30	30.58
Delta Shores	31	10	21	691.60
Delta Shores Transit Center	1	0	1	37.51
Florin	75	45	30	109.87
Folsom East	44	33	11	91.88
Franklin	24	14	10	12.21
Freeport North	50	43	7	24.99
Freeport South	20	12	8	28.91
Fruitridge	33	20	13	14.45
Globe LRT	89	39	50	46.27
Granite Park	26	9	17	82.67
Jackson	14	3	11	395.74
Johnston East	28	17	11	46.52
Johnston West	27	19	8	67.39
Kaiser Med Center	2	2	0	0.72
Lemon Hill	124	21	103	74.50
Mack	49	39	10	103.69

Flood Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Marconi	12	4	8	10.96
Marysville	10	4	6	2.56
Meadowview	6	0	6	11.31
Methodist Med Center	3	0	3	7.02
North City Farms	20	1	19	8.56
Point West	45	45	0	129.56
Power Inn/Army Depot	364	192	172	1,044.53
R Street Central City Housing	108	52	56	19.73
Railyards	27	4	23	4.03
Raley	6	1	5	55.52
Richards Boulevard	152	48	104	219.76
Riverfront	53	28	25	55.42
Robla	31	1	30	92.56
Royal Oaks	29	18	11	13.33
Stockton North	13	11	2	1.79
Stockton South	46	30	16	57.96
Strawberry Manor	241	70	171	167.34
Swanston Station	74	32	42	30.75
0.2% Annual Chance Flood Hazard Total	2,807	1,429	1,378	4,216.47
Other Areas				
65th North	31	19	12	18.43
65th South	9	7	2	17.68
Arden Fair	3	2	1	1.86
Broadway	3	3	0	0.80
Broadway East	52	21	31	9.05
C Street	2	0	2	2.51
CBD	52	32	20	8.83
Central City Corridors	16	14	2	2.70
City College	3	2	1	0.34
Cosumnes River	15	2	13	41.80
CSUS Village	9	4	5	24.94
Del Paso	14	6	8	3.09

Flood Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Franklin	80	49	31	26.51
Mack	3	0	3	5.62
Marconi	59	30	29	28.83
Marysville	71	25	46	20.65
McClellan Heights/Parker Homes	54	3	51	51.51
Power Inn/Army Depot	56	29	27	233.60
R Street Central City Housing	5	3	2	5.95
Railyards	3	0	3	24.76
Raley	173	47	126	484.00
Richards Boulevard	8	1	7	195.37
Riverfront	5	0	5	3.75
Robla	44	8	36	19.92
Stockton	35	24	11	55.54
Stockton North	75	42	33	21.23
Strawberry Manor	31	5	26	9.02
Swanston Station	33	23	10	20.39
UCD Med Center	117	2	115	5.38
Other Areas Total	**1,061**	**403**	**658**	**1,344.06**
Grand Total	4,190	1,996	2,194	7,230.98

Source: FEMA DFIRM 11/2/2018, City of Sacramento GIS

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The City of Sacramento is subject to localized flooding throughout the City. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the City vary by location. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the City tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

The City local drainage system services approximately 100 square miles and is handled by a combination of gravity and lift stations which a total of approximately some 140 storm drainage basins. Since the City is typically lower than the elevated rivers by as much as 5-25 feet, the majority of the local drainage must be pumped into the rivers. The City operates 94 sumps and pumps to keep the drainage pumped down. A major power outage within any of these basins can cause significant local flooding.

The City tracks localized flooding areas. The list below and Table F-46 identify known and past occurrences of such areas and the associated problems encountered. This list is an initial inventory of key problem areas and is not intended to be a complete inventory of all problems and locations associated with severe weather events and localized flooding in the City of Sacramento.

1. Sump (pump station) 157 screen. During rain events the north channel which empties into sump 157 conveys debris onto the screen which can reduce the pumping capacity of the station. The screen is monitored during rain events and cleaned as necessary.
2. Riza ditch near Stockton Boulevard and Riza Avenue. During rain events the screen on the culvert on the east side of Stockton Boulevard can become clogged with debris. The screen is monitored during rain events and cleaned as necessary.
3. Culvert at John Stiles ditch at Interstate 5 upstream of Sump 134. This culvert tends to clog during rain events. The culvert is monitored and cleaned as necessary.
4. Bypass pipe between Sumps 37 and 43 under Power Inn Road. Pipe tends to clog. Maintenance crews keep the pipe free and clear prior to rain events.
5. Inverted siphon under Fruitridge Road – Proctor and Gamble Ditch. Headwalls have been installed upstream and downstream of the inverted siphon, which allows crews to better service the siphon. During rain events the siphon is monitored and cleaned as necessary.
6. Sears ditch near Arden Way onramp to Business 80 freeway. This ditch terminates at a box culvert. The box culvert has a screen at the entrance to the culvert which tends to clog during first flush rain events. The screen is monitored and cleaned as necessary.
7. San Juan Road bridge. Screen on the south side of the bridge tends to clog during rain events. The screen is monitored during rain events and cleaned as necessary.
8. Sump 95 and 98. If these stations lose electrical power during rain events, the watershed tends to flood rapidly. Power to these stations is monitored during rain events and trailer mounted generators are available to provide backup power to these pump stations.
9. Sutterville Road at 24th Street. An 8-inch pipe in this area routinely plugs. Field crews check this pipe during storm events and provide the necessary maintenance to keep the pipe cleared.

10. Hagginwood ditch downstream of Arcade Boulevard near Acacia Avenue. This ditch has an ongoing trash problem and is difficult to clean. This ditch is monitored during rain events and cleaned as necessary.
11. Low lying area of the Valley Hi neighborhood
12. River Park neighborhood
13. Downtown Area – during rain events, the combined storm/sewer system can't handle all of the water causing a lot of street flooding
14. Florin Road and Meadowview Intersection
15. Sump 96 at Beach Lake Stables
16. Magpie Creek at Raley Blvd. A low lying area of Raley Blvd always fills up with water during rain events making it almost impossible to drive through.
17. Elvas Avenue & 65th Street near walking path to Sacramento State University
18. Sump 99 at McKinley Park in East Sacramento

Table F-46 City of Sacramento's Road List of Localized Flooding Problem Areas

Road Name	Flooding	Pavement Deterioration	Washout	High Water	Landslide/ Mudslide	Debris	Downed Trees
Stockton Boulevard at Riza Avenue	X						
Interstate 5 upstream of Sump 134	X						
Arden Way onramp to Business 80 freeway	X						
Sutterville Road at 24th Street	X						
Arcade Boulevard near Acacia Avenue	X						
Florin Road at Meadowview Blvd.	X						
Raley Blvd	X						
Power Inn Road at Fruitridge Blvd.	X						
Mack Road at Franklin Blvd.	X						

Source: City of Sacramento

Past Occurrences

The situation brought about by extremely heavy local rain storms could conceivably result in badly flooded streets and flooding of homes in some areas. It is probable that such situations would be brought about by a slow-moving high-intensity rainstorm over several hours reaching a peak intensity of ½" per hour later in the storm event. Any higher intensity storm event will cause localized flooding problems. An example is shown in Figure F-47.

Figure F-47 City of Sacramento – Localized Flooding at Anita Avenue and 23rd Street

Source: City of Sacramento Department of Utilities

The City noted the following past occurrences of localized flooding:

- **December 2012**: Severe rain for several days. The Department Operation Center (DOC) was activated for approximately a week due extreme weather forecasts.
- **2013**: Sewer system overflow incident. DOC activation was not required.
- **December 2014** – Media and reports claimed severe rain predicted for multiple days. DOC activated for several days.
- **March 2016** – DOC was on alert due to heavy rain projections. DOC activation was ultimately not required.
- **March 3- 10, 2016**: Projected winter storm affecting the Sacramento Valley – Almost activated, but storm fizzled out at the end
- **October 10 – 20, 2017**: Purple colored water detected in one neighborhood in North Sacramento. Activation was for one day on the 20th.
- **April 5 – 12, 2018**: Heavy rains predicted for a four day stretch and light rains continuing into the following week
- **January 16, 2019**: National Weather predicting a series of storms for three days straight with as much as ¼ of an inch to fall for one hour. Concerns over winds and high river levels.
- **February 26, 2019**: The National Weather Service is predicting an wet atmospheric river starting in the evening along with gusty winds. Rain totals for the Sacramento area is predicted of up to 6" by the

end of the fourth day. In addition, Folsom is releasing water which will created high levels in the creeks and rivers.

- **December 6 - 8, 2019**: Steady rain slowly creeping into Sacramento Monday and continuing through Thursday with only one dry day. Another system began with breezy conditions and heavier rains Friday and peaking on Sunday during the California International Marathon (CIM).

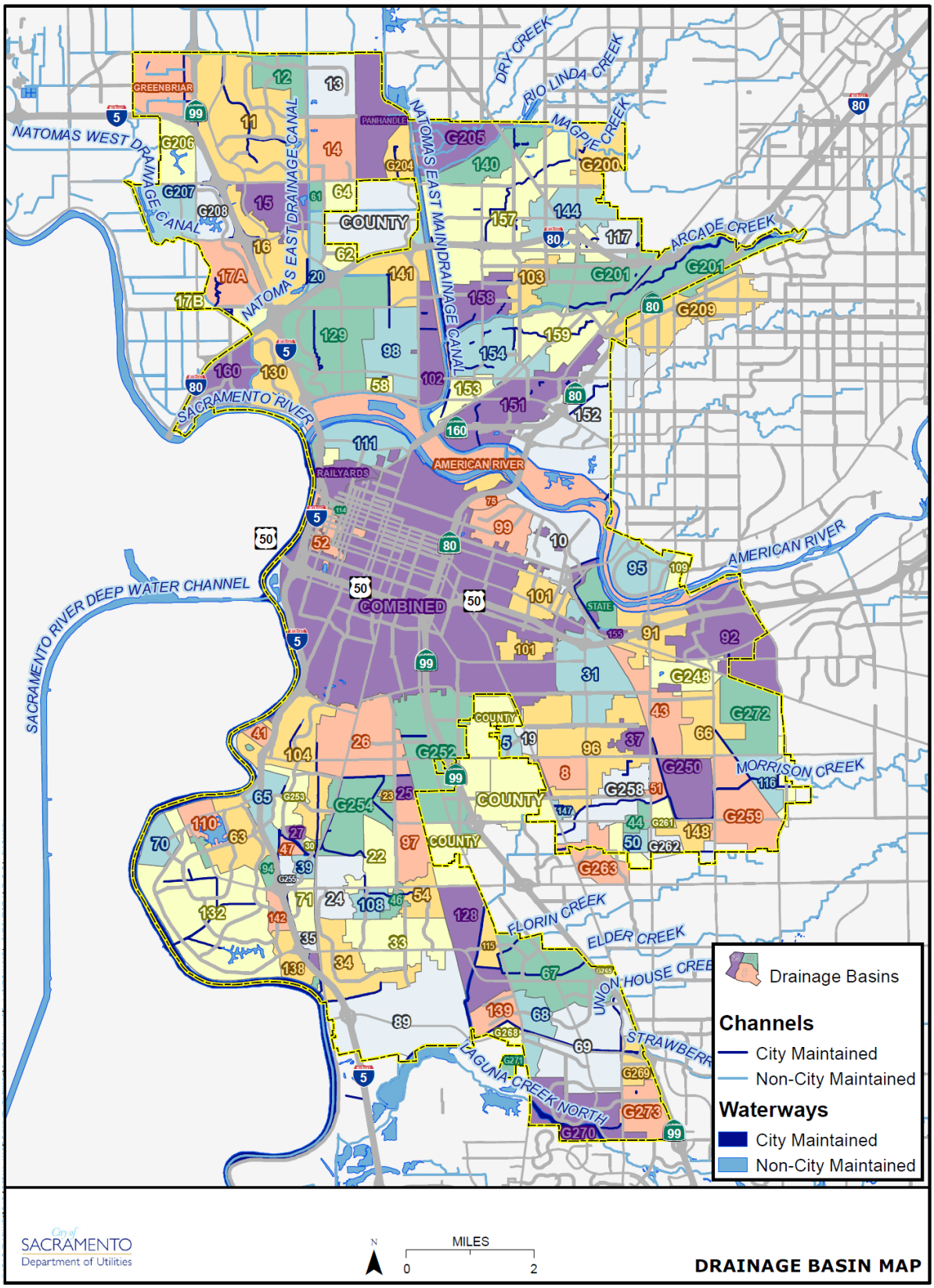
Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the City and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt critical services such as 9-1-1 communications. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Although levee failure may result in much more catastrophic damage than flooding from internal drainage, most of the City's flood damage since 1955 has resulted from drainage deficiencies. In 1995, for instance, approximately 100 homes in 4 south area drainage basins incurred flood damage due to internal drainage system failure during a particularly intense storm. The City has a total of 1,354 miles of storm drain pipes, 49,914 DIs, and 105 pump stations. The City's drainage basins are shown in Figure F-48. Much of this infrastructure was constructed before current storm drainage design guidelines were in place. In many areas, the system is sized based on outdated hydrology and does not have capacity to drain a 100-year storm event.

Figure F-48 City of Sacramento – Drainage Basins



Source: City of Sacramento Department of Utilities

Assets at Risk

Sewer and Drainage System Damage

In case of a major disaster, such as an earthquake or flood, the City of Sacramento's sewer collection system may be subject to many severe pipe failures. In the City's combined system, there may be complete pipe collapses, especially where the City's brick mains are located. Sewage pumping stations could and probably would be damaged at these locations. The Operations & Maintenance Division's sewer maintenance would close down and isolate areas where severely damaged pipes were located and bypass pumping would be implemented. Furthermore, this Division would have the responsibility of inspecting and evaluating the restoration of all sewers, sewer collections mains, and service laterals.

Energy Shortage

Should the City experience a shortage or shut-down of the fuel supply or electrical distribution system due to a flood, the Public Works Energy Emergency Coordinator will provide critical information and coordination. The Energy Coordinator will report to the Emergency Operations Center and provide information regarding critical City facilities in relation to function and auxiliary power.

Back-up generators at the pump stations are also available in case of a loss of power.

Future Development

Future development in the City will add more impervious surfaces causing an increase in stormwater runoff and the continued need to drain these waters. Future development in the City will add more impervious surfaces and need to drain those waters. The City will be proactive to ensure that increased development has proper siting and drainage for stormwaters. New development and redevelopment requirements have been approved to mitigate flooding, hydromodification and water quality issues. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding will reduce future risks of losses.

Levee Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main channel of a stream. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example,

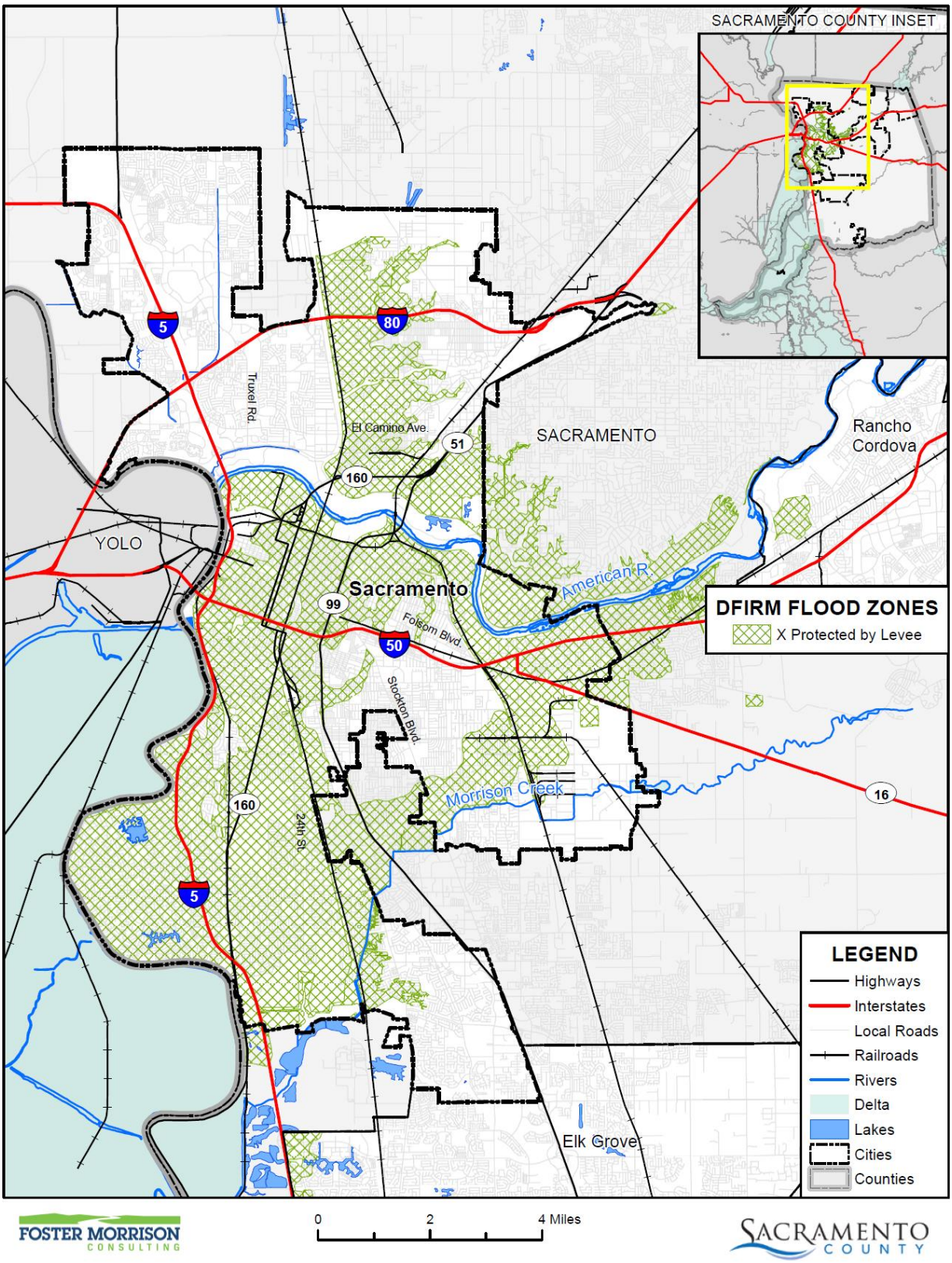
levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the City are not known. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. The HMPC noted that when northern California reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees.

Figure F-49 shows the FEMA DFIRM X Protected by Levee areas in the City. Geographical levee failure flood extent for the City from the FEMA DFIRMs is shown in Table F-47.

Figure F-49 City of Sacramento – DFIRM X Protected by Levee Areas



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table F-47 City of Sacramento – Geographical Levee Failure Extents

X Protected by Levee/ Jurisdiction	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
City of Sacramento	24,355	32.93%	16,745	34.80%	7,610	29.44%

Source: FEMA DFIRM 7/19/2018

*Percentage of total acres is the percent of total acres of the entire County Planning Area, not the total acres of the jurisdiction

Levee Status

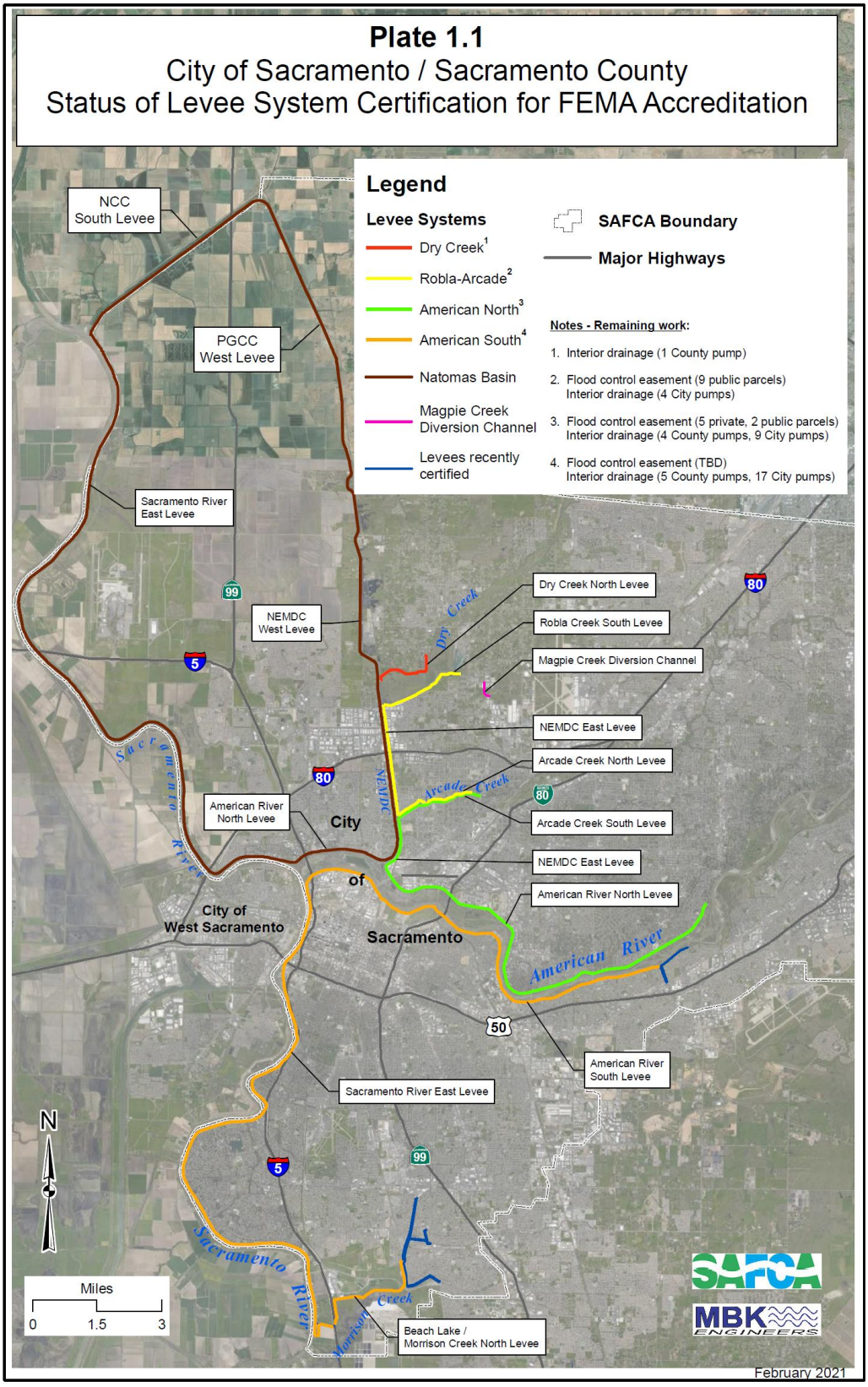
USACE expired the City's levee certifications in 2012 and 2013 because the certifications no longer met USACE's risk & uncertainty criteria and/or were older than 10 years. This is shown in Table F-48. Figure F-50 shows the City of Sacramento's current levee status.

Table F-48 USACE Levee Certification Expiration Dates Stream Reach Expiration Date

Stream	Reach	Expiration Date
Dry Creek	North levee	March 19, 2012
Robla Creek	South levee from approximately Sully Street to City border on the east	August 31, 2013
Robla Creek	South levee from junction with Natomas East Main Drainage Canal to approximately Sully Street	March 19, 2012
Arcade Creek	North and south levees	March 19, 2012
Natomas East Main Drainage Canal	East levee from junction with American River north levee to the pump station north of Dry Creek	March 19, 2012
American River	North and south levee (not including Natomas)	August 31, 2013
Sacramento River	Left bank levee from the junction with the American River to the southern City limits	August 31, 2013
Morrison Creek	Junction with Sacramento River to Unionhouse Creek Right bank from Unionhouse Creek to Brookfield Drive	August 31, 2013

Source: 2016 Comprehensive Flood Management Plan

Figure F-50 City of Sacramento Levee Status



Source: City of Sacramento Department of Utilities, MBK Engineers, SAFCA

In 2012, SAFCA along with the local communities and maintaining agencies, began developing a levee accreditation program to determine whether the levees protecting Sacramento along the lower American and Sacramento rivers and their tributaries (outside the Natomas Basin) adequately met the minimum requirements of the NFIP. The following projects need to be completed to accredit the levees:

Federal projects:

- Folsom Dam JFP
- Folsom Dam Raise
- American River Common Features WRDA 96/99
- South Sacramento Streams

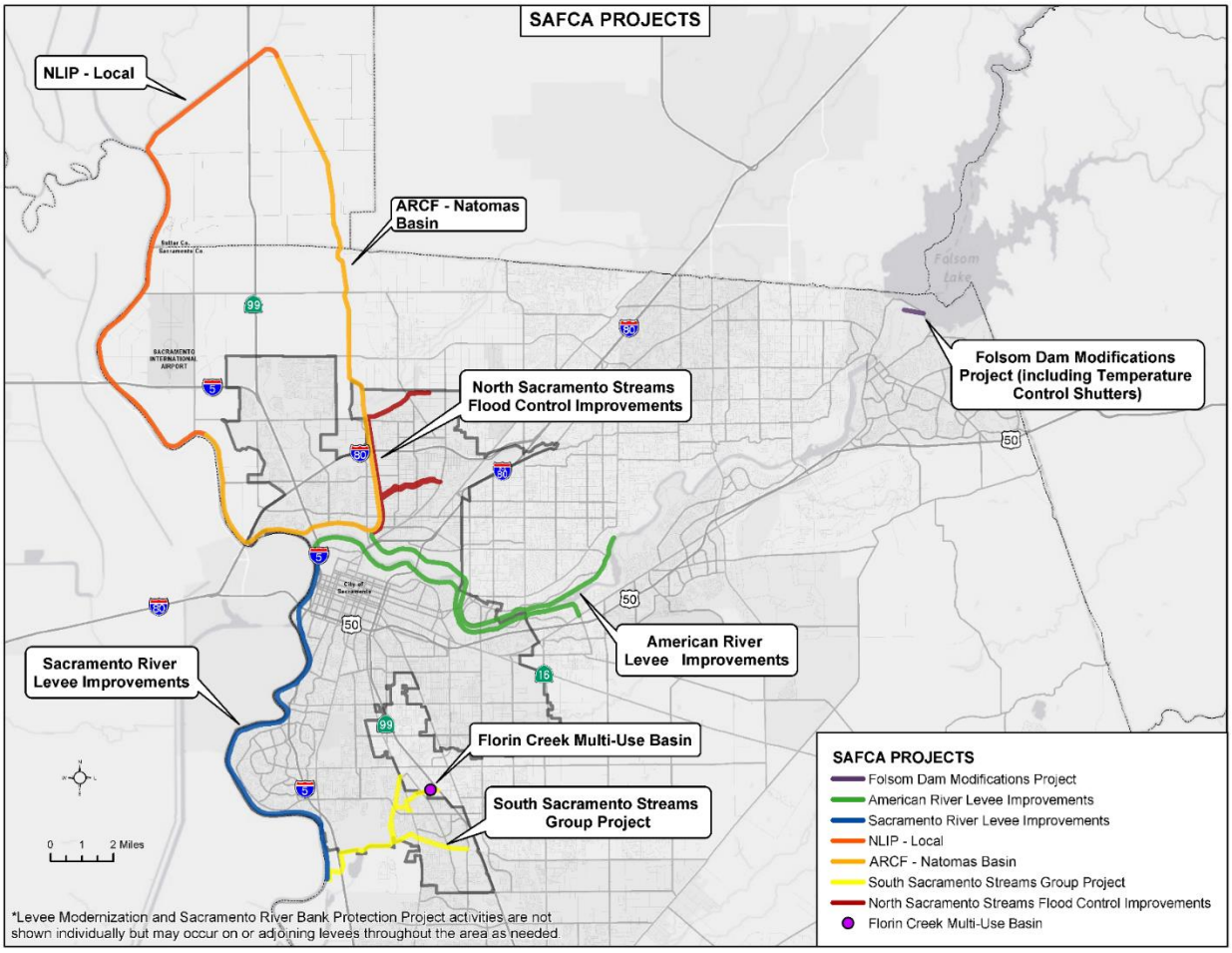
State and local projects:

- North Area Streams
- Sacramento River East Levee downstream of the American River
- Various high hazard encroachments/vegetation

The levees must also meet the State of California's Urban Levee Design Criteria (ULDC). The ULDC requires the city to address additional criteria including encroachments, vegetation, and access to the levees. It was decided that the levee deficiencies would be addressed in two phases – accreditation and modernization.

Figure F-51 shows areas that need to be addressed in the short term (5 to 7 years) to meet the NFIP accreditation and immediate ULDC requirements.

Figure F-51 City of Sacramento – Areas to be Addressed to Meet NFIP Accreditation and Immediate ULDC Requirements



Source: 2016 Comprehensive Flood Management Plan

Past Occurrences

There have been two state and two federal disaster declaration from levee failure. This can be seen in Table F-49.

Table F-49 Sacramento County – State and Federal Levee Failure Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Levee Break	2	1972, 1980	2	1972, 1980

Source: Cal OES, FEMA

The City Planning Team noted the following past occurrence of levee failures.

December 9, 1861 - American River Levee failed east of 30th street, flooding what is now known as River Park. The water then overran the City's levee built to protect it. To relieve the building water levels, the levee at R & 5th Streets was cut to drain the "lake" but houses were swept away in the current in the cut in the levee.

Figure F-52 January 1862 K Street Flooding

Source: Drainage and Flood Control, 152 Year.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Generally, levees fail due to overtopping or collapse. A catastrophic levee failure resulting from collapse probably will occur very quickly with relatively little warning. Such a failure would occur where the levee is saturated and the high hydrostatic water pressure on the river side, coupled with erosion of the levee from high water flows or an inherent defect in the levee that causes an almost instant collapse of a portion of the levee. Under such circumstances, structures located relatively near the break will suffer immediate and extensive damage. Several hundred yards away from the break the energy of the flood waters will be dispersed sufficiently to reduce, but not eliminate, flooding damage to structures in its path. The flood water will flow in a relatively shallow path toward any low point in the affected area. Flood water will collect in these low areas and the levels will rise as the flow continues. When the rivers are high, it is not possible to close or repair a levee break until the water surface in the river and the flooded area equalize.

Assets at Risk

Based on the vulnerability of Sacramento to the levee failure hazard, the sections that follow describes significant assets at risk in the City of Sacramento. This section includes the values at risk, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of levee failure flooding within the City of Sacramento. The methodology described in Section 4.3.14 of the Base Plan was followed in determining structures and values at risk to the levee failure flooding. Table F-50 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in FEMA X Protected by Levee flood zones in the City.

Table F-50 City of Sacramento – Count and Values of Parcels at Risk in X Protected by Levee Flood Zone and Property Use

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
X Protected by Levee						
Agricultural	2	0	$4,382	$0	$0	$4,382
Care/Health	95	82	$56,338,066	$948,186,157	$948,186,157	$1,952,710,380
Church/Welfare	286	236	$58,219,993	$245,515,904	$245,515,904	$549,251,801
Industrial	1,066	927	$340,988,541	$868,045,887	$1,302,068,816	$2,511,103,265
Miscellaneous	1,148	6	$2,219,040	$134,491	$134,491	$2,488,022
Office	1,307	1,043	$834,541,039	$3,568,339,668	$3,568,339,668	$7,971,220,375
Public/Utilities	401	1	$311,958	$31,233	$31,233	$374,424
Recreational	83	46	$45,215,017	$402,974,334	$402,974,334	$851,163,685
Residential	70,328	69,537	$6,561,266,974	$15,479,336,428	$7,739,668,041	$29,780,271,693
Retail/ Commercial	1,853	1,383	$774,751,530	$1,432,116,376	$1,432,116,376	$3,638,984,282
Unknown	1	0	$0	$0	$0	$0
Vacant	2,195	103	$440,694,133	$11,516,726	$0	$452,210,859
X Protected by Levee Total	**78,765**	**73,364**	**$9,114,550,673**	**$22,956,197,204**	**$15,639,035,020**	**$47,709,783,168**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table F-51 shows City of Sacramento levee failure flood loss estimates and improved values at risk by FEMA X Protected by Levee flood zones.

Table F-51 City of Sacramento – X Protected by Levee Flood Loss Estimates

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
X Protected by Levee	11,884	11,074	$3,120,723,923	$2,756,209,233	$5,876,933,156	$1,175,386,631	0.65%

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table F-51, the City of Sacramento has 11,074 parcels and $5.88 billion of structure and contents values or values in the X Protected by Levee flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.11 of the Base Plan, two feet of flooding would cause $1.18 billion in flood damages in the City.

Structures protected by levees that fail are often total losses. The analysis above assumes all levees in the City break at one time, which is unlikely. The extent and depth of actual flooding and associated damage will vary depending on the location, nature, depth, and extent of any levee break.

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the levee failure flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Sacramento – 2.76. According to this analysis, there is a total population of 813 residents of the City at risk to levee failure flooding. This is shown in Table F-35.

Table F-52 City of Sacramento – Count of Improved Residential Parcels and Population by Flood Zone

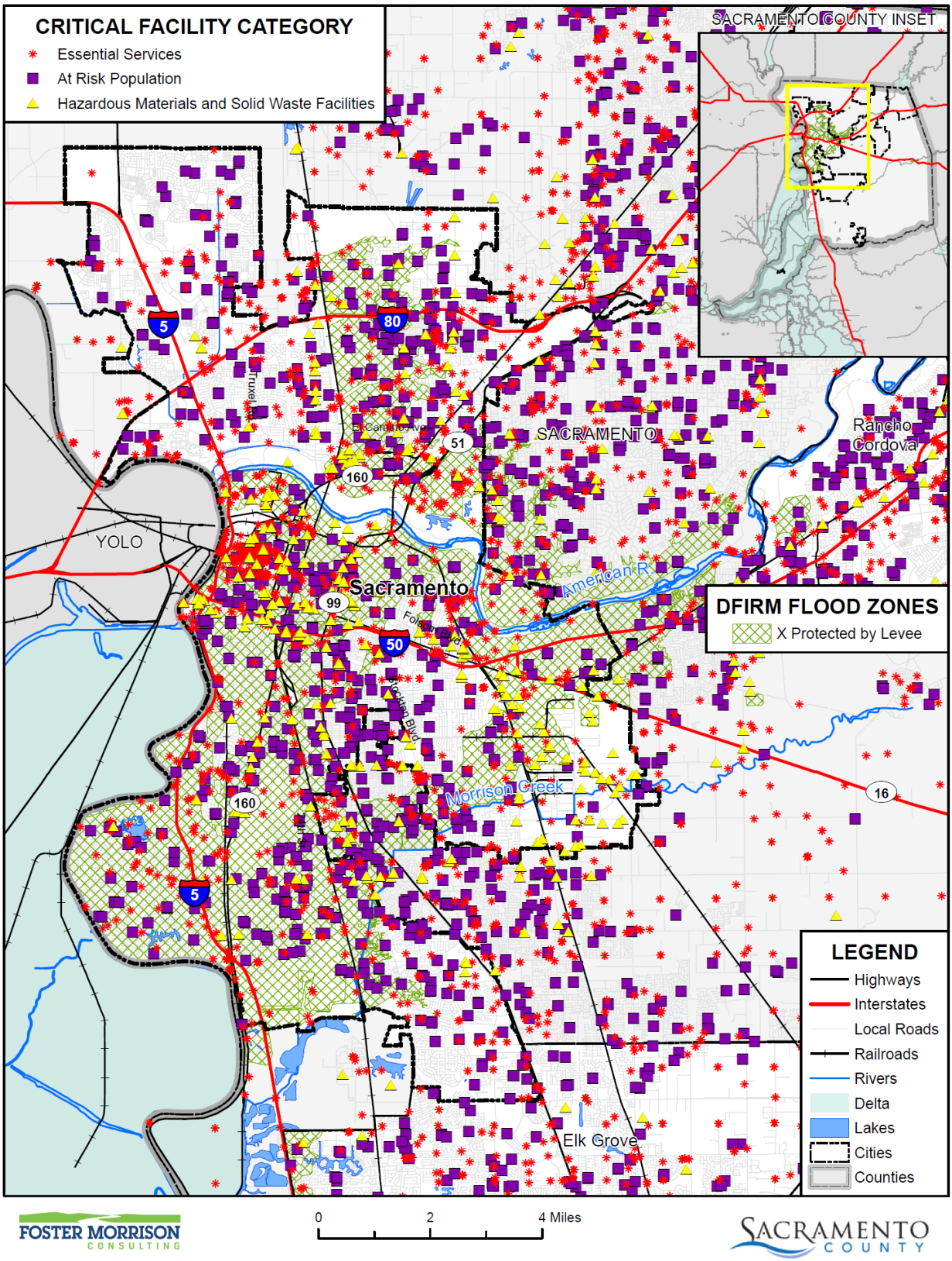
Jurisdiction	X Protected by Levee	
	Improved Residential Parcels	Population at Risk
City of Sacramento	69,537	184,968

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Sacramento in identified DFIRM flood X Protected by Levee zones. GIS was used to determine whether the critical facility locations intersect a DFIRM X Protected by Levee zone. Details of critical facilities in DFIRM flood zones in the City of Sacramento are shown in Figure F-53 for and detailed by dam inundation in Table F-53. Details of critical facility definition, type, name, and address and jurisdiction by DFIRM flood zones are listed in Appendix F.

Figure F-53 City of Sacramento – Critical Facilities in DFIRM X Protected by Levee Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table F-53 City of Sacramento – Critical Facilities in FEMA DFIRM X Protected by Levee Flood Zones by Category and Type

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
X Protected by Levee		
Essential Services Facilities	Airport	1
	Bridge	17
	Cellular Tower	1
	Emergency Evacuation Center	58
	EMS Stations	22
	FDIC Insured Banks	54
	Fire Station	18
	Floodgate	9
	Hospital or Urgent Care	5
	Law Enforcement	18
	Microwave Service Towers	277
	Power Plants	4
	Public Transit Stations	25
	Pump Station	121
	Sewage Treatment Plant	6
	State Government Buildings	29
	Water Well	64
	Total	**729**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	4
	Community Center	2
	Day Care Center	72
	Major Sports Venues	2
	Mobile Home Parks	9
	Places of Worship	256
	School	136
	Total	**481**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	1
	EPA ER TRI Facility	20
	EPA ER TSCA Facility	2
	Leaky Underground Storage Tank	114
	Solid Waste Facility	10
	Tank Farm	3
	Waste Transfer Station	1

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
	Total	**151**
X Protected by Levee Total		**1,361**

Source: City of Sacramento, FEMA 7/19/2018 DFIRM

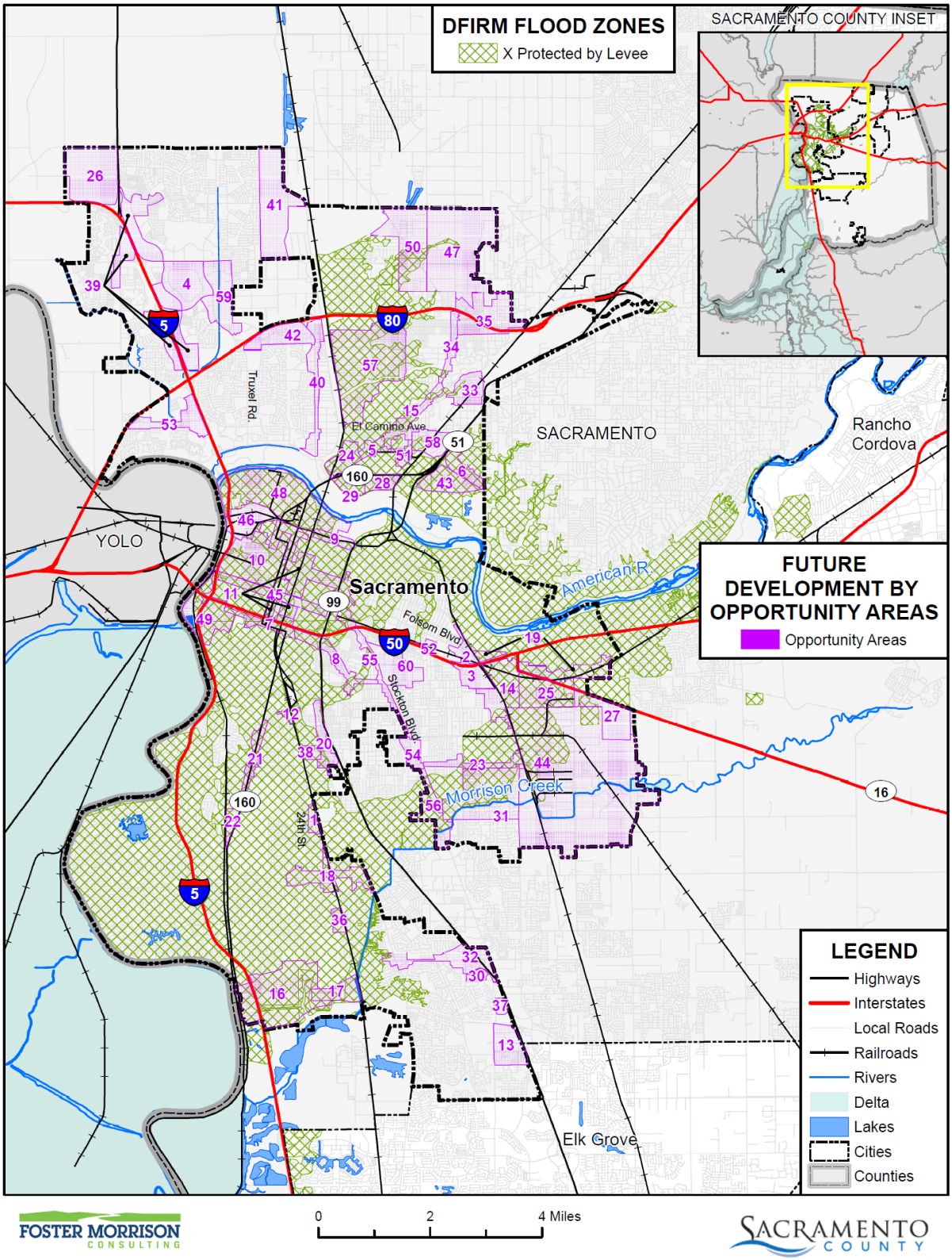
Future Development

Future development built in the areas protected by levees is subject to being built to the standards in the City of Sacramento Floodplain Ordinance. Whether a levee is certified as providing protection from the 1% annual chance flood will also factor into development requirements. Per Sacramento City Code: A minimum 20-foot setback from the landside toe of any flood control levee is required for development less than five acres in size. A minimum 50-foot setback is required from the landside toe of any flood control levee for development five acres or greater in size. No primary or accessory structures may encroach into the levee setback. Future development in levee protected areas may be affected by this hazard, thus there will always be some level of concern.

GIS Analysis

The City provided 60 Opportunity Areas as part of their Draft 2040 General Plan Land Use map which were used as the basis for the inventory of future development areas for the City. Utilizing the Opportunity Areas spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each area. Figure F-54 (with a legend shown on Figure F-55) shows the locations of Opportunity Areas overlayed on the DFIRM X Protected by Levee layer. Table F-54 shows the parcels and acreages of each Opportunity Area in the City in the X Protected by Levee zones.

Figure F-54 City of Sacramento – Future Development Opportunity Areas and X Protected by Levee Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 11/2021.

Figure F-55 City of Sacramento – Future Development Opportunity Areas Legend

Table F-54 City of Sacramento – Future Development Opportunity Areas in DFIRM X Protected by Levee Flood Zones

Flood Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
X Protected by Levee				
47th	25	11	14	12.65
Arden Fair	18	13	5	69.88
Arden/Del Paso	55	29	26	20.47
Broadway	71	49	22	15.53
Broadway East	88	42	46	14.91
C Street	13	5	8	31.14
CBD	47	27	20	24.84
Central City Corridors	381	258	123	66.00
City College	51	24	27	8.30
CSUS Village	69	35	34	116.04
Del Paso	40	25	15	15.58
Delta Shores	31	10	21	691.60

Flood Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Delta Shores Transit Center	1	0	1	37.51
Florin	75	45	30	109.87
Folsom East	44	33	11	91.88
Franklin	24	14	10	12.21
Freeport North	50	43	7	24.99
Freeport South	20	12	8	28.91
Fruitridge	25	18	7	9.59
Globe LRT	89	39	50	46.27
Granite Park	24	9	15	77.38
Jackson	4	0	4	11.90
Johnston East	28	17	11	46.52
Johnston West	27	19	8	67.39
Lemon Hill	87	15	72	51.44
Mack	1	0	1	5.88
Marconi	3	0	3	4.17
Marysville	8	2	6	1.43
Meadowview	6	0	6	11.31
North City Farms	20	1	19	8.56
Point West	45	45	0	129.56
Power Inn/Army Depot	171	79	92	275.23
R Street Central City Housing	108	52	56	19.73
Railyards	27	4	23	4.03
Raley	5	1	4	9.71
Richards Boulevard	152	48	104	219.76
Riverfront	53	28	25	55.42
Robla	8	1	7	53.80
Royal Oaks	21	13	8	10.58
Stockton North	13	11	2	1.79
Stockton South	36	26	10	43.18
Strawberry Manor	241	70	171	167.34
Swanston Station	47	15	32	16.31
X Protected by Levee Total	**2,352**	**1,188**	**1,164**	**2,740.60**

Source: FEMA DFIRM 11/2/2018, City of Sacramento GIS

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the City, County, and surrounding region is at risk, as pandemic is a regional, national, or international event. The speed of onset of pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and two federal disaster declaration due to pandemic, as shown in Table F-55.

Table F-55 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	2	2020, 2021	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic flu.

- The **1918-1919 Influenza Pandemic (H1N1)**
- The **February 1957-1958 Influenza Pandemic (H2N2)**
- The **1968 Influenza Pandemic (H3N2)**

To date, the 21st century has seen two acknowledged pandemics.

- **2009 Swine Flu (H1N1**)
- **2019/2020/2021 COVID 19**

Sacramento City Office of Emergency Management activated a virtual EOC, a Crisis Activation Team, and Operational Planning Team in March of 2019 in response to the global pandemic. Coordination efforts to provide critical supplies to essential workers, maintain continuity of city essential services, public messaging, and emergency programs are still on-going. Significant impacts of Shelter-In-Place orders to our unhoused citizens occurred in the City.

Vulnerability to and Impacts from Pandemic

Pandemic has and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the City. Pandemic can have varying levels of impact to the citizens of the City and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations, surges affecting ICU capacity, variants in the virus strain, and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently), and unemployment rose significantly. Supply chains for food can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

Future Development

Future development is not expected to be significantly impacted by this hazard, though population growth in the City could increase exposure to a pandemic, and increase the ability of each disease to be transmitted among the population of the City. If the median age of City residents continues to increase, vulnerability to pandemic diseases may increase, due to the fact that these diseases are often more deadly to senior citizens.

Severe Weather: Extreme Cold and Freeze

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

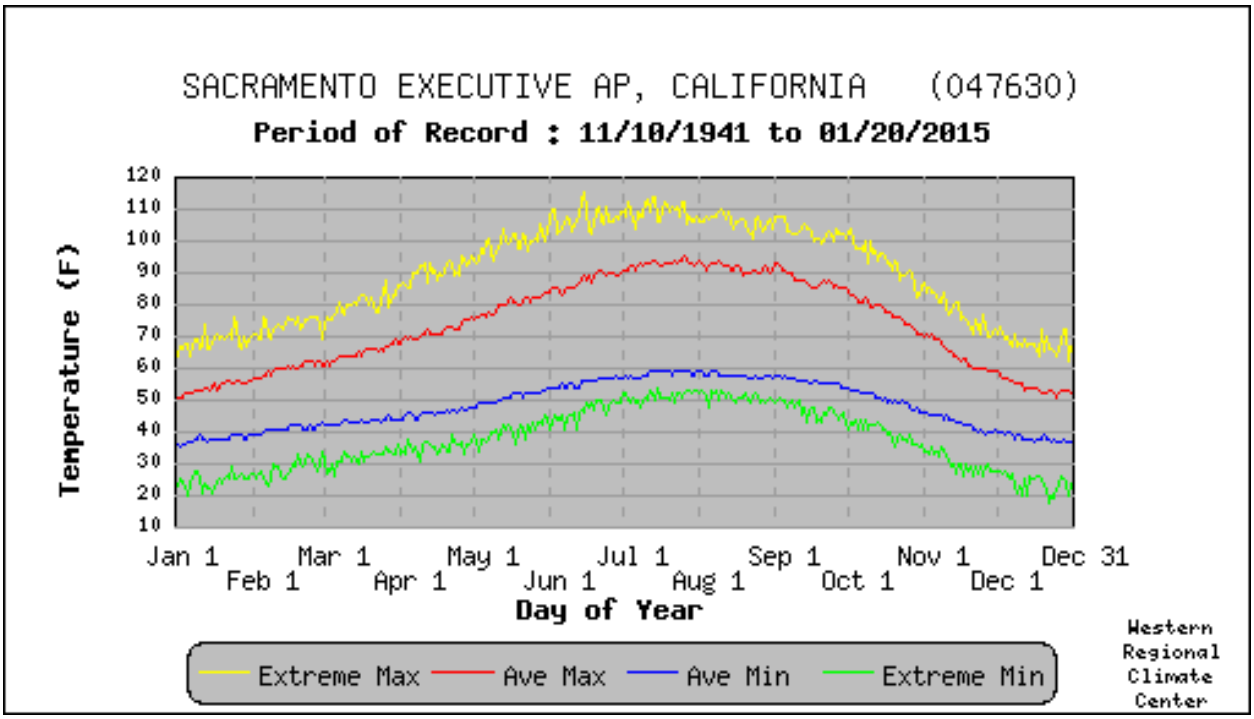
Hazard Profile and Problem Description

According to the National Weather Service), extreme cold often accompanies a winter storm or is left in its wake. Freezing temperatures can also occur without the accompanying winter storm.

The City of Sacramento experiences severe weather including peak periods of extreme cold and freeze. In general, individuals are able to dress appropriately and stay sheltered during these peak periods, however the City's elderly population and homeless are highly susceptible to the extreme temperatures. The City

experiences temperatures that hover around or below 32 degrees during the winter months (see Figure F-56). Many months see a high number of days where daily low temperatures fall below 32°F. Generally, people who live and work in this weather are prepared to cope with the extremes in that they dress appropriately and stay indoors.

Figure F-56 Daily Temperatures Averages and Extremes for the City of Sacramento



Source: Western Regional Climate Center, Sacramento FAA Airport Station

Location and Extent

Extreme cold and freeze are regional issues, meaning the entire City is at risk to cold weather and freeze events. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of extreme cold and freeze, temperature data from the County from the WRCC indicates minimum temperatures fall below 32°F on 8.3 days with no days falling below 0°F. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days to weeks at a time. When it does snow, the snow often melts relatively quickly.

Past Occurrences

Past average occurrences of extreme cold in the City of Sacramento are shown in both Table F-56 and Table F-57.

Table F-56 Record Low Temperatures in the City of Sacramento

Month	Temperature	Date	Month	Temperature	Date
January	23°	1/1979	July	48°	7/1983
February	23°	2/1989	August	49°	8/1978

Month	Temperature	Date	Month	Temperature	Date
March	26°	3/1971	September	43°	9/1978
April	32°	4/1953	October	36°	10/1989
May	36°	5/1974	November	26°	11/1993
June	41°	6/1990	December	18°	12/1990

Source: Western Regional Climate Center, Sacramento FAA Airport Station

Table F-57 Average Number of Days in a Month Below 32°F

Month	Days Below 32°F	Month	Days Below 32°F
January	7.2	July	0
February	2.2	August	0
March	0.5	September	0
April	0	October	0
May	0	November	1.5
June	0	December	6.4

Source: Western Regional Climate Center, Sacramento FAA Airport Station

There has been no federal or state disaster declarations in the County for freeze and snow. The City noted that cold and freeze is a regional phenomenon; events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

In **January of 2017**, cold weather hit the City. The City opened warming centers. This can be seen on Figure F-57.

Figure F-57 January 2017 Warming Center

Source: City of Sacramento

The City noted an event on **December 29, 2020**. Cold hit the City and the region. Incidents of cold related illnesses strained emergency response. The City activated multiple facilities as warming centers to provide cold weather-related respite to the community. COVID-19 precautions and screenings were in place.

The City noted an event on **January 25, 2021**. Cold hit the City and the region. Incidents of cold related illnesses strained emergency response. The City activated multiple facilities as warming centers to provide cold weather-related respite to the community. COVID-19 precautions and screenings were in place.

Vulnerability to and Impacts from Severe Weather: Extreme Cold and Freeze

The City experiences temperatures below 32 degrees during the winter months. The temperature moves to the 20s in rather extreme situations. Freeze can cause injury or loss of life to residents of the City. While it is rare for buildings to be affected directly by freeze, damages to pipes that feed building can be damaged during periods of extreme cold.

Extreme cold and freeze can affect critical facilities and infrastructure, down trees, break pipes, impact agriculture, and can be a life safety issue. When extreme cold is coupled with high winds or ice storms, power lines may be downed, resulting in an interruption of utilities and critical services. Transportation networks, communications, and utilities infrastructure are the most vulnerable physical assets in the City. The elderly and young population are most vulnerable to temperature extremes. The residents of nursing

homes and elder care facilities, as well as transient and homeless populations are especially vulnerable to extreme cold events.

Future Development

Future development built to code should be able to withstand issues associated with extreme cold and freeze events. Pipes at risk of freezing should be buried or insulated from freeze as new facilities are improved or added. Vulnerability to extreme cold will increase as the average age of the population in the County shifts and homelessness becomes more of an issue.

The Sacramento Housing and Rehabilitation Agency and County Department of Human Services currently operate programs such as the Winter Shelter Program and In-Home Support Services which help address severe weather conditions needs for vulnerable populations. Continued community outreach and potential regulatory mitigation capabilities would further address the extreme cold/freeze hazard within the community.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and lasts for several weeks. Heat kills by taxing the human body beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a "normal temperature." Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, transient and homeless populations, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the City, there are risk to the built environment from extreme heat. While extreme heat on its own does not usually affect structures, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat can lead to power outages and when combined with high winds, to Public Safety Power Shutdown (PSPS) events, creating significant issues in the City. However, PSPS events in the City have been declining with PG&E's refined system for shutting power off in high wildfire risk areas. More information on power failure and PSPS can be found at the beginning of Section F.5.3.

Location and Extent

Heat is a regional phenomenon and affects the whole of the City. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

Past average occurrences of extreme heat in the City of Sacramento are shown in both Table F-58 and Table F-59.

Table F-58 Record High Temperatures in the City of Sacramento

Month	Temperature	Date	Month	Temperature	Date
January	74°	1/12/2009	July	114°	7//1983
February	76°	2/19/1964	August	110°	8/10/1996
March	88°	3/5/1971	September	108°	9/01/1950
April	95°	4/9/1999	October	104°	10/02/2001
May	105°	5/3/1950	November	87°	11/01/1960
June	115°	6/7/1950	December	73°	12/02/2011

Source: Western Regional Climate Center, Sacramento FAA Airport Station

Table F-59 Average Number of Days in a Month Exceeding 90°F

Month	Days Exceeding 90°F	Month	Days Exceeding 90°F
January	0	July	21.3
February	0	August	19.1
March	0	September	12.8
April	0.5	October	2.5
May	5.4	November	0
June	11.6	December	0

Source: Western Regional Climate Center, Sacramento FAA Airport Station

The City Planning Team noted that since extreme heat is a regional phenomenon, events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

The City did note an even on **August 6, 2020**. Incidents of heat related illnesses, dehydration, and strain on emergency response. Sacramento City Office of Emergency Management conducted interdepartmental and Public Health coordination to ensure activation of two cooling centers were made available September 6-7 in response to high temperatures. COVID-19 precautions and screenings were in place.

The City noted an event on **August 14-19, 2020**. High temperatures in the region. Incidents of heat related illnesses, dehydration and strain on emergency response. The City activated warming center to provide warm weather-related respite to the community. COVID-19 precautions and screenings were in place.

The City noted an event on **September 6-7, 2020**. High temperatures in the region. Incidents of heat related illnesses, dehydration and strain on emergency response. The City activated warming center to provide warm weather-related respite to the community. COVID-19 precautions and screenings were in place.

Vulnerability to and Impacts from Extreme Heat

The City experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-115°F in rather extreme situations. During these times, drought conditions may worsen and the City may see an increase in dry fuels. Also, power outage and PSPS events may occur during these times as well. Health issues are the primary concern with this hazard, although economic impacts can also be an issue.

The elderly and individuals below the poverty level are the most vulnerable to extreme temperatures. Nursing homes and elder care facilities are especially vulnerable to extreme heat events if power outages occur and air conditioning is not available. In addition, individuals below the poverty level may be at increased risk to extreme heat if use of air conditioning is not affordable. This is especially true of homeless people and the transient population.

Days of extreme heat have been known to result in medical emergencies, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts. Extreme heat can also dry out vegetations, making it more vulnerable to wildfire ignitions.

Future Development

Future development of new buildings in the City will likely not be affected by extreme heat. Extreme heat is more likely to affect vulnerable populations. Vulnerability to extreme heat will increase as the average age of the population in each City shifts. It is encouraged that nursing homes and elder care facilities have emergency plans or backup power to address power failure during times of extreme heat and in the event of a PSPS. Low income residents and homeless populations are also vulnerable. Cooling centers for these populations should be utilized when necessary. The City will continue to enhance the City's tree canopy and encourage "green" infrastructure, such as rooftop gardens and light-colored pavement, to reduce urban heat island effects.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

Hazard Profile and Problem Description

Storms in the City occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in

excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the City falls mainly in the fall, winter, and spring months. Wind often accompanies these storms; hail and lightning are rare in the City.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the City. All portions of the City are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Hail and lightning are rare in the City and Sacramento County. Duration of severe storms in California, Sacramento County, and the City can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the City. This is the cause of many of the federal disaster declarations related to flooding.

- **December 2012** – Severe rain for several days. The DOC was activated for approximately a week due extreme weather forecasts.
- **December 2014** – Media and reports claimed severe rain predicted for multiple days. DOC activated for several days.
- **March 2016** – DOC was on alert due to heavy rain projections. DOC activation was ultimately not required.
- **January 2017-March 2017** – Drainage crews increased monitoring of Sacramento River and South Sacramento Streams.
- **April 2018** – DOC was activated.
- **January 2019** – Major storm - Wind Event. Winds 25-35 MPH sustained winds with gusts up to 65 MPH accompanied by persistent rain, falling trees, drainage disruption, power outages, and localized flooding. IAP established with unified response.
- **February 2019** – DOC was activated.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the City. These events can cause significant and localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the City, but also can cause damage, with lightning occasionally igniting wildfires.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Power outages may also occur. Heavy rains and storms often result in flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

Future Development

Building codes in the City ensure that new development is built to current building standards, which should reduce the risk to future development in the City from heavy rains and storms. New critical facilities such as communications towers and others should be built to withstand hail damage, lightning, and thunderstorm winds. With adherence to development standards, future losses to new development should be minimal.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire City is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and City. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The City noted that since high winds is a regional phenomenon, events that affected the lower elevations of the City also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.5.

Listed below are the largest tornadoes for the Sacramento area:

- **February 7, 1978**: Fujita 2, Width 20 yards, Length 1.9 miles
- **March 22, 1983**: Fujita 1, Width 50 yards, Length 2 miles
- **April 19, 1988**: Fujita 1, Width 30 yards, Length 1 mile

Source: Tornado History Project

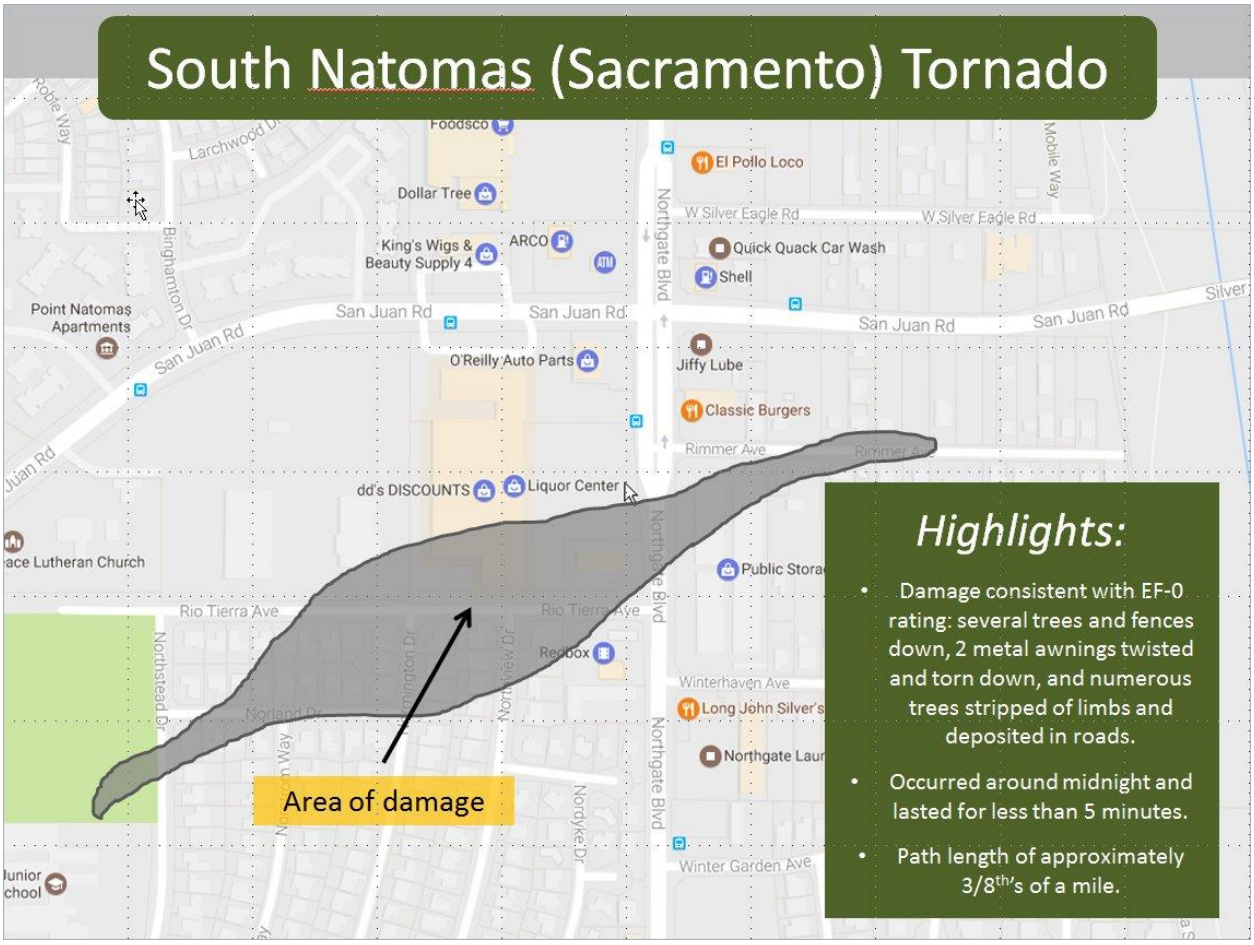
City specific events include the following:

January 2006: A series of storms accompanied by winds as fast as 63 MPH struck Northern California for a period of a week. Two deaths were recorded by falling trees as a result of high winds. The storm resulted in over $300 million of damage and 10 counties, including Sacramento, being classified as federal disaster areas.

January 2008: Severe winds exceeding hurricane force strength were a part of the January 2008 North American Storm Complex, a series of 3 storms that hit the California region. In California, 1.2 million residents were left without power due to the approximately 500 miles of power lines were damaged in the state. Listed below are the largest tornadoes for the Sacramento area.

The City noted a tornado that occurred in the Natomas Area on January 10, 2017. The tornado was estimated as a EF0. Information on the tornado and the areas impacted can be seen on Figure F-58, while Figure F-59 shows an example of the damage that occurred in the area.

Figure F-58 City of Sacramento – 2017 Natomas Tornado Event



Source: City of Sacramento

Figure F-59 Example of Damage from 2017 Tornado

Source: City of Sacramento

The City did note and event on January 16, 2019. The National Weather Service noted 25-35mph sustained winds with gusts up to 65mph accompanied by persistent rain that impacted the City and the region. Falling trees, drainage disruptions, power outages, and localized flooding reported. Damages, injuries, and deaths were not known.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the City throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the City will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Increased PSPS events
- Occasional building damage, primarily to roofs

Strong wind is a frequent type of severe weather occurrence in the area. Wind often accompanies the region's storms and has caused damage in the past. Buildings that house populations at risk such as schools, nursing homes, hospitals, and urgent care facilities are at risk to wind and tornadoes. Also at risk are power lines, which can arc or be damaged during high wind events. The City has had power outages and damages to electric lines in past storms. This is especially difficult when the outages impact the stormwater pumps, which can exacerbate flooding.

Future Development

Future development projects will consider wind hazards at the planning, and design stage with the goal of reducing vulnerability. The City enforces the state building code and other ordinances, which regulate construction techniques that minimize damage from windstorms. Future development in the City is subject to these building codes. New critical facilities should also consider adding generators for times of PSPS.

Wildfire

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

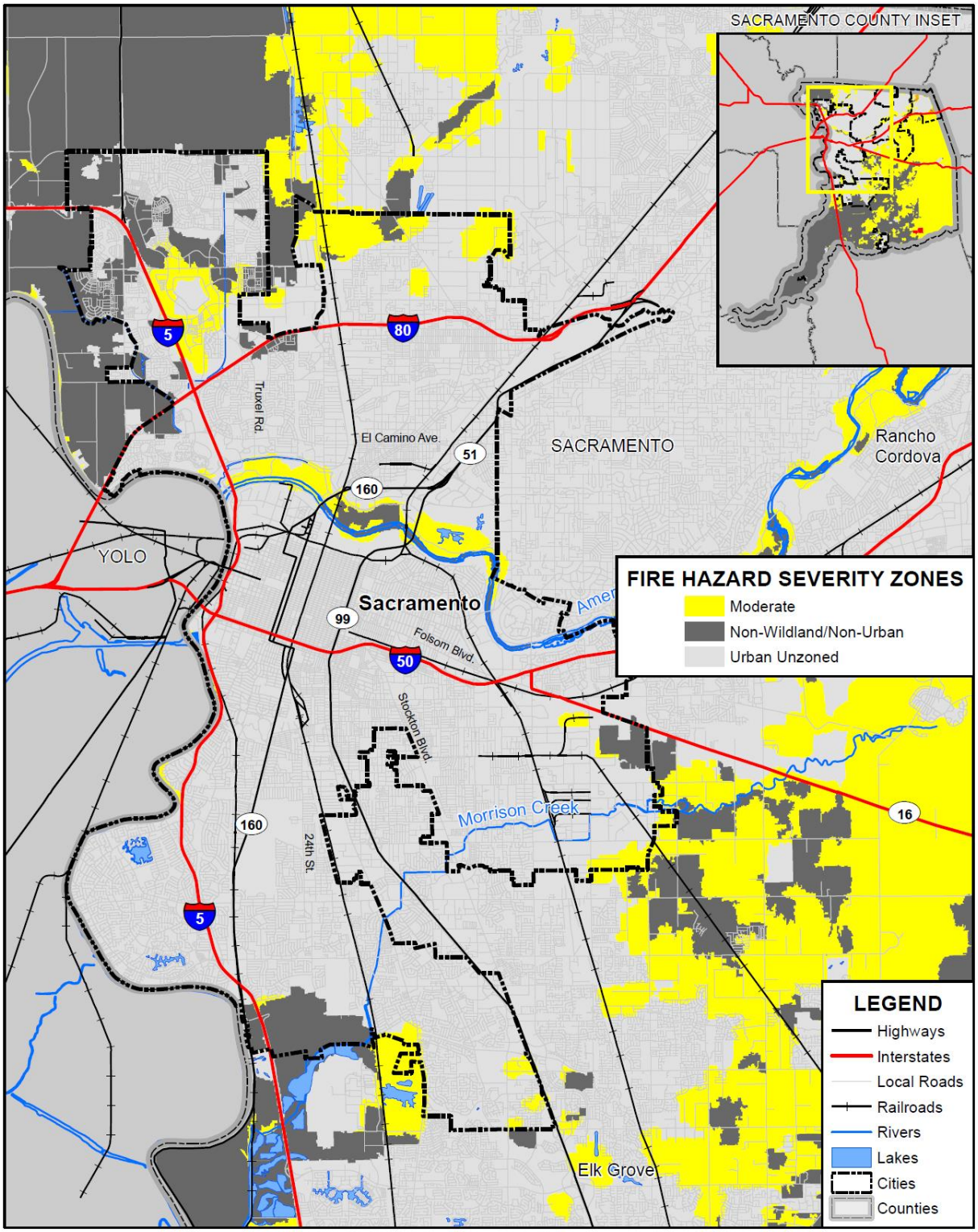
Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the City of Sacramento. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. These high winds can result in red flag days, and can result in PSPS events in the City. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

Wildfire can affect all areas of the City. CAL FIRE has estimated that the risk varies across the City and has created maps showing risk variance. Following the methodology described in Section 4.3.19 of the Base Plan, wildfire maps for the City of Sacramento were created. Figure F-60 shows the CAL FIRE Fire Hazard Severity Zone (FHSZ) in the City. As shown on the maps, FHSZs within the City range from Urban Uzoned to Moderate. Figure F-61 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, fire threat within the City range from No Threat to High.

Figure F-60 City of Sacramento – Fire Hazard Severity Zones

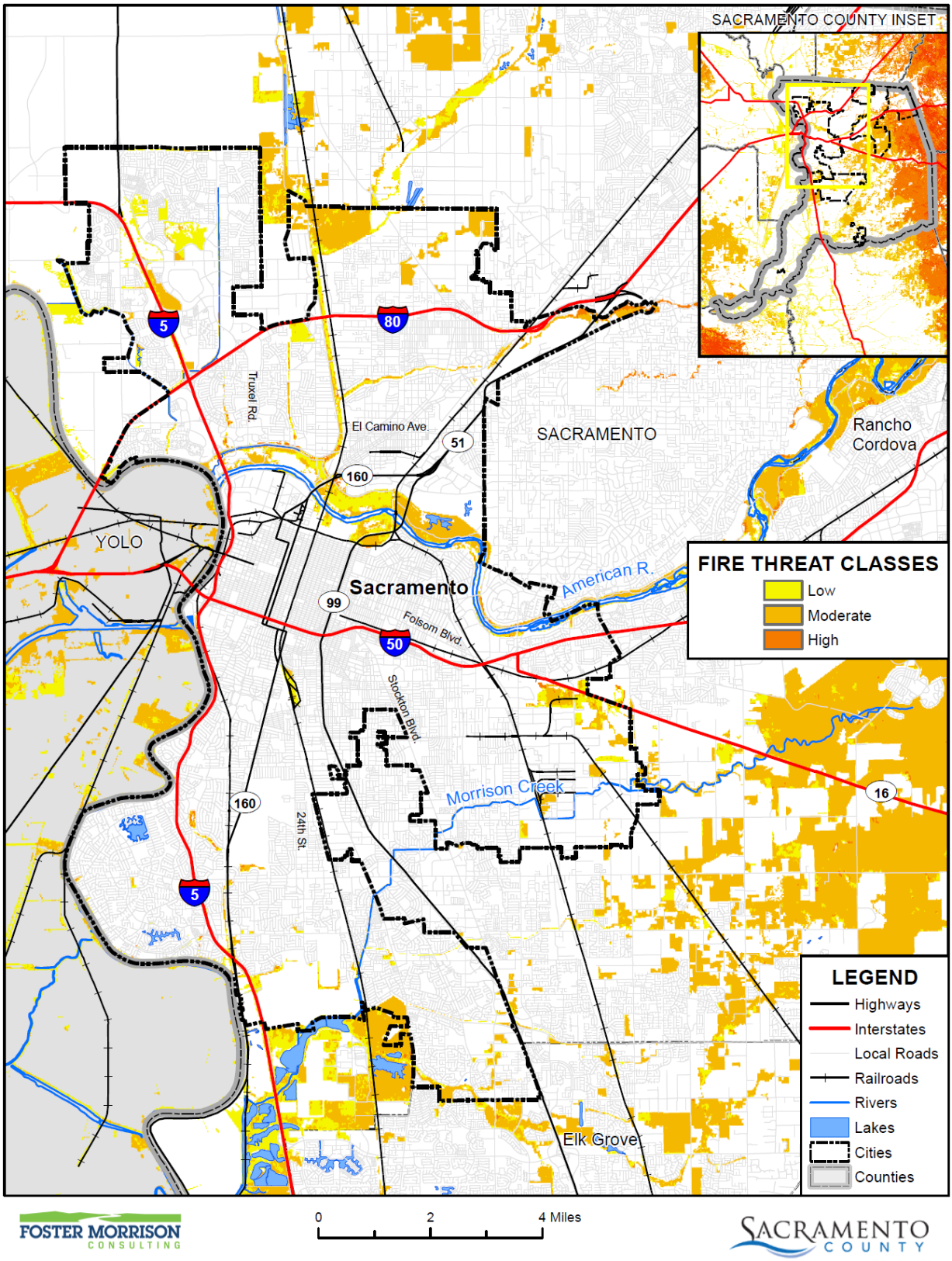


FOSTER MORRISON CONSULTING

SACRAMENTO COUNTY

Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure F-61 City of Sacramento – Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Some areas of the City have been identified as susceptible to urban-wildland fires. The areas are generally along the America River Parkway from Watt Avenue to the Sacramento River and along the Garden Highway in the Natomas area.

The American River Parkway is a stretch of a dense trees and brush on both sides of the American River. It is bordered by extensive commercial and residential development, including California State University, Sacramento. The parkway property is owned by the State of California, maintained by the Sacramento County Parks Department, and protected from fire by the Sacramento City Fire Department. The area is natural habitat with no fire break areas. Access for fire equipment is difficult and is limited to the paved stretches of the bicycle path. Some of the potential fire areas are not accessible to vehicular traffic. Fires occurred in the area in 1985 and 1992.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more. Geographical FHSZ extent from CAL FIRE is shown in Table F-60. Geographical Fire Threat Area extents from CAL FIRE are shown on Table F-61.

Table F-60 City of Sacramento – Geographical FHSZ Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	0	0.00%	0	0.00%	0	0.00%
Moderate	6,600.9	8.93%	3,705.6	7.70%	2,895.3	11.20%
Non-Wildland/non-Urban	14,662.3	19.83%	5,758.5	11.97%	8,903.9	34.45%
Urban Unzoned	52,692.3	71.25%	38,646.4	80.33%	14,045.9	54.35%
Total	73,955.6	100.00%	48,110.5	100.00%	25,845.1	100.00%

Source: CAL FIRE

Table F-61 City of Sacramento – Geographical Fire Threat Area Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	176.8	0.24%	18.5	0.04%	158.3	0.61%
Moderate	3,043.0	4.11%	459.8	0.96%	2,583.2	9.99%
Low	2,063.1	2.79%	218.7	0.45%	1,844.5	7.14%
No Threat	68,672.6	92.86%	47,413.4	98.55%	21,259.2	82.26%
Total	**73,955.6**	**100.00%**	**48,110.5**	**100.00%**	**25,845.1**	**100.00%**

Source: CAL FIRE

Past Occurrences

There has been no state and one federal disaster declaration due to fire, as shown in Table F-62. It should be noted that this fire disaster was from an explosion in Roseville, and not from an actual wildfire.

Table F-62 Sacramento County – State and Federal Wildfire Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

According to the City Planning Team, large wildland fires occur approximately every 2-3 years that require a large number of fire resources and affect the adjacent populations. The last large fire occurred on July 4, 2014 that burned approximately 100 acres in the Bushy Lake area adjacent to the Cal Expo Fairgrounds. The fire caused the evacuation of the nearby water park, caused the cancellation of the professional soccer game, and postponed the largest pyrotechnic show in the region. Additionally, the incident drew down fire resources from the entire county and required the request of resources from Cal Fires Amador, El Dorado Ranger Unit to assist in mitigation.

Since 2016, the City has been indirectly affected by two wildfires. Neither burned property within the City, but air quality issues were felt by City residents.

- The City noted that on November 10, 2018, wildfires in the region caused smoke issues in the City from the Camp Fire in Butte County. The Sacramento City Office of Emergency Management routed a resource request through the County to CalOES to received 260,000 N95 masks to distribute to essential workers, the public, and unhoused persons who were impacted by the unhealthy Air Quality Index. Sacramento Fire educated and distributed the masks to employees and the community.
- On August 22, 2020, the North Complex Fire caused smoke issues in the City. County Public Health issues recommendations for public to remain indoors. This impacted businesses and unhoused persons. N95 masks were distributed in the City during this event.

Vulnerability to and Impacts from Wildfire

Fuel loads in the County and Cities, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. The more urbanized areas within the County are not immune from fire. The dry vegetation and hot and sometimes windy weather, combined with continued growth in the WUI areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and City, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Sacramento is not immune to numerous types of grass and brush fires and any one of them may accelerate into an urban interface wildfire. Such a situation could lead to evacuation of large portions of the population and the potential for significant loss of personal property, structures, and rangeland. The natural fuels

available in or near the City vary greatly in the rate and intensity of burning. Fires in heavy brush and stands of trees burn with great intensity but more slowly than in dry grass and leaves. Dense fuels will propagate fire better than sparse fuels. In the City, this occurs generally along the America River Parkway from Watt Avenue to the Sacramento River and along the Garden Highway in the Natomas area.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and timber; and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the City. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the City by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the City; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate a PSPS which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Assets at Risk

Based on the vulnerability of Sacramento to the wildfire hazard, the sections that follow describes significant assets at risk in the City of Sacramento. This section includes the values at risk, population at risk, and critical facilities at risk.

Values at Risk in Fire Hazard Severity Zones

GIS was used to determine the possible impacts of wildfire within the City of Sacramento. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire hazard severity zones. Summary analysis results for Sacramento are shown in Table F-63, which summarizes total parcel counts, improved parcel counts and their structure values by fire hazard severity zone.

Table F-63 City of Sacramento – Count and Value of Parcels by Fire Hazard Severity Zone

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate	3,966	3,052	$476,852,476	$1,381,070,910	$948,198,494	$2,806,121,933

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Non-Wildland/Non-Urban	5,208	3,798	$766,099,910	$1,882,990,400	$1,136,701,772	$3,785,792,130
Urban Unzoned	146,416	136,046	$15,089,069,899	$40,129,374,461	$26,994,730,553	$82,213,175,523
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table F-64 breaks out the Table F-63 by adding the property use details by fire hazard severity zone for the City. As shown in both of these tables, the City has no properties in the very high or high fire hazard severity zone.

Table F-64 City of Sacramento – Count and Value of Parcels by Fire Hazard Severity Zone and Property Use

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Moderate						
Agricultural	4	1	$343,359	$457,776	$457,776	$1,258,911
Care/Health	5	4	$7,819,964	$23,969,017	$23,969,017	$55,757,998
Church/Welfare	6	4	$2,767,584	$28,242,377	$28,242,377	$59,252,338
Industrial	112	101	$36,055,709	$121,095,875	$181,643,815	$338,795,400
Miscellaneous	234	0	$318,525	$0	$0	$318,525
Office	33	31	$54,614,941	$110,594,561	$110,594,561	$275,804,063
Public/Utilities	20	0	$865,251	$0	$0	$865,251
Recreational	1	0	$0	$0	$0	$0
Residential	3,016	2,846	$268,109,138	$978,535,308	$489,267,610	$1,735,912,108
Retail / Commercial	53	51	$41,175,104	$114,023,338	$114,023,338	$269,221,780
Unknown	0	0	$0	$0	$0	$0
Vacant	482	14	$64,782,901	$4,152,658		$68,935,559
Moderate Total	**3,966**	**3,052**	**$476,852,476**	**$1,381,070,910**	**$948,198,494**	**$2,806,121,933**
Non-Wildland/Non-Urban						
Agricultural	5	1	$3,414,468	$165,516	$165,516	$3,745,500
Care/Health	1	1	$4,473,720	$31,867,452	$31,867,452	$68,208,624
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	1	1	$2,398,330	$6,621,937	$9,932,906	$18,953,172
Miscellaneous	194	0	$518,095	$0	$0	$518,095

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Office	72	67	$19,194,876	$92,074,975	$92,074,975	$203,344,826
Public/Utilities	8	0	$9	$0	$0	$9
Recreational	7	1	$1,623,678	$5,412,160	$5,412,160	$12,447,998
Residential	4,237	3,693	$426,841,526	$1,498,996,058	$749,498,003	$2,675,335,636
Retail / Commercial	32	32	$76,283,580	$247,750,760	$247,750,760	$571,785,100
Unknown	0	0	$0	$0	$0	$0
Vacant	651	2	$231,351,628	$101,542	$0	$231,453,170
Non-Wildland/Non-Urban Total	**5,208**	**3,798**	**$766,099,910**	**$1,882,990,400**	**$1,136,701,772**	**$3,785,792,130**
Urban Unzoned						
Agricultural	5	0	$8,477	$0	$0	$8,477
Care/Health	152	127	$89,692,526	$1,595,069,973	$1,595,069,973	$3,279,832,472
Church/Welfare	533	436	$108,028,517	$519,675,544	$519,675,544	$1,147,379,605
Industrial	1,921	1,718	$677,319,857	$2,109,784,334	$3,164,676,492	$5,951,780,696
Miscellaneous	2,637	9	$2,935,988	$320,049	$320,049	$3,576,086
Office	1,691	1,354	$1,120,667,843	$4,860,966,374	$4,860,966,374	$10,842,600,591
Public/Utilities	740	1	$844,388	$31,233	$31,233	$906,854
Recreational	131	79	$89,391,284	$466,831,891	$466,831,891	$1,023,055,066
Residential	131,418	129,890	$11,155,089,164	$28,311,263,746	$14,155,631,491	$53,621,984,998
Retail / Commercial	2,858	2,258	$1,223,665,912	$2,231,527,506	$2,231,527,506	$5,686,720,924
Unknown	2	1	$0	$86,693	$0	$86,693
Vacant	4,328	173	$621,425,943	$33,817,118	$0	$655,243,061
Urban Unzoned Total	**146,416**	**136,046**	**$15,089,069,899**	**$40,129,374,461**	**$26,994,730,553**	**$82,213,175,523**
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Values at Risk in Fire Threat Areas

GIS was used to determine the possible impacts of wildfire within the City of Sacramento. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire threat area. Summary analysis results for Sacramento are shown in Table F-65, which summarizes total parcel counts, improved parcel counts and their structure values by fire threat area. Table F-66 breaks out the Table F-65 by adding the property use details by threat areas for the City.

Table F-65 City of Sacramento – Count and Value of Parcels by Fire Threat Area

Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	0	0	$0	$0	$0	$0
High	109	67	$15,788,630	$38,303,420	$28,104,152	$82,196,206
Moderate	820	354	$142,451,051	$214,897,344	$149,835,830	$507,184,233
Low	693	245	$74,272,287	$129,795,580	$80,617,834	$284,685,707
No Threat	153,968	142,230	$16,099,510,317	$43,010,439,427	$28,821,073,003	$87,931,023,440
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table F-66 City of Sacramento – Count and Value of Parcels by Fire Threat Area and Property Use

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
High						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	1	1	$3,080,974	$17,467,737	$17,467,737	$38,016,448
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	1	1	$274,617	$218,572	$327,858	$821,047
Miscellaneous	25	0	$159	$0	$0	$159
Office	0	0	$0	$0	$0	$0
Public/Utilities	3	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	69	65	$12,095,119	$20,617,111	$10,308,557	$43,020,791
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	10	0	$337,761	$0	$0	$337,761
High Total	**109**	**67**	**$15,788,630**	**$38,303,420**	**$28,104,152**	**$82,196,206**
Moderate						
Agricultural	1	0	$9	$0	$0	$9
Care/Health	2	1	$5,061,341	$980,000	$980,000	$7,021,341
Church/Welfare	3	2	$2,156,602	$21,959,741	$21,959,741	$46,076,084
Industrial	7	6	$5,992,597	$12,597,016	$18,895,524	$37,485,137
Miscellaneous	170	0	$24,502	$0	$0	$24,502
Office	4	3	$28,443,746	$20,508,772	$20,508,772	$69,461,290

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Public/Utilities	16	0	$19	$0	$0	$19
Recreational	2	0	$8,936	$0	$0	$8,936
Residential	365	335	$55,522,564	$141,614,769	$70,807,377	$267,944,718
Retail/ Commercial	6	4	$8,144,494	$16,684,416	$16,684,416	$41,513,326
Unknown	0	0	$0	$0	$0	$0
Vacant	244	3	$37,096,241	$552,630	$0	$37,648,871
Moderate Total	**820**	**354**	**$142,451,051**	**$214,897,344**	**$149,835,830**	**$507,184,233**
Low						
Agricultural	1	0	$1,888	$0	$0	$1,888
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	183	0	$113,405	$0	$0	$113,405
Office	7	6	$1,821,049	$6,055,146	$6,055,146	$13,931,341
Public/Utilities	10	0	$0	$0	$0	$0
Recreational	1	1	$171,367	$5,335	$5,335	$182,037
Residential	248	231	$39,925,423	$98,160,494	$49,080,247	$187,166,170
Retail/ Commercial	5	5	$3,063,256	$25,477,106	$25,477,106	$54,017,468
Unknown	0	0	$0	$0	$0	$0
Vacant	238	2	$29,175,899	$97,499	$0	$29,273,398
Low Total	**693**	**245**	**$74,272,287**	**$129,795,580**	**$80,617,834**	**$284,685,707**
No Threat						
Agricultural	12	2	$3,764,407	$623,292	$623,292	$5,010,991
Care/Health	155	130	$93,843,895	$1,632,458,705	$1,632,458,705	$3,358,761,305
Church/Welfare	536	438	$108,639,499	$525,958,180	$525,958,180	$1,160,555,859
Industrial	2,026	1,813	$709,506,682	$2,224,686,558	$3,337,029,831	$6,271,223,084
Miscellaneous	2,687	9	$3,634,542	$320,049	$320,049	$4,274,640
Office	1,785	1,443	$1,164,212,865	$5,037,071,992	$5,037,071,992	$11,238,356,849
Public/Utilities	739	1	$1,709,629	$31,233	$31,233	$1,772,095
Recreational	136	79	$90,834,659	$472,238,716	$472,238,716	$1,035,312,091
Residential	137,989	135,798	$11,742,496,722	$30,528,402,738	$15,264,200,923	$57,535,101,063
Retail/ Commercial	2,932	2,332	$1,329,916,846	$2,551,140,082	$2,551,140,082	$6,432,197,010
Unknown	2	1	$0	$86,693	$0	$86,693
Vacant	4,969	184	$850,950,571	$37,421,189	$0	$888,371,760

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
No Threat Total	**153,968**	**142,230**	**$16,099,510,317**	**$43,010,439,427**	**$28,821,073,003**	**$87,931,023,440**
City of Sacramento Total	**155,590**	**142,896**	**$16,332,022,285**	**$43,393,435,771**	**$29,079,630,819**	**$88,805,089,586**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Population at Risk

The FHSZ dataset was overlayed on the parcel layer. Those residential parcel centroids that intersect the FHSZs were counted and multiplied by the 2010 Census Bureau average household factors for the City of Sacramento – 2.76. According to this analysis, there is a total population of 7,570 residents of Sacramento at risk to moderate or higher FHSZs, while there is a total of 1,064 in the moderate or higher fire threat areas. This is shown in Table F-67 and Table F-68, respectively.

Table F-67 City of Sacramento – Count of Improved Residential Parcels and Population by Fire Hazard Severity Zone

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
City of Sacramento	0	0	0	0	2,846	7,570

Source: CAL FIRE, US Census Bureau Average Household Sizes: Sacramento City (2.76)

Table F-68 City of Sacramento – Count of Improved Residential Parcels and Population by Fire Threat Area

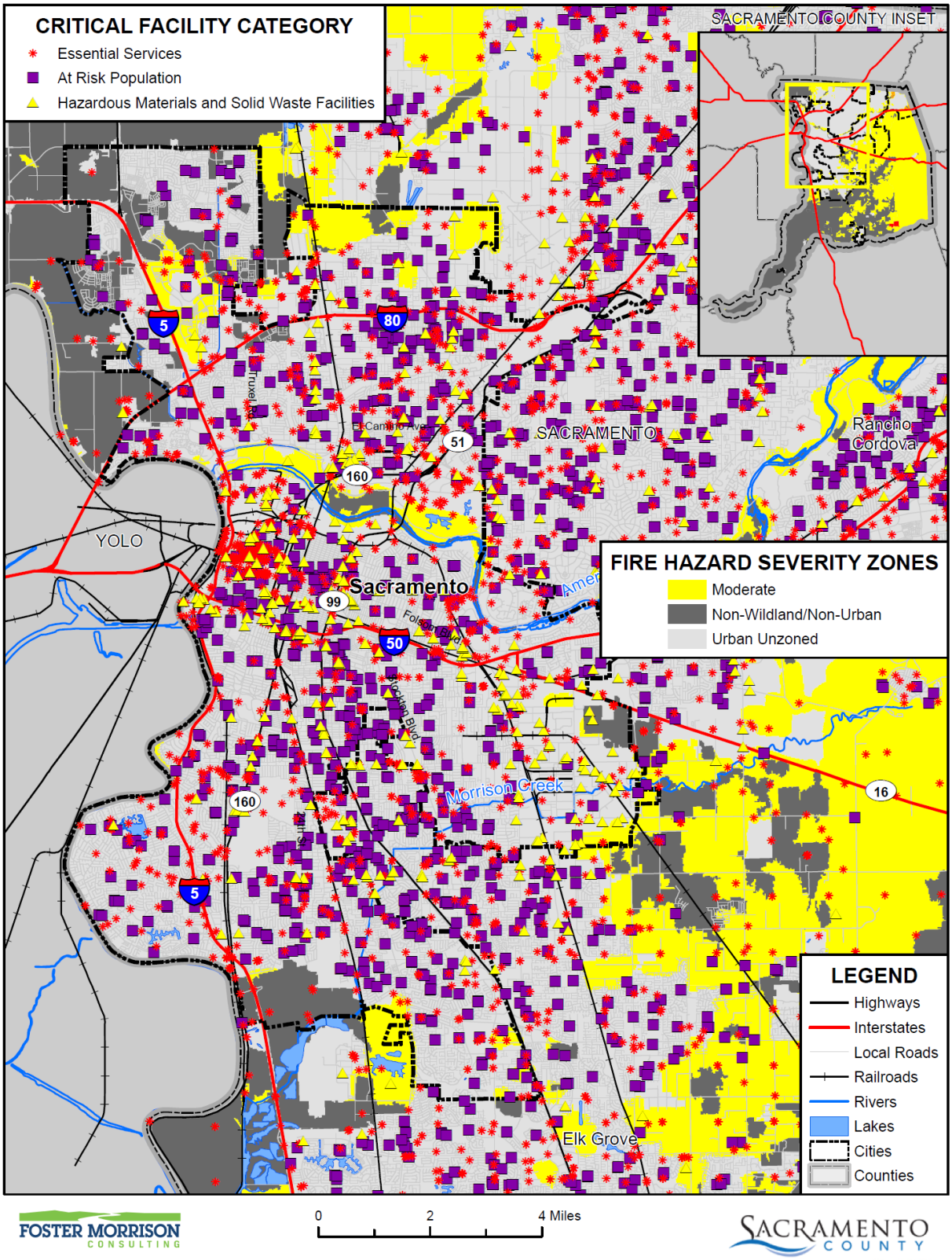
Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
City of Sacramento	0	0	65	173	335	891

Source: CAL FIRE, US Census Bureau Average Household Sizes: Sacramento City (2.76)

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Sacramento in identified FHSZs. Critical facilities in a FHSZ in the City of Sacramento are shown in Figure F-62 and detailed in Table F-69. Critical facilities in a fire threat area in the City of Sacramento are shown in Figure F-63 and detailed in Table F-70. Details of critical facility definition, type, name and address and jurisdiction by fire hazard severity zone are listed in Appendix F.

Figure F-62 City of Sacramento – Critical Facilities in Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table F-69 City of Sacramento – Critical Facilities by Fire Hazard Severity Zone

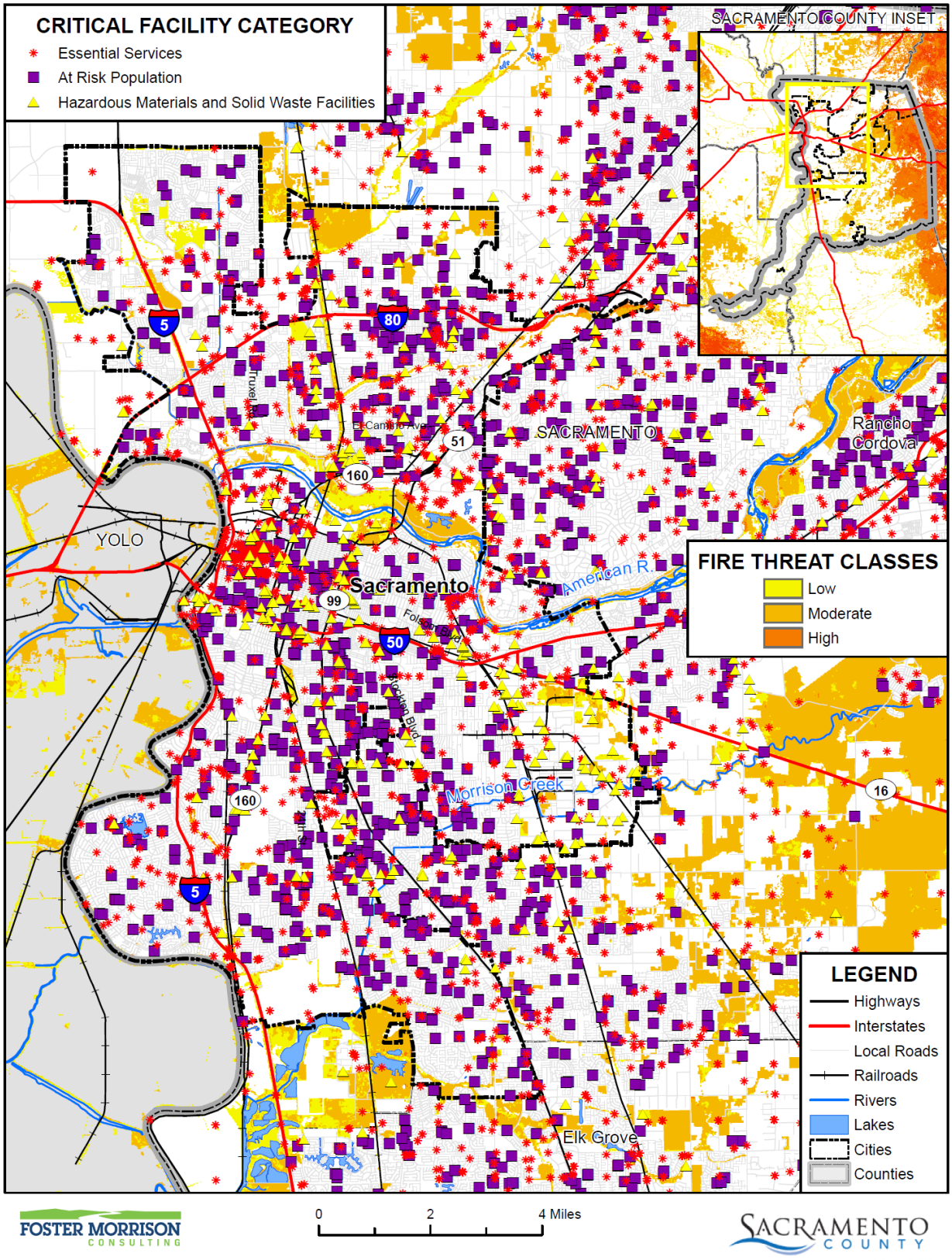
Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
Moderate		
Essential Services Facilities	Bridge	1
	Cellular Tower	1
	FDIC Insured Banks	6
	Floodgate	5
	Microwave Service Towers	11
	Port Facilities	1
	Public Transit Stations	2
	Pump Station	8
	State Government Buildings	1
	Water Well	8
	Total	**44**
At Risk Population Facilities	Day Care Center	3
	Mobile Home Parks	1
	Places of Worship	6
	School	2
	Total	**12**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	1
	EPA ER TSCA Facility	1
	Leaky Underground Storage Tank	2
	Solid Waste Facility	3
	Total	**7**
Moderate Total		**63**
Non-Wildland/Non-Urban		
Essential Services Facilities	Bridge	5
	Emergency Evacuation Center	2
	FDIC Insured Banks	1
	Port Facilities	3
	Pump Station	9
	Sewage Treatment Plant	1
	Water Well	10
	Total	**31**
At Risk Population Facilities	Day Care Center	3
	Places of Worship	2
	School	2

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
	Total	**7**
Hazardous Materials and Solid Waste Facilities	Solid Waste Facility	2
	Tank Farm	1
	Total	**3**
Non-Wildland/Non-Urban Total		**41**
Urban Unzoned		
Essential Services Facilities	Airport	1
	Bridge	20
	Cellular Tower	1
	Emergency Evacuation Center	89
	EMS Stations	26
	FDIC Insured Banks	75
	Fire Station	22
	Floodgate	38
	Hospital or Urgent Care	16
	Law Enforcement	27
	Microwave Service Towers	490
	Port Facilities	2
	Power Plants	7
	Public Transit Stations	39
	Pump Station	183
	Sewage Treatment Plant	8
	State Government Buildings	32
	Water Well	133
	Total	**1,209**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	11
	Community Center	2
	Day Care Center	134
	Major Sports Venues	3
	Mobile Home Parks	21
	Places of Worship	419
	School	234
	Total	**824**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	2
	EPA ER TRI Facility	38
	EPA ER TSCA Facility	2

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
	Leaky Underground Storage Tank	172
	Solid Waste Facility	18
	Tank Farm	3
	Waste Transfer Station	5
	Total	**240**
Urban Unzoned Total		**2,273**
City of Sacramento Total		**2,377**

Source: CAL FIRE, Sacramento County

Figure F-63 City of Sacramento – Critical Facilities in Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table F-70 City of Sacramento – Critical Facilities by Fire Threat Areas

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
High		
Essential Services Facilities	Floodgate	1
	Pump Station	1
	Total	**2**
High Total		**2**
Low		
Essential Services Facilities	Cellular Tower	1
	Floodgate	3
	Microwave Service Towers	9
	Pump Station	5
	Sewage Treatment Plant	1
	Water Well	3
	Total	**22**
At Risk Population Facilities	School	1
	Total	**1**
Low Total		**23**
Moderate		
Essential Services Facilities	Floodgate	3
	Microwave Service Towers	5
	Power Plants	1
	Public Transit Stations	1
	Water Well	2
	Total	**12**
At Risk Population Facilities	Mobile Home Parks	1
	Places of Worship	1
	Total	**2**
Hazardous Materials and Solid Waste Facilities	EPA ER TRI Facility	1
	Solid Waste Facility	3
	Total	**4**
Moderate Total		**18**
No Threat		
Essential Services Facilities	Airport	1
	Bridge	26
	Cellular Tower	1
	Emergency Evacuation Center	91
	EMS Stations	26

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
	FDIC Insured Banks	82
	Fire Station	22
	Floodgate	36
	Hospital or Urgent Care	16
	Law Enforcement	27
	Microwave Service Towers	487
	Port Facilities	6
	Power Plants	6
	Public Transit Stations	40
	Pump Station	194
	Sewage Treatment Plant	8
	State Government Buildings	33
	Water Well	146
	Total	**1,248**
At Risk Population Facilities	Colleges, Universities, and Professional Schools	11
	Community Center	2
	Day Care Center	140
	Major Sports Venues	3
	Mobile Home Parks	21
	Places of Worship	426
	School	237
	Total	**840**
Hazardous Materials and Solid Waste Facilities	EPA ER FRP Facility	2
	EPA ER TRI Facility	38
	EPA ER TSCA Facility	3
	Leaky Underground Storage Tank	174
	Solid Waste Facility	20
	Tank Farm	4
	Waste Transfer Station	5
	Total	**246**
No Threat Total		**2,334**
City of Sacramento Total		**2,377**

Source: CAL FIRE, Sacramento County

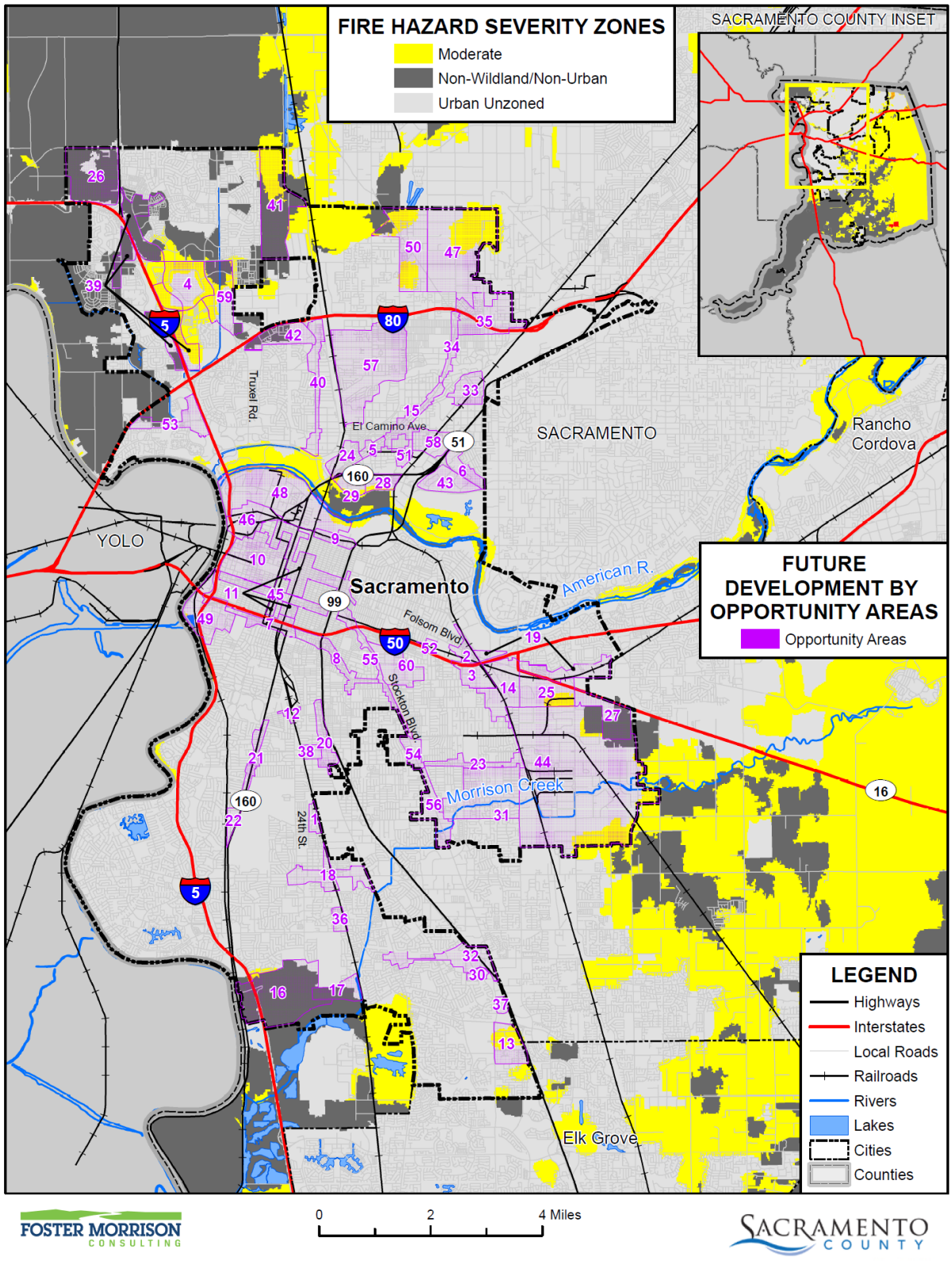
Future Development

Additional growth and development within moderate or higher fire hazard severity zones in the City would place additional values at risk to wildfire. City building codes are in effect and should continue to be updated as appropriate to reduce this risk. Most the City's wildfire hazard area is owned by the State of California or Sacramento County and is preserved as a natural habitat.

GIS Analysis

The City provided 60 Opportunity Areas which were used as the basis for the inventory of future development areas for the City. Utilizing the Opportunity Areas spatial layer, the parcel centroid data was intersected to determine the parcel counts and acreage within each area. Figure F-64 shows the locations of the Opportunity Areas overlayed on the FHSZs (with a legend shown on Figure F-65). Table F-71 shows the parcels and acreages of each Opportunity Area in the City by FHSZ. Figure F-66 (with a legend shown on Figure F-67) shows the locations of Opportunity Areas overlayed on the Fire Threat Areas. Table F-72 shows the parcels and acreages of each Opportunity Area in the City by Fire Threat Area.

Figure F-64 City of Sacramento - Future Development Opportunity Areas and FHSZs



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 11/2021.

Figure F-65 City of Sacramento – Future Development Opportunity Areas Legend

Table F-71 City of Sacramento – Future Development Opportunity Areas and FHSZs

Fire Threat / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
High				
Globe LRT	1	1	0	1.46
Johnston West	2	0	2	9.44
High Total	3	1	2	10.89
Moderate				
Cosumnes River	10	2	8	25.57
Granite Park	9	0	9	43.66
Jackson	2	1	1	15.45
Johnston West	2	0	2	0.72
Mack	1	0	1	4.24
Methodist Med Center	2	0	2	5.94
North Natomas EC	1	0	1	5.29
Panhandle	4	1	3	167.83
Power Inn/Army Depot	12	3	9	117.72

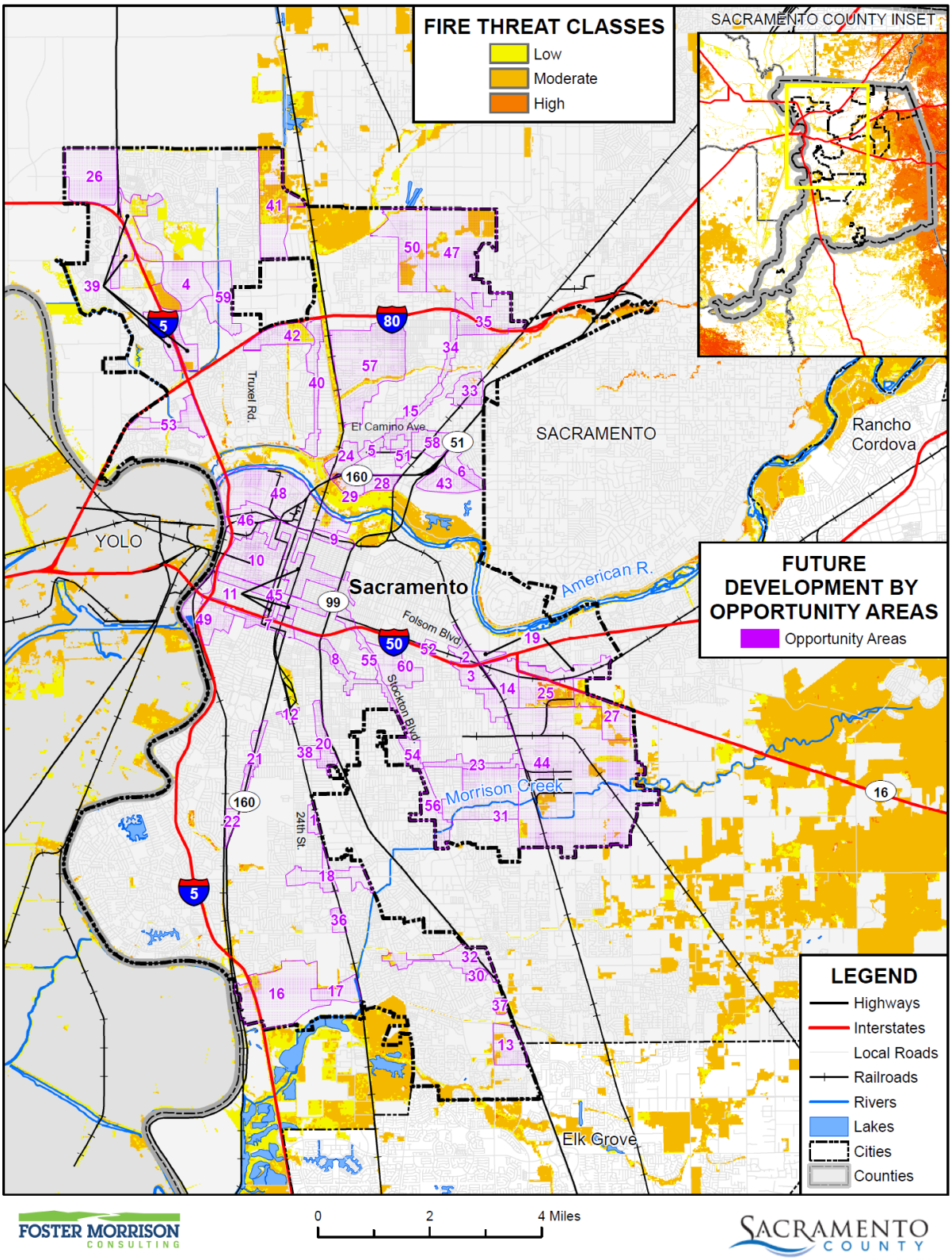
Fire Threat / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Raley	30	0	30	161.49
Richards Boulevard	1	0	1	3.67
Robla	5	1	4	48.51
Moderate Total	**79**	**8**	**71**	**600.09**
Low				
Cosumnes River	1	0	1	4.86
Delta Shores	4	0	4	14.90
Granite Park	1	0	1	13.36
Jackson	4	0	4	11.90
Johnston West	1	0	1	2.56
Mack	2	0	2	7.06
North Natomas EC	6	0	6	42.24
Panhandle	1	0	1	64.22
Parkebridge	7	0	7	73.78
Power Inn/Army Depot	5	0	5	24.19
Raley	4	0	4	11.95
Richards Boulevard	2	0	2	11.47
Low Total	**38**	**0**	**38**	**282.51**
No Threat				
47th	25	11	14	12.65
65th North	31	19	12	18.43
65th South	9	7	2	17.68
Arco Arena	18	7	11	55.13
Arden Fair	21	15	6	71.74
Arden/Del Paso	55	29	26	20.47
Broadway	74	52	22	16.33
Broadway East	140	63	77	23.95
C Street	15	5	10	33.65
CBD	99	59	40	33.67
Central City Corridors	397	272	125	68.70
City College	54	26	28	8.64
Cosumnes River	27	12	15	37.08
CSUS Village	83	42	41	159.78
Del Paso	98	60	38	33.67
Delta Shores	27	10	17	676.70

Fire Threat / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Delta Shores Transit Center	2	0	2	49.02
Florin	75	45	30	109.87
Folsom East	44	33	11	91.88
Franklin	104	63	41	38.72
Freeport North	50	43	7	24.99
Freeport South	20	12	8	28.91
Fruitridge	33	20	13	14.45
Globe LRT	88	38	50	44.81
Granite Park	16	9	7	25.65
Greenbriar	1	0	1	252.14
Jackson	8	2	6	368.38
Johnston East	28	17	11	46.52
Johnston West	22	19	3	54.68
Kaiser Med Center	2	2		0.72
Lemon Hill	124	21	103	74.50
Mack	53	42	11	101.38
Marconi	71	34	37	39.79
Marysville	86	34	52	25.26
McClellan Heights/Parker Homes	54	3	51	51.51
Meadowview	6	0	6	11.31
Methodist Med Center	1	0	1	1.08
North City Farms	20	1	19	8.56
North Natomas EC	58	25	33	529.29
Northgate	104	76	28	102.07
Panhandle	3	0	3	65.67
Parkebridge	11	8	3	64.70
Parkerbridge	1	0	1	0.46
Point West	45	45	0	129.56
Power Inn/Army Depot	407	221	186	1,156.42
R Street Central City Housing	113	55	58	25.69
Railyards	30	4	26	28.79
Raley	149	48	101	402.80

Fire Threat / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Richards Boulevard	157	49	108	399.99
Riverfront	58	28	30	59.17
Robla	89	8	81	81.29
Royal Oaks	29	18	11	13.33
Southwest Natomas	25	10	15	68.21
Stockton	35	24	11	55.54
Stockton North	88	53	35	23.02
Stockton South	46	30	16	57.96
Strawberry Manor	277	75	202	177.02
Swanston Station	107	55	52	51.15
Truxel	40	26	14	87.59
UCD Med Center	117	2	115	5.38
No Threat Total	**4,070**	**1,987**	**2,083**	**6,337.50**
Grand Total	**4,190**	**1,996**	**2,194**	**7,230.98**

Source: CAL FIRE, City of Sacramento GIS

Figure F-66 City of Sacramento - Future Development Opportunity Areas and Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 11/2021.

Figure F-67 City of Sacramento – Future Development Opportunity Areas Legend

Table F-72 City of Sacramento – Future Development Opportunity Areas and Fire Threat Areas

Fire Hazard Severity Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Moderate				
Arco Arena	12	7	5	46.39
Cosumnes River	23	6	17	34.17
Delta Shores	4	0	4	14.90
Granite Park	7	0	7	38.37
Johnston East	5	5	0	10.24
Johnston West	4	0	4	4.25
North Natomas EC	12	4	8	104.83
Northgate	1		1	0.44
Panhandle	5	1	4	202.48
Power Inn/Army Depot	38	18	20	190.94
Raley	20	3	17	283.91
Richards Boulevard	1	0	1	3.67

Fire Hazard Severity Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Robla	60	2	58	102.69
Truxel	11	7	4	18.75
Moderate Total	**203**	**53**	**150**	**1,056.02**
Non-Wildland/Non-Urban				
Delta Shores	21	6	15	600.69
Greenbriar	1	0	1	252.14
Jackson	4	0	4	159.44
North Natomas EC	41	19	22	392.89
Panhandle	3	0	3	95.24
Parkebridge	1	0	1	3.65
Robla	1	0	1	7.23
Southwest Natomas	1	0	1	7.94
Truxel	18	11	7	29.51
Non-Wildland/Non-Urban Total	**91**	**36**	**55**	**1,548.73**
Urban Unzoned				
47th	25	11	14	12.65
65th North	31	19	12	18.43
65th South	9	7	2	17.68
Arco Arena	6		6	8.75
Arden Fair	21	15	6	71.74
Arden/Del Paso	55	29	26	20.47
Broadway	74	52	22	16.33
Broadway East	140	63	77	23.95
C Street	15	5	10	33.65
CBD	99	59	40	33.67
Central City Corridors	397	272	125	68.70
City College	54	26	28	8.64
Cosumnes River	15	8	7	33.34
CSUS Village	83	42	41	159.78
Del Paso	98	60	38	33.67
Delta Shores	6	4	2	76.02
Delta Shores Transit Center	2	0	2	49.02
Florin	75	45	30	109.87

Fire Hazard Severity Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Folsom East	44	33	11	91.88
Franklin	104	63	41	38.72
Freeport North	50	43	7	24.99
Freeport South	20	12	8	28.91
Fruitridge	33	20	13	14.45
Globe LRT	89	39	50	46.27
Granite Park	19	9	10	44.30
Jackson	10	3	7	236.30
Johnston East	23	12	11	36.28
Johnston West	23	19	4	63.14
Kaiser Med Center	2	2	0	0.72
Lemon Hill	124	21	103	74.50
Mack	56	42	14	112.68
Marconi	71	34	37	39.79
Marysville	86	34	52	25.26
McClellan Heights/Parker Homes	54	3	51	51.51
Meadowview	6	0	6	11.31
Methodist Med Center	3	0	3	7.02
North City Farms	20	1	19	8.56
North Natomas EC	12	2	10	79.10
Northgate	103	76	27	101.63
Parkebridge	17	8	9	134.83
Parkerbridge	1	0	1	0.46
Point West	45	45	0	129.56
Power Inn/Army Depot	386	206	180	1,107.39
R Street Central City Housing	113	55	58	25.69
Railyards	30	4	26	28.79
Raley	163	45	118	292.33
Richards Boulevard	159	49	110	411.47
Riverfront	58	28	30	59.17
Robla	33	7	26	19.88
Royal Oaks	29	18	11	13.33

Fire Hazard Severity Zone / Opportunity Area	Total Parcel Count	Improved Parcel Count	Unimproved Parcel Count	Total Acres
Southwest Natomas	24	10	14	60.27
Stockton	35	24	11	55.54
Stockton North	88	53	35	23.02
Stockton South	46	30	16	57.96
Strawberry Manor	277	75	202	177.02
Swanston Station	107	55	52	51.15
Truxel	11	8	3	39.33
UCD Med Center	117	2	115	5.38
Urban Unzoned Total	**3,896**	**1,907**	**1,989**	**4,626.23**
Grand Total	**4,190**	**1,996**	**2,194**	**7,230.98**

Source: CAL FIRE, City of Sacramento GIS

F.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

F.6.1. Regulatory Mitigation Capabilities

Table F-73 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Sacramento.

Table F-73 City of Sacramento Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2015	The General Plan identifies hazards within the City. Identified mitigation actions can be implemented from this document.
Capital Improvements Plan	Y 2021-2026	The Capital Improvement Program is a five-year expenditure plan which provides the City with a financial plan for the funding of infrastructure and facility projects. The program identifies projects to address the City's natural hazards.
Economic Development Plan	N	
Local Emergency Operations Plan	Y 2018	This plan addresses potential hazards that face the community. Mitigation projects are not identified.

Continuity of Operations Plan	Y	Essential functions of City staff, relocation strategies, recover and reconstruction strategies have been developed in the event of a disaster. Does not identify mitigation strategies.
Transportation Plan	Y	This City's transportation plan is incorporated into the 2035 General Plan, Mobility. This portion of the plan identifies mitigation goal for greenhouse gases related to extreme weather hazards.
Stormwater Management Plan/Program	Y	This program regulates future and current stormwater standards to protect the City against high priority hazards, such as, flooding and severe storms.
Engineering Studies for Streams	Y	Many of the studies exam the impacts of a 100-year and 200-year storm. At times the studies provide mitigation options for flooding issues.
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change mitigation)	Y	The City has prepared the 2035 General Plan as a qualified plan for the reduction of greenhouse gas emissions. Therefore, the General Plan serves as the City's Climate Action Plan. City Pre-Disaster Recovery Plan was completed in 2019. This plan guides decisions that affect the City's short, intermediate, and long-term recovery after a disaster.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: 2019 The Building Code is adequately enforced.
Building Code Effectiveness Grading Schedule (BCEGS) Score	Y	Score: 2/2 The Building Code is adequately enforced.
Fire department ISO rating:	Y	Rating: 2 (within city limits), 3 (in contract areas – Natomas and Fruitridge Pacific) The fire protection codes is adequately enforced.
Site plan review requirements	Y	Site plan review requirements are adequately enforced.
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	Yes, the ordinance is an effective measure for reducing hazard impacts and is adequately administered and enforced.
Subdivision ordinance	Y	Yes, the ordinance is an effective measure for reducing hazard impacts and is adequately administered and enforced.
Floodplain ordinance	Y	Yes, the ordinance is an effective measure for reducing hazard impacts and is adequately administered and enforced.
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	2008 American River Parkway Plan is an effective measure for reducing hazard impacts and is adequately administered and enforced.
Flood insurance rate maps	Y	This plan presents a set of strategies that will achieve a community-wide greenhouse gas reduction goal.
Elevation Certificates	Y	Yes, the FIRMs are an effective measure for reducing hazard impacts and is adequately administered and enforced.
Acquisition of land for open space and public recreation uses	Y	Yes, the Elevation Certificates are an effective measure for reducing hazard impacts and is adequately administered and enforced.

Erosion or sediment control program	Y	When used, acquisition of land is an effective measure for reducing hazard impacts and is adequately administered and enforced.
Other	Y	Yes, the erosion control program for the region is an effective measure for reducing hazard impacts and is adequately administered and enforced.
How can these capabilities be expanded and improved to reduce risk?		
The City continually evaluates the ordinance requirements of FEMA's CRS program. Improvements are made as needed to reduce risk to people and property.		

Source: City of Sacramento

City of Sacramento 2035 General Plan

The City of Sacramento 2035 General Plan serves as a blueprint for future growth and development and provides comprehensive planning for the future. It encompasses what the City currently is and what it intends to be. It provides the general framework to achieve the desired future condition.

The General Plan includes a Public Health and Safety Element that focuses on safety issues to be considered in planning for the present and future development for the City. The General Plan also addresses Environmental Resources which considers climate change and severe weather hazards facing the City. Goals related to mitigation strategies are outlined. The 2035 General Plan is currently being updated and is anticipated to be adopted in 2022.

City of Sacramento Urban Water Management Plan (2020 Draft)

An Urban Water Management Plan (UWMP) helps water suppliers assess the availability and reliability of their water supplies and current and projected water use to help ensure reliable water service under different conditions. This water supply planning is especially critical for California currently, as climate change is resulting in changes in rainfall and snowfall which impact water supply availability and development is occurring throughout the State resulting in increased needs for reliable water supplies. The Urban Water Management Planning Act (Act) requires larger water suppliers that provide water to urban users (whether directly or indirectly) to develop UWMPs every five years. UWMPs evaluate conditions for the next 20 years, so these regular updates ensure continued long-term planning.

Since the City of Sacramento (City) provides water service directly to more than 3,000 connections, it is required to prepare a UWMP.

City of Sacramento Emergency Operations Plan

The City of Sacramento Emergency Operations Plan (EOP) addresses the planned response for the City of Sacramento to emergencies associated with disasters, technological incidents, or other dangerous conditions created by either man or nature. It provides an overview of operational concepts, identifies components of the City emergency management organization, and describes the overall responsibilities of local, state, and federal entities. It addresses the hazards addressed in the previous 2011 City and County of Sacramento Hazard Mitigation Plan.

Sacramento County Warning and Evacuation Procedures

The City of Sacramento in conjunction with Sacramento County and other incorporated communities have a variety of systems and procedures established to protect its residents and visitors to plan for, avoid, and respond to a hazard event including those associated with floods and other natural disasters. This includes Pre-Disaster Public Awareness and Education information which is major component in successfully reducing loss of life and property in a community when faced with a potentially catastrophic incident. Much of this information is not specific to a given hazard event and is always accessible to the public on local City and County websites, while other information is incident-specific. A general overview of specific warning and evacuation systems and procedures are summarized further below.

Monitoring for Alerts, Watches and Warnings

Emergency officials constantly monitor events and the environment to identify specific threats that may affect their jurisdiction and increase awareness levels of emergency personnel and the community when a threat is approaching or imminent.

The National Weather Service (NWS), a part of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), is the prime agency for detecting meteorological threats, such as floods and severe weather. Severe weather warnings are transmitted through NOAA's Weather Radio System, considered by the federal government as the official source for weather information. Federal agencies can only look at the large scale, (e.g., whether conditions are appropriate for the formation of a thunderstorm.) Local emergency managers can provide more site-specific and timely recognition by sending out NWS trained spotters to watch the skies when the Weather Service issues a watch or a warning. The NWS page for Sacramento County and incorporated communities is accessible through the Sacramento County website and at the following: http://forecast.weather.gov/MapClick.php?zoneid=CAZ017

A flood threat recognition system predicts the time and height of a flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels.

On larger rivers, this measuring and calculating is performed by the NWS. Support for NOAA's efforts is provided by cooperating partners from state and local agencies. Forecasts of expected river stages are made through the Advanced Hydrologic Prediction Service (AHPS) of the NWS. Flood threat predictions are disseminated on the NOAA Weather Wire or NOAA Weather Radio.

On smaller rivers, locally established rainfall and river gauges are needed to establish a flood threat recognition system. The NWS may issue a "flash flood watch." This is issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain nor imminent. These events are so localized and so rapid that a "flash flood warning" may not be issued, especially if no remote threat recognition equipment is available. In the absence of a gauging system on small streams, the best threat recognition system is to have local personnel monitor rainfall and stream conditions. While specific flood crests and times will not be predicted, this approach will provide advance notice of potential local or flash flooding.

The City and County EOPs include procedures for threat identification. The City and County work closely with the NWS for issuing an Emergency Alert System (EAS). Additional threat identification mechanisms include:

California Data Exchange Center (CDEC). The CDEC provides information for flood forecasting information at http://cdec.water.ca.gov/. The CDEC installs, maintains, and operates an extensive hydrologic data collection network including automatic snow reporting gages for the Cooperative Snow Surveys Program and precipitation and river stage sensors for flood forecasting.

Automated Local Evaluation in Real Time (ALERT) System. ALERT was created by the NWS to provide continuous and automatic reports from river levels and rainfall gauges detect impending high water levels. ALERT information includes:

- Rainfall Summary
- Stage Summary
- Storm Ready
- Sandbag Information
- Detailed Forecast
- Quantitative Precipitation Forecasts (QPF)
- NWS River Forecasts

The regional ALERT system consists of 2 base stations, and 50 gaging stations. The purpose of the County's ALERT website is to provide real time monitoring information to stage and rainfall information during storm events, which assist in informing the activation of additional warning and potential evacuation of affected areas. This information which can be accessed through links from the City of Sacramento's website to the Sacramento County website includes information for: Stream Level Summaries and Maps; and Rainfall Summaries and Maps. See https://www.sacflood.org/home.php.

Dam Protocols. Should an event trigger the activation of an Emergency Action Plan (EAP) for a potential dam failure, City OEM and County OES receives this information via direct phone calls from the originating source/agency or from Sacramento County Dispatch and/or Cal OES. City OES then follows the notification and evacuation procedures called for in the EOP.

Notifications and Warning Systems

Once a disaster is imminent, action is taken to control the situation, save lives, protect property, and minimize the effects of the disaster. During this phase, warning systems are activated; resources and first responders notified and mobilized; and evacuations begin.

After a threat recognition system tells the emergency management office that a flood, severe weather or other hazard is coming, the next step is to notify the public and staff of other agencies and critical facilities. Providing adequate and timely notification to the public is the greatest challenge, especially with sudden or no-notice events. The earlier and more specific the warning, the greater the number of people that can implement protection measures.

As previously described, the NWS issues notices to the public using two levels of notification:

- **Watch.** Conditions are right for flooding, thunderstorms, or other hazard event.
- **Warning**. A flood or other event has started or been observed.

In coordination with established public safety warning protocols, the activated EOC will manage the dissemination of timely and adequate warnings to threatened populations in the most direct and effective means possible. Depending upon the threat and time availability, the City and County EOCs will initiate alerts and warnings utilizing any of the following methods:

- Activation of the Emergency Alert System (EAS)
- Activation of the Telephonic Alert and Warning
- System (Everbridge and Reverse 911)
- Activation of the Emergency Digital Information System (EDIS)
- Activation of the California Law Enforcement Mutual Aid Radio System (CLEMARS)
- Media broadcast alerts.
- Commercial or public radio or TV stations
  - ✓ Radio: KFBK 1530 am, KSTE 650, KGBY, 92.5 FM
  - ✓ TV: KCRA Channel 3, www.KCRA.com; KXTV Channel 10; KOVR Channel 13; KTXL Channel 40
- NOAA Weather Radio
- www.saccounty.net; SacramentoReady.org websites
- 211/311 Sacramento
- CalTrans 511
- Telephone trees/mass telephone notifications
- Tone activated receivers in key facilities
- Fire and Law enforcement loudspeakers
- Outdoor warning sirens
- Mobile public address sirens/systems
- Door-to-door contact
- Vulnerable population databases
- Email notifications

Multiple or redundant systems are most effective – if people do not hear one warning, they may still get the message from another part of the system. Just as important as issuing a warning is telling people what to do in case of an emergency. A warning program should have a public information aspect that details appropriate warnings and responses.

Sacramento ALERT

The City of Sacramento Police Department in partnership with all public safety agencies within Sacramento, Yolo and Placer counties, use a state-of-the-art emergency alert system known as Sacramento Alert. The system provides information to residents about emergency events quickly and through a variety of communication methods.

The alert system currently includes all listed and unlisted landline telephone numbers in Yolo, Placer, and Sacramento counties that are serviced by AT&T and Verizon.

To ensure emergency notices are received quickly both at work and home, residents are encouraged to log onto the Sacramento Alert Self- Registration Portal and provide phone numbers for both home and work,

including land and cell phone numbers, email addresses, TTY device information and instant messaging information.

Residents will only receive alerts that are critical and time-sensitive, including: flooding, levee failures, severe weather, disaster events, unexpected road closures, missing persons, and evacuations of buildings or neighborhoods in specific geographic locations.

The system, which uses Everbridge Alert and Notifications System, was made possible for all three counties by a grant from CAL OES and supported by CA Department of Water Resources, Flood Operations Center.

StormReady

The NWS established the StormReady program to help local governments improve the timeliness and effectiveness of hazardous weather related warnings for the public. The City of Sacramento and Sacramento County are StormReady certified. StormReady communities are better prepared to save live from the onslaught of severe weather through advanced planning, education, and awareness. Being designated a StormReady community by the NWS is a good measure of a community's emergency warning program for weather hazards.

Evacuation and Shelter-in-Place

The principle of evacuation is to move citizens from a place of relative danger to a place of relative safety, via a route that does not pose significant danger. There are six key components to a successful evacuation:

- Adequate warning
- Adequate routes
- Proper timing to ensure the routes are clear
- Traffic control
- Knowledgeable travelers
- Care for special populations (e.g., disabled, hospital patients, school children)

Evacuation planning also considers sheltering options for those that cannot get out of harm's way. Shelters can also serve as a temporary place after the storm for those who have lost their homes.

The City maintains an Evacuation Plan that outline strategies and protocols for medium to high-level (catastrophic) evacuation events. These plans also include procedures for sheltering to provide people affected by a disaster with a safe, temporary place to be housed during or immediately after a disaster until they can either return to their homes or be relocated to other housing facilities. Highlights of these City plans are detailed below.

City of Sacramento Evacuation Plan

The Evacuation Plan is an Annex to the City of Sacramento's Emergency Operations Plan. As such its intent is to support and guide the City's Emergency Managers, Emergency Operations Center staff, and other governmental and non-governmental agencies who would be involved with an Evacuation Event in the City. The Evacuation Plan provides evacuation specific strategy and information that is intended to

support but not supplant operational strategy as provided in the City's EOP and Departmental operations plans.

The primary threat that would incite the City to begin an evacuation event is a flood. As such, much of the material was written with flood as the primary concern. The overall evacuation strategy and associated plan details, however, would also serve the City in conducting an evacuation due to other hazards and as such the Plan is intended to provide an all-hazards approach.

The plan is organized such that the first five sections provide quick reference materials to support emergency workers. The plan begins with Section 1 – Triggers and Activation, which details the flood threat triggers that would initiate the opening and staffing of the City EOC, and initiate notification, evacuation, and sheltering actions that need to take place as the imminent and substantial threat of a flood increases. Section 2 - Roles, Responsibilities, and Resources is meant to support emergency managers with deciding minimal personnel requirements to complete actions defined in the trigger section, who they should seek to fulfill certain roles, and to provide some general notion of resources likely already available for the situation. The next part, Section 3- Emergency Public Notifications, provides the emergency staff with a brief description of each of the notification systems the City has available to notify the citizenry, along with a How To Activate description. Section 4 – Area Evacuation Control by Police Beats, provides evacuation routes for every area of the City as broken out by the Sacramento Police Department Beat maps. Many critical facilities, schools and shelters in each beat are identified. This information is useful both for supporting evacuations out of an area, and supporting evacuees coming into an area. In Section 5 – Care and Sheltering, the community centers and schools that have been assessed as available and ready to support sheltering of people and their pets, and may be assessable to people with disabilities, are listed with contact information.

Evacuation maps, by police beat, are shown. Flood scenarios are also given, and evacuation routing planned for. An example is shown in Figure F-68.

Figure F-68 Sacramento River Sutter Scenario Evacuation Routes for Beat 1-A

Evacuation Routes: 0-4 Hours
Police Beat 1A

Flood Scenario **1 - Sacramento River - Sutter**

Status *PASSABLE STREETS (1)*

Street	Direction	# of Lanes	Comments
ARENA BLVD	E/W	4	
(2) DEL PASO RD	E/W	4	
EL CENTRO RD	N/S	2	
(2) ELKHORN BL	E/W	2	
(2) ELVERTA RD	E/W	2	
(2) GARDEN HWY	E/W	2	
N MARKET BLVD	E/W	4	
NATOMAS BLVD	N/S	4	
(2) SAN JUAN RD	E/W	2	

Notes:
(1) Streets that are expected to be open for at least the first 4 hours of an event.
(2) Roadways which take evacuees directly out of the flood area.

Source: City of Sacramento Evacuation Plan, 2008

Rescue and Evacuation Maps

These maps show the depth of flooding with a 300-foost levee breach, 100-year storm, and running 10 days straight without mitigation. These maps also show the rescue and evacuation areas. The rescue areas show which areas would have 2' of water within an hour. These maps are available online at: http://mysacramento.org/utilities/flood-ready/city_county_neighborhood_flood_depth_maps.cfm.

More information on the importance of including evacuation procedures and maps as part of a sound mitigation strategy can be found in Appendix C to this plan. In addition, Appendix C contains additional information on post mitigation policies and procedures. More information specific to the City can be found in their various other response and recovery plans.

City of Sacramento Post Disaster Mitigation Policies and Procedure

The City of Sacramento EOP, and related documents, are intended to facilitate multi-agency and multi-jurisdictional coordination during emergencies including hazard events. Through it policies and procedures it seeks to mitigate the effects of hazards, prepare for measures to be taken which will preserve life and minimize damage, enhance response during emergencies and provide necessary assistance, and establish a recovery system in order to return the community to their normal state of affairs.

The goal of the recovery phase of an emergency incident or natural disaster is to return the residents, public services and private sector in an impacted area to their pre-disaster state, and through implementation of hazard mitigation measures, seek to prevent, as much as possible, similar damage, destruction or chaos after incidents and disasters in the future. Sacramento policies include objectives, responsibilities and procedures

for restoration of services and returning of the affected area to its pre-emergency condition. Mitigation is emphasized as a major component of recovery efforts.

Post-disaster recovery activities are designed to protect public health and safety and facilitate recovery. Appropriate measures include:

- Patrolling evacuated areas to prevent looting
- Providing safe drinking water
- Monitoring for diseases
- Vaccinating residents for tetanus and other diseases
- Clearing streets
- Cleaning up debris and garbage

As the initial and sustained operational priorities are met, emergency management officials consider the recovery phase needs. Short-term and long-term recovery is covered in EOP and related documents. Short-term recovery operations begin during the response phase and include rapid debris removal and cleanup and restoration of essential services to minimum operating standards. Long-term recovery operations work to restore the community to pre-disaster conditions and include hazard mitigation activities, restoration and reconstruction of public facilities, and disaster response cost recovery. Local Assistance Centers and/or Disaster Recovery Centers are opened and damages assessed. Elements of recovery include:

- Windshield survey and documentation of flood impacts
- Safety assessment
- Damage assessments
- Engineering assessments
- Post-flood building entry
- High water marks (also risk communication)
- Code enforcement/triage process
- Permitting process
- Temporary housing
- After action reporting

Regulating Reconstruction

Requiring permits for building repairs and conducting inspections are vital activities to ensure that damaged structures are safe for people to reenter and repair. The NFIP requires that local officials enforce the substantial damage regulations. These rules require that if the cost to repair a building in the mapped floodplain equals or exceeds 50% of the building's market value, the building must be retrofitted to meet the standards of a new building in the floodplain. In most cases, this means that a substantially damaged building must be elevated above the base flood elevation.

Mitigation

Mitigation measures to reduce the risk and vulnerability of a community to future disaster losses can be implemented in advance of a disaster event and also as part of post-disaster recovery efforts. Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. Effective mitigation can break the cycle of disaster damage, reconstruction, and repeated damage. Categories of mitigation measures

include prevention, emergency services, property protection, natural resource protection, structural, and public information, many of which are discussed throughout this document.

Additional mitigation elements specific to the Sacramento area are discussed further below.

LHMP

The Federal Disaster Mitigation Act (DMA) of 2000 requires communities to develop an approved Local Hazard Mitigation Plan (LHMP) to remain eligible to apply for certain FEMA Hazard Mitigation Assistance (HMA) grants. Applications submitted for funding from the FEMA HMA grant programs must "be consistent with" the mitigation strategy outlined in the LHMP. Sacramento County and the City of Sacramento are in process with the update of their 2016 LHMP Update. Once complete and adopted, this LHMP update will provide continued eligibility for all participating jurisdictions for FEMA pre- and post-disaster mitigation funding.

Grant Funding

An understanding of the various funding streams and opportunities will enable the communities to match up identified flood mitigation projects with the grant programs that are most likely to fund them. Additionally, some of the funding opportunities can be utilized together. Mitigation grant funding opportunities available pre- and post- disaster include the following:

- FEMA Hazard Mitigation Assistance (HMA) Grants (Pre-disaster Mitigation (PDM), Flood Mitigation Assistance (FMA), and Hazard Mitigation Grant Program (HMGP))
- FEMA Public Assistance Section 406 Mitigation
- Community Development Block Grants
- Small Business Loans
- Increased Cost of Compliance

Other Key City of Sacramento Emergency Plans

- ✓ DOU Emergency Operations Plan, 2018
- ✓ City's Emergency Operations Plan, 2016
- ✓ Pre-Disaster Recovery Plan, 2019
- ✓ Annexes in Process for: Mass Care/Sheltering, Temporary Housing, Human Services
- ✓ Evacuation Plan for Flood and other Emergencies, 2008
- ✓ Continuity of Operations/Continuity of Government, 2009
- ✓ Drainage Collection Annex to the DOU Emergency Operation Plan, 2018
- ✓ DOU Flood Emergency Plan, 2016DOU Department of Operations Center (DOC) Operations Guide, 2018
- ✓ Resources and References – Drainage Collection
- ✓ Local Hazard Mitigation Plan, Update 2011, 2016 Update in process

Other Key City Data Related to Education and Communication of Flood Hazard Information

- FEMA DFIRMs and Flood Insurance Studies (FIS)
- DWR BAM maps

- Ultimate flood depths map
- Areas dependent on levees map
- Levee break scenario mapping
- Historical flood information which may include location of nearest high water mark, repetitive loss area, flood photos, and flood calls
- Rescue and evacuation maps
- Community assets inventory: people, structures, infrastructure, critical facilities
- Emergency Action Plans

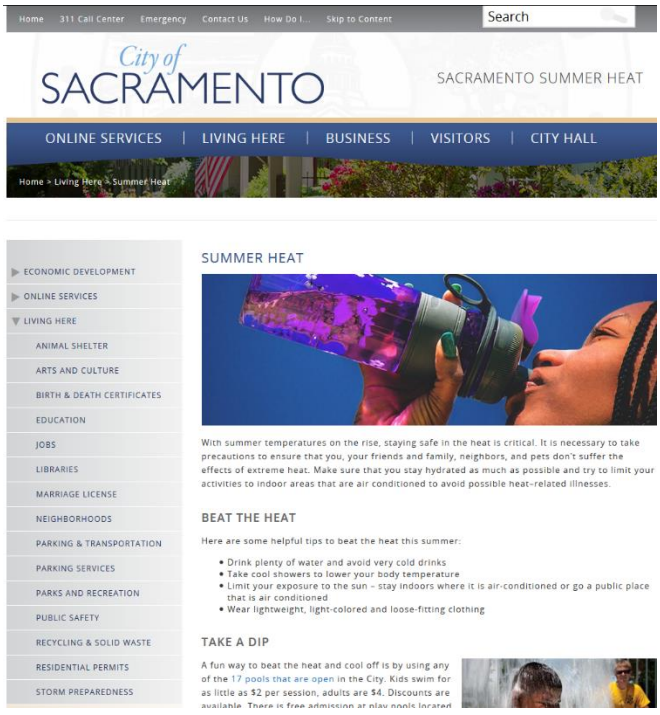
Climate Action Plan

The City's Climate Action Plan (CAP) was incorporated into the 2035 General Plan and adopted in Marchy 2015 . The City's CAP presents a set of strategies that will achieve a community-wide greenhouse gas reduction goal. Many of these strategies will have environmental co-benefits including improving air quality. The City is currently in the process of updating its Climate Action Plan to a Climate Action and Adaptation Plan and in tandem is preparing a Climate Change Vulnerability Assessment. These documents are anticipated to be adopted in 2022.

City of Sacramento Extreme Heat Plan/Cooling Centers

When summer temperatures rise, staying safe in the heat is critical for Sacramento residents. The City publishes information on its website on how to deal with extreme heat.

> ***It is necessary to take precautions to ensure that you, your friends and family, neighbors, and pets don't suffer the effects of extreme heat. Make sure that you stay hydrated as much as possible and try to limit your activities to indoor areas that are air conditioned to avoid possible heat–related illnesses***



The City has historically followed the County OES Severe Weather Guidance when activating cooling centers. The County criteria for opening one includes temperatures of 105 degrees or more for three consecutive days WITH night time low temperatures of 75 or above. If cooling centers are open at faith-based and other community facilities, the list is posted at 211sacramento.org or is available by calling 2-1-1. Starting Memorial Day weekend of 2021, the City began activating cooling centers when National Weather Service issues an *Excessive Heat Warning*. The County Severe Weather Guidance plan is set to be updated.The City website notes that a complete list of pools and openings can be found on the City's website.

Ordinances

The City of Sacramento has many ordinances related to mitigation. These ordinances can be primarily or secondarily focused on mitigation.

Ordinances Primarily Focused on Mitigation

Zoning and Land Use Ordinance (Title 17)

This title and its accompanying maps are known as "the comprehensive zoning plan of the City of Sacramento." It is adopted as a further refinement of the land use plan for Sacramento under the provisions of the "Conservation and Planning Law of the State of California." The purpose of these regulations is to do the following:

- Regulate the use of land, buildings, or other structures for residences, commerce, industry, and other uses required by the community;
- Regulate the location, height, and size of buildings or structures, yards, courts, and other open spaces, the amount of building coverage permitted in each zone, and population density, among other things;
- Divide the city into zones of such shape, size, and number best suited to carry out these regulations, and to provide for their enforcement;
- Ensure the provision of adequate open space for recreational, aesthetic and environmental amenities.

These zoning regulations are necessary to:

- Encourage the most appropriate use of land;
- Conserve, stabilize and improve the value of property;
- Provide adequate open space for recreational, aesthetic and environmental amenities;
- Control the distribution of population;
- Promote health, safety and the general welfare.

Subdivision Ordinance (Title 16)

This title is adopted pursuant to Article XI, Section 7 of the California Constitution, and to supplement and implement the Subdivision Map Act, Government Code Section 66410, et seq., and may be cited as the subdivision ordinance of the city. The regulations established by this title are designed to assist in the systematic implementation of the general plan, specific and community plans, the zoning ordinance, and other land use regulations, and to provide for public needs, health and safety, convenience, and general welfare.

Neither the approval nor conditional approval of the tentative map shall constitute or waive compliance with any other applicable provisions of the city code or other applicable ordinances or regulations adopted by the city, nor shall any such approval authorize or be deemed to authorize a violation or failure to comply with other applicable provisions of the city code or other applicable ordinances or regulations adopted by the city. Nothing in these regulations shall be construed to permit the premature or haphazard subdivision of lands in violation of the applicable zoning and land use regulations.

Building Code (Title 15)

The chapters of this title shall be known and referred to as the Sacramento City Building Code, and may be cited as such, and will be referred to as "this code" or "this building code." The purpose of this code is to provide minimum requirements and standards for the protection of the public safety, health, property, and welfare. This code is not intended as a design specification or an instructional manual for untrained persons. This code shall apply to all new construction and to any alterations, repairs, relocations or reconstruction of a building or any portion thereof including any electrical, mechanical, gas, or plumbing equipment installed on any property or used on or within any building.

As part of the construction permitting process, the City requires completed reports of soil conditions at the specific construction sites to identify potentially unsuitable soil conditions including liquefaction, settlement, subsidence, lateral spreading, and collapse. The City requires that these evaluations be conducted by registered soil professionals, and measures to eliminate inappropriate soil conditions must be applied, depending on the soil conditions. The design of foundation and excavation-wall support must conform to the analysis and implementation criteria described in the CBC, Chapters 16, 18, 33, and the appendix to Chapter 33. Adherence to the CBC and City policies contained in the 2035 General Plan would ensure the maximum practicable protection available for users of buildings and infrastructure and their associated trenches, slopes, and foundations.

Floodplain Management Ordinance (Chapter 15.104)

This chapter is designed to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas. This chapter regulates development which is or might be dangerous to health, safety and property by requiring at the time of initial development or substantial improvement methods of protection against flood damage in areas vulnerable to flooding in order to minimize flood damage. This chapter regulates the following developmental impacts: filling, grading or erosion, alteration of natural flood plains, stream channels or water courses, the imposition of barriers which increase flood hazards, or any other impacts that aggravate or cause flood hazards. This ordinance establishes the City's participation in the NFIP, and establishes base flood elevations at 1 foot above the FIRM flood depth for zones A, AH, and AE. In zones AO, the lowest floor will be elevated to one foot above the FIRM flood depth, or two feet above the highest adjacent grade if not depth number is specified.

Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

- Prohibit encroachments, including fill, new construction, substantial improvements, and other development unless certification by a registered professional engineer is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.
- If the above subsection of this section is satisfied, all new construction and substantial improvements shall comply with all other applicable flood hazard reduction provisions of this section.

The local administrator is empowered to issue a variance only for purposes consistent with the objectives of FEMA's floodplain management regulations. However, a variance could affect flood insurance rates

and may result in flood insurance premium rates on structures which are beyond the means of the person receiving the variance. FEMA requires the city to make an annual report on any variance which is granted, and if FEMA determines that such variance is inconsistent with the objectives of sound floodplain management, FEMA may take action to suspend the city from the National Flood Insurance Program.

Weed and Rubbish Abatement Ordinance (Chapter 8.28)

In order to reduce wildfire potential in the City, excess weeds and rubbish must be mitigated. Weed and rubbish abatement in the city is performed pursuant to Title 4, Division 3, Part 2 of the Government Code. This ordinance places the fire chief as the code enforcement director.

Stormwater Management Ordinance (Chapter 13.16)

This chapter is known as the Stormwater Management and Discharge Control Code. The purpose of this chapter is to protect and promote the health, safety and general welfare of the citizens of the City by controlling non-stormwater discharges to the stormwater conveyance system, by eliminating discharges to the stormwater conveyance system from spills, dumping, or disposal of materials other than stormwater, and by reducing pollutants in urban stormwater discharges to the maximum extent practicable. This chapter is intended to assist in the protection and enhancement of the water quality of watercourses, water bodies, and wetlands in a manner pursuant to and consistent with the Federal Water Pollution Control Act, Porter-Cologne Water Quality Control Act, and National Pollutant Discharge Elimination System (NPDES) Permit No. CAS082597, as such permit is amended and/or renewed.

Grading and Erosion and Sediment Control (Chapter 15.88)

The City's grading ordinance is enacted for the purpose of regulating grading on property within the city to safeguard life, limb, health, property and the public welfare; to avoid pollution of watercourses with nutrients, sediments, or other materials generated or caused by surface water runoff from construction sites; to comply with the City's National Pollution Discharge Elimination System (NPDES) Permit No. CAS082597 issued by the California Regional Water Quality Control Board; and to ensure that the graded site within the city limits complies with all applicable City ordinances and regulations. The grading ordinance is intended to control all aspects of grading operations within the city.

Ordinances Secondarily Focused on Mitigation

City of Sacramento Tree Preservation Ordinance

The City of Sacramento adopted the Tree Preservation Ordinance to protect trees as they are a significant resource for the community. It is the City's policy to retain trees whenever possible regardless of their size. When circumstances will not allow for retention, permits are required to remove heritage trees that are within the City's jurisdiction. Removal of, or construction around, trees that are protected by the tree ordinance are subject to permission and inspection by City arborists. The City of Sacramento Tree Service Division reviews project plans and works with the City of Sacramento Public Works during the construction process to minimize impacts to street trees in the city.

Historic Preservation Ordinance

The City of Sacramento's historic preservation program began in 1975 with the enactment of the City's first Historic Preservation Ordinance. The current Historic Preservation Ordinance (No. 2006-063) was enacted in October 2006. The purpose of the Historic Preservation Ordinance is to identify, protect, and encourage the preservation of significant resources; maintain an inventory and ensure the preservation of these resources; encourage maintenance and rehabilitation of the resources; encourage retention, preservation, and re-use of the resources; safeguard city resources; provide consistency with state and federal regulations; protect and enhance the city's attraction to tourists; foster civic pride in the city's resources; and encourage new development to be aesthetically compatible.

F.6.2. Administrative/Technical Mitigation Capabilities

Table F-74 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Sacramento.

Table F-74 City of Sacramento's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	Y	Approves variances, special permits, tentative maps, and development plans
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Department of Utilities', RD1000, and American River Flood Control District, and State of CA maintain the drainage system, pump stations, and levees within the City. Public Works trims trees.
Mutual aid agreements	Y	Mutual aid agreements are maintained, but reside with different departments in the City.
Other	Y	Law and Legislation Committee
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	Y/FT	Staff is adequate and trained. Coordination efforts between agencies.
Floodplain Administrator	Y/FT	Staff is adequate and trained. Coordination efforts between agencies.
Emergency Manager	Y/FT	Staff is adequate and trained. Coordination efforts between agencies.
Community Planner	Y/FT	Staff is adequate and trained. Coordination efforts between agencies.
Civil Engineer	Y/FT	Staff is adequate and trained. Coordination efforts between agencies.
GIS Coordinator	Y/FT	Staff is adequate and trained. Coordination efforts between agencies.
Other		

Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Sacramento, Yolo, and Placer County oversee an alert system called Everbridge. In addition, the City has outdoor warning signals.
Hazard data and information	Y	Sacramento County Environmental Management runs a hazardous materials program
Grant writing	Y	The City employees grant writers. The Department of Utilities has a grant writer on staff in the Business Services Division.
Hazus analysis	N	Many of the studies performed include Hazus analysis.
Other	Y	River and creeks conditions, water levels, forecasts, etc.
How can these capabilities be expanded and improved to reduce risk?		
The City continually seeks out new grant opportunities to improve and generate new mitigation related activities. The Department of Utility (DOU) Floodplain staff will continue to attend informational meetings to take advantage of any grant opportunities available. DOU Floodplain staff work with a dedicated DOU grant writer.		

Source: City of Sacramento

F.6.3. Fiscal Mitigation Capabilities

Table F-75 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table F-75 City of Sacramento's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Funding has been used for mitigation action projects. It also can be used for future projects.
Authority to levy taxes for specific purposes	Y	There are special taxes to mitigate hazards (i.e., SAFCA development impact fee and property tax assessment). This method can be used in the future.
Fees for water, sewer, gas, or electric services	Y	Utility bill fees and development review costs are used and can be used in the future.
Impact fees for new development	Y	Development impact fees for certain hazards
Storm water utility fee	Y	
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	Y	
Community Development Block Grant	Y	
Other federal funding programs	Y	FEMA, HUD, etc.
State funding programs	Y	DWR, SRF loans, etc.
Other		

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
How can these capabilities be expanded and improved to reduce risk?		
Future increases in the City's drainage rate will allow for needed improvements to the system. The improvements will reduce the flooding risk.		

Source: City of Sacramento

F.6.4. Mitigation Education, Outreach, and Partnerships

Table F-76 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table F-76 City of Sacramento's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	American River Parkway Foundation Certified Emergency Response Teams (CERT)
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes	The City of Sacramento has multiple public education campaigns that promote preparedness and mitigation information. The campaigns include: Stormwater Program Flood Fight Preparedness Event – Highwater Jamboree CRS Program for Public Information (Flood) Fire Suppression Fire Safety
Natural disaster or safety related school programs	No	
StormReady certification	Yes	
Firewise Communities certification	No	
Public-private partnership initiatives addressing disaster-related issues	Yes	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Work with teachers, students, and school administrators to develop a program that addresses natural hazards and preparedness.		

Source: City of Sacramento

The City currently has several outreach programs that are conducted on an annual basis:

- Public Assistance: The City has a floodplain information hotline (916) 808-5061 or floodinfo@ciytofsacramento.org for citizen inquiries about flood insurance, development standards in a floodplain, and flood map information.
- "Be Flood Ready" brochure – this brochure is sent annually to all parcel owners in the City of Sacramento through their Utility bill in October/November.
- "Be Flood Ready" billboard – this billboard is posted up in various locations within the City of Sacramento in October/November.
- Dam Brochure – this brochure is sent annually in the Utility bill in November/December to warn residents about how to be prepared in case of a dam break.
- Repetitive Loss Outreach. The City annually mails a letter of notice on property protection to repetitive loss properties.
- Storm Preparation Outreach
  - ✓ The City annually encourages residents to purchase flood insurance with bus advertising and a billboard along Business 80.
  - ✓ The City works closely with its Fire Department and the City/County Office of Emergency Services to share information at community events about flood risks in our community and flood insurance.
  - ✓ The City is actively working with community volunteers through "Sacramento Ready" to prepare our community for flooding emergencies. The group works with Community Emergency Response Volunteers, American Red Cross and local service agencies to have a team of volunteers ready to assist residents with winter weather preparation and planning, evacuation, and care and shelter.
- "Flood Watch". SAFCA develops and distributes a newsletter called, "Flood Watch", to provide information to the public on levee work status, and assessment information. SAFCA periodically holds community meetings in coordination with the City in areas where levee work is being completed.
- "Flood Risk Notice". As part of Assembly Bill 156, which is part of the Central Valley Flood Protection Plan, the Department of Water Resources is required to send out a "Flood Risk Notice" to all property owners receiving protection from State-Federal project levees. The goal of the notice is to raise flood risk awareness and encourage actions on an individual basis to reduce flood losses. The first notice was sent in approximately September 2010 and will be continued to be sent annually. Instead of sending out a separate notice to all floodplain residents in the City, the City used this notice in 2010 instead as required by the Community Rating System program.
- "Program for Public Information". The City are completed an outreach program under the Community Rating System guidelines, which gives citizens discounts on flood insurance. This strategy will under Activity 330-Outreach Projects.
- The City sponsors/encourages participation in area clean up events and funded several clean up events in Spring/Summer through its Community Action Grant Program.
- The City funds the Sacramento Splash in the Class program, which provides presentations focused on stormwater pollution prevention to third through sixth grade classrooms. On average, the presentations are given to 102 classrooms throughout the City.
- The City supports/sponsors the Pups in the Parkway program which provides pet waste stations along the American River Parkway including Discovery Park.
- The City carries out stormwater pollution prevention outreach by participating in various community outreach events throughout the year (i.e., Earth Day events, cultural events, etc.).
- The City is part of the Sacramento Stormwater Quality Partnership, and as a partner, the City both sponsors and directly carries out stormwater pollution prevention outreach activities. These activities include, but are not limited to:
  - ✓ Participating in clean up events and engaging the public in clean ups.
  - ✓ Implementing pet waste reduction programs and promoting the use of pet waste disposal stations.
  - ✓ Developing and distributing stormwater pollution prevention brochures and promotional materials. Conducting mixed media campaigns (e.g., radio, print ads, television, signage, etc.).

- ✓ Implementing home and garden care programs, including the distribution of educational materials (e.g., Our Water Our World, Waterwise, and River-Friendly Landscaping).
- ✓ Increasing awareness on the impact of fundraiser carwash discharges in waterways by maintaining the River-Friendly Fundraiser Carwash Program (RFFCP) website and distributing promotional materials
- ✓ Working with the Business Environmental Resource Center (BERC) to encourage stormwater pollution prevention and to establish stormwater practices for businesses and mobile businesses.
- ✓ Provide information on proper disposal of mercury-containing waste in coordination with the Household Hazardous Waste programs. Support community outreach events by providing/making available outreach material or engage residents through website, social media, or mixed media to encourage proper disposal of mercury-containing waste.
- ✓ Conduct public outreach to encourage behaviors that address litter/trash, using website, social media and mixed media., and by providing tools for clean-ups.
- ✓ Support schools by providing educational materials or resources on watershed stewardship and stormwater pollution prevention.

F.6.5. Other Mitigation Efforts

To mitigate winter storms and the flooding associated with them, the Department of Utilities and Department of Public Works perform work year around.

- ➢ During the summer, crews assist in maintaining channels, canals and creeks by removing weeds and debris that can impede water flow during winter storms.
- ➢ Floodgates are inspected and maintained throughout the City. Also inspected and maintained are drainage inlets, pumps and generators, which are vital tools in removing water from City streets and discharging storm water into local waterways.
- ➢ Materials are stored close to floodgates or areas prone to flooding. Not only does this provide easy access to materials when needed, but also it helps City crews to open a sandbag station within two hours of being instructed to do so.
- ➢ Drills are held to rehearse floodgate closures to ensure that they can be quickly closed in an emergency.
- ➢ The City's 100,000 public trees are pruned on a 10-year cycle and crews respond promptly to calls about trees that may pose a safety hazard.
- ➢ During a storm event, extra crews are on-call after hours responding to hundreds of calls to 311.
- ➢ Flood Preparedness Week and Annual interagency community event to encourage home and family preparedness, flood protection, floodplain information, evacuation routes and tips, flood warning systems, and sandbag availability

F.7 Mitigation Strategy

F.7.1. Mitigation Goals and Objectives

The City of Sacramento adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

F.7.2. NFIP Mitigation Strategy

Given the flood hazard in the Planning Area, an emphasis will be placed on continued compliance with the National Flood Insurance Program (NFIP) and participation by Sacramento County and the City of Sacramento in the Community Rating System. Other cities are encouraged to begin participating in the CRS. Detailed below is a description of the City's flood management program to ensure continued compliance with the NFIP.

City of Sacramento's Flood Management Program: Recent Activities

The City of Sacramento has participated in the Regular Phase of the NFIP since September 1978. Since then, the City has administered floodplain management regulations that meet the minimum requirements of the NFIP. Under that arrangement, residents and businesses paid the same flood insurance premium rates as most other communities in the country.

The City of Sacramento submitted applications to participate in the CRS program in December 1990 and again 1992, shortly after its 1990 launch. It is designed to recognize floodplain management activities that are above and beyond the NFIP's minimum requirements. CRS is designed to reward a community for implementing public information, mapping, regulatory, loss reduction and/or flood preparedness activities. On a scale of 10 to 1, the City is currently ranked Class 3.

The activities credited by the CRS provide direct benefits to the City of Sacramento and its residents, including:

- Enhanced public safety;
- A reduction in damage to property and public infrastructure;
- Avoidance of economic disruption and losses;
- Reduction of human suffering; and
- Protection of the environment.

The activities that City of Sacramento implements and receives CRS credits include:

- **Activity 310** – Elevation Certificates: The Department of Utilities (DOU) maintains elevation certificates for new and substantially improved buildings. Copies of elevation certificates are made available upon request. Elevation Certificates are also kept for post-FIRM and pre-FIRM buildings. The City maintains hard copies in folders at DOU (away from the permit office) and electronically in the City's building permit database.
- **Activity 320** – Map Information Service: Credit is provided for furnishing inquirers with flood zone information from the community's Flood Insurance Rate Map (FIRM), publicizing the service annually and maintaining records.
- **Activity 330** – Outreach Projects: A community brochure is mailed to all properties in the community on an annual basis. An outreach brochure is mailed annually to all properties in the community's Special Flood Hazard Area (SFHA). The community also provides flood information through displays on buses and billboards, and at community events.
- **Activity 340** – Hazard Disclosure: Credit is provided for state and community regulations requiring disclosure of flood hazards.

- **Activity 350** – Flood Protection Information: Documents relating to floodplain management are available in the reference section of the Sacramento Public Library. Credit is also provided for floodplain information displayed on the City's website.
- **Activity 360** – Flood Protection Assistance: The community provides technical advice and assistance to interested property owners and annually publicizes the service.
- **Activity 410** – Additional Flood Data: Credit is provided for conducting and adopting flood studies for areas not included on the flood insurance rate maps and that exceed minimum mapping standards. Credit for determining Base Flood Elevations in approximate A zones. Credit is also provided for a cooperating technical partnership agreement with FEMA.
- **Activity 420** – Open Space Preservation: Credit is provided for preserving approximately 5 acres in the Special Flood Hazard Area (SFHA) as open space. Credit is also provided for open space land that is deed restricted.
- **Activity 430** – Higher Regulatory Standards: Credit is provided for enforcing regulations that require freeboard for new and substantial improvement construction, protection of floodplain storage capacity, natural and beneficial functions, enclosure limits, other higher regulatory standards, land development criteria and state mandated regulatory standards. Credit is also provided for a Building Code Effectiveness Grading Schedule (BCEGS) Classification of 2/2, certification as a floodplain manager, EMI NFIP class graduates, and the adoption of the International Building Codes.
- **Activity 440** – Flood Data Maintenance: Credit is provided for maintaining and using digitized maps in the day to day management of the floodplain. Credit is also provided for maintaining copies of all previous FIRMs and Flood Insurance Study Reports.
- **Activity 450** – Stormwater Management: The community enforces regulations for stormwater management, soil and erosion control, and water quality. Credit is also provided for watershed management master planning.
- **Activity 510** – Floodplain Management Planning: Based on NFIP Repetitive Losses data as of January 2016, the City has 21 repetitive loss properties and is a Category C community for CRS purposes. Credit is provided for preparing an area analyses the covers the repetitive loss areas.
- **Activity 520** – Acquisition and Relocation: Credit is provided for acquiring and relocating buildings from the community's flood hazard area.
- **Activity 530** – Flood Protection: Credit is provided for buildings that have been flood proofed, elevated or otherwise modified to protect them from flood damage.
- **Activity 540** – Drainage System Maintenance: Portions of the community's drainage system are inspected regularly throughout the year and maintenance is performed as needed by the Department of Water Resources. Records are being maintained for both inspections and required maintenance. Credit is also provided for an ongoing Capital Improvements Program. The community also enforces a regulation prohibiting dumping in the drainage system.
- **Activity 610** – Flood Warning Program: Credit is provided for a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities.
- **Activity 620** – Levees: Credit is provided for maintaining levees, having a warning system, a response operations, and critical facilities planning.
- **Activity 630** – Dam Safety: All California communities currently receive CRS credit for the state's dam safety program.

City of Sacramento's Flood Management Program: 5-year Outlook

The following is a description/list of those flood management activities that will be enhanced and/or added over the next five years to show continued compliance with the NFIP

- Continuing in the CRS program, while making an effort to implement new CRS activities to benefit the City of Sacramento and residents.
- Working with more Repetitive Loss properties to mitigate flooding problems and implement the Repetitive Loss Area Analysis
- Adding more restrictions in Building Divisions on building next to a levee and compensatory storage
- Increasing the amount of public outreach by implementing a Program for Public Information
- Implementing the requirements in the State of California's Central Valley Flood Protection Plan
- Improving the City/County's emergency response system
- Implementing flood control projects to better protect property and life safety

More information about the floodplain administration in the City of Sacramento can be found in Table F-77.

Table F-77 City of Sacramento Compliance with NFIP

NFIP Topic	Comments
Insurance Summary	
How many NFIP policies are in the community? What is the total premium and coverage?	43,303 policies $18,492,906 in premiums $14,714,226,400 in coverage
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	1,855 claims $9,852,037.68 in claims paid 43 substantial damage claims
How many structures are exposed to flood risk within the community?	30,884 in 1% annual chance 84,838 in 0.2% annual chance
Repetitive Loss (RL) and Severe Repetitive Loss Properties (SRL)	106 RL properties 0 SRL properties (post-FIRM)
Describe any areas of flood risk with limited NFIP policy coverage	The Natomas Basin (A99) is an area within the City that has a relatively low percentage of NFIP policies compared to the number of insurable structures.
Staff Resources	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	Yes
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	The City reviews permits, provides flood insurance information, GIS support, and many outreach/education projects
What are the barriers to running an effective NFIP program in the community, if any?	The large community size makes communication with all residents difficult. Also, changes in the status of levee certifications have cause major changes in the City's floodplains over the years.
Compliance History	
Is the community in good standing with the NFIP?	Y
Are there any outstanding compliance issues (i.e., current violations)?	N
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	CAV 7/16/2008
Is a CAV or CAC scheduled or needed?	Y

NFIP Topic	Comments
Regulation	
When did the community enter the NFIP?	09/15/1978
Are the FIRMs digital or paper?	Digital
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Yes, Freeboard and local floodplain requirements
Provide an explanation of the permitting process.	Permit system flags permits applied for in floodplain areas. Floodplain staff review the permit and advise the owner of flood protection measures that must be done. Permit is not issued until flood projection requirements are met.
Community Rating System	
Does the community participate in CRS?	Y
What is the community's CRS Class Ranking?	lass 3)
What categories and activities provide CRS points and how can the class be improved?	Receive points for all categories. Class will be improved by new drainage studies, new flood response projects, applying for new identified elements in the 2021 addendum and applying for more credits under the Dam element.
Does the plan include CRS planning requirements?	Y

F.7.3. Mitigation Actions

The planning team for the City of Sacramento identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake: Liquefaction
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Severe Weather: High Winds and Tornadoes
- Wildfire

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Earthquake: Liquefaction, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Severe Weather: High Winds and Tornadoes, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140).

Project Description: Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Safety Element of General Plan

Responsible Office: City of Sacramento Planning Department

Priority (H, M, L): High

Potential Funding: Local budgets

Benefits (avoided Losses): Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

Schedule: As soon as possible

Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Earthquake: Liquefaction, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Severe Weather: High Winds and Tornadoes, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City and County play a key role in public outreach/education efforts to communicate the potential risk and vulnerability of their community to the effects of natural hazards. A comprehensive multi-hazard public education program will better inform the community of natural hazards of concern and actions the public can take to be better prepared for the next natural disaster event.

Project Description: A comprehensive multi-hazard outreach program will ascertain both broad and targeted educational needs throughout the community. The City will work with the County and other agencies as appropriate to develop timely and consistent annual outreach messages in order to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will leverage and build upon existing mechanisms.

Other Alternatives: Continue public information activities currently in place.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing City, County, and State outreach programs will be reviewed for effectiveness and leveraged and expanded upon to reach the broader region.

Responsible Office: City of Sacramento in partnership with the County

Priority (H, M, L): High

Cost Estimate: Annual costs to be determined, and will depend on the scope and frequency of activities and events as well as volunteer participation

Benefits (Losses Avoided): Increase residents' knowledge of potential hazards and activities required to mitigate hazards and be better prepared. Protect lives and reduce damages, relatively low cost to implement.

Potential Funding: Local budgets, grant funds

Timeline: Ongoing/Annual public awareness campaign

Action 3. Coordination with Relevant Organizations and Agencies to Consider the Impacts of Urbanization and Climate Change on Long-Term Natural Hazard Safety

Hazards Addressed: Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: In 2014, due to extremely low water levels, the City of Sacramento Department of Utilities performed an emergency retrofit of the water intake on the Sacramento River. This is an example of the kind of adaptive measures that may be required in the future as Sacramento adapts to the impacts of climate change.

Climate change and urbanization may intensify natural and manmade hazards, sometimes combining to amplify hazards such as increased flooding, water shortages, disease vectors, and air pollution. The City of Sacramento provides infrastructure and services including water supply, wastewater, stormwater drainage, solid waste, street and urban forest maintenance. Management plans and specifications are prepared and updated by various City Departments and agencies, including but not limited to:

- Urban Water Management Plan – City of Sacramento Department of Utilities
- Comprehensive Flood Management Plan - City of Sacramento Department of Utilities
- City of Sacramento Standard Specifications for Public Construction (with Addendums #1 and #2)
- Stormwater Quality Design Manual for Sacramento and South Placer Regions
- Hydromodification Management Plan – Sacramento Stormwater Quality Partnership
- Additional standards and design manuals can be found at: http://www.cityofsacramento.org/Utilities/Resources/Specs-and-Drawings
- California Water Plan – Department of Water Resources: California Water Plan

The 2040 General Plan includes a policy to "continue to analyze information on potential impacts of climate change on government operations and the local economy, and actively share results to foster public awareness and support for adaptation policy."

Predictions on the specific local impacts of climate change are not necessarily available, however to the extent feasible, climate change impacts should be incorporated into City infrastructure and operations.

Project Description: Develop an Interagency Adaptation Team to work with appropriate agencies (e.g., California Natural Resources Agency, State Lands Commission, California Energy Commission, Sacramento Area Flood Control Agency [SAFCA], UC Davis) and neighboring jurisdictions (e.g., Sacramento County) to:

- Ensure that current information and data on climate change effects and impacts are considered and addressed as part of updates to infrastructure and utility plans, manuals, and specifications.
- Review existing infrastructure plans, policies, standards, and investments to ensure information about projected climate change impacts is included.
- Assess impacts of climate change effects when siting new infrastructure and maintaining or renovating existing infrastructure.
- Incorporate climate change impact information into the design, construction, operation, and maintenance of infrastructure.
- Identify inadequate existing infrastructure.

The work products of this effort are updated standards and specifications for infrastructure; updated management plans; and design guidelines; and an inventory of inadequate existing infrastructure.

Other Alternatives: Actively collaborate with regional agencies and neighboring jurisdictions to ensure that planning for future development and redevelopment incorporates risks from climate change effects/impacts.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Project is an implementation program listed in the 2035 General Plan.

Responsible Agency/ Department/Partners: Community Development Department, Public Works Department, Department of Utilities

Cost Estimate: $500,000

Benefits (Losses Avoided): Reduced damage to property and/or infrastructure.

Potential Funding: State and/or Federal Grant

Timeline: 2021-2026

Project Priority (H, M, L): H

Action 4. Maintain and Identify Changes in Critical Facilities GIS Lay to Support Emergency Management Efforts

Hazards Addressed: Multi-Hazard: Flood, Wildfire, Dam Failure, Levee Failure, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: GIS databases of critical facilities have been used by the City for incident management and emergency planning purposes. These databases need to be continuously updated with the results from GIS analysis associated with the development of the Multi-Hazard Mitigation Plan.

Project Description: Businesses, schools, EMS Services or any other identified critical facilities will have contact information collected and mapped for analyzing and preparation for the Multi-Hazard Mitigation Plan. Protection of critical infrastructure are supported by City Ordinance 2020-0009.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implement through existing emergency preparedness activities.

Responsible Agency/ Department/Partners: City GIS Technical Group, City Department of Utilities, and City & County Office of Emergency Services

Cost Estimate: City staff time

Benefits (Losses Avoided): Life safety and early notification

Potential Funding: None

Timeline: 2026

Project Priority (H, M, L): H

Action 5. Community Outreach on Multi-Hazard Preparation & Pre-mitigation

Hazards Addressed: Multi-Hazard: Flood, Dam Failure, Fire, Earthquake, Severe Weather, Drought

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: With the broad spectrum of hazards that can affect the City of Sacramento it is important for the Community to know how to be prepared for and execute pre-mitigation (if possible) for these hazards.

Project Description: Continue to maintain and improve webpage that addresses the multi-hazard threat and add measures for preparation and pre-mitigation. Continue to participate and host many community outreach events associated with Hazard awareness and preparation. These events include: "Capitol Action Day", "Flood Preparedness Week", "Highwater Jamboree" Annual Flood Preparedness Event and visiting neighborhood meetings and community events to share preparedness information.

Other Alternatives: Other forms of media outreach

Existing Planning Mechanism(s) through which Action Will Be Implemented: Continuing to maintain OEM's Preparing For a Disaster - City of Sacramento webpage.

Responsible Agency/ Department/Partners: City Department of Utilities, City Office of Emergency Management

Cost Estimate: City staff time

Benefits (Losses Avoided): Reduction in the loss of life & property damage through education. Better prepared citizens before and during an event.

Potential Funding: None

Timeline: Long-term

Project Priority (H, M, L): H

Action 6. Evaluation and Mitigation of Critical Facilities in Identified Hazard Areas

Hazards Addressed: Multi-Hazard: Flood, Dam Inundation, Levee Failure, Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Based on the critical facility analysis completed for this plan, over 3,000 critical facilities have been identified within the Sacramento County Planning Area. This number is anticipated to go up based on additional mapping of critical facilities as the GIS mapping effort is completed. For Sacramento County, 52 mapped critical facilities have been identified within the 100-year floodplain and another 164 (81-city) in the 500-year floodplain. A detailed list of those affected critical facilities are included in Appendix E. Due to the significant number of critical facilities identified within the flood and other hazard areas, additional evaluation of each affected facility is required in order to determine which facilities should be potentially relocated and/or protected.

Project Description: This project addresses the additional evaluation of identified critical facilities to determine options for mitigation. The initial focus will be on those facilities within the flood hazard areas, with other hazard-prone facilities to follow. The end result of this analysis will be a list of facilities within the 100- and 500-year floodplain and their mitigation recommendations and priorities.

Other Alternatives: Remove all critical facilities from the floodplain or no action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: This will be implemented through existing floodplain management programs. Protection of critical infrastructure are supported by City Ordinance 2020-0009.

Responsible Agency/ Department/Partners: City Department of Utilities

Cost Estimate: Analysis and recommendations should involve staff time; resulting mitigation measures will be cost on an individual facility basis.

Benefits (Losses Avoided): Increase property protection and life safety for City residents.

Potential Funding: City of Sacramento, Grants

Timeline: 2026

Project Priority (H, M, L): H

Action 7. Retrofit of Repetitive Loss Properties

Hazards Addressed: Multi-Hazard – Flood, Localized Stormwater Flooding, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento has 21 repetitive loss structures. Some of these structures can be structurally retrofitted or elevated to fix the flooding problem and remove them from FEMA's Repetitive Loss List.

Project Description: The City must identify property owners interested in retrofits and also obtain grant money to assist with the retrofits.

Other Alternatives: Promote flood insurance

Existing Planning Mechanism(s) through which Action Will Be Implemented: The City's Repetitive Loss Analysis

Responsible Agency/ Department/Partners: City Department of Utilities

Cost Estimate: $250,000-$1,000,000 (depending on number of structures retrofitted)

Benefits (Losses Avoided): The structures would be less prone to flooding, resulting in less flood insurance claims

Potential Funding: FEMA grants, Department of Utilities, property owners

Timeline: 2026

Project Priority (H, M, L): H

Action 8. Safeguard Essential Communication Services

Hazards Addressed: Multi-Hazard– Flood, Dam Failure, Earthquake, Fire, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Communication services during and after a disaster event is essential. The ability to communicate real time information to first responders, the public, and the Emergency Operations Center is critical.

Project Description: Maintenance and continued testing of essential communication services, and have a plan in place to restore those essential services should they be damaged in an event. They include the City phone system, electronic mail, network services and servers. The creation of redundancy and safeguarding the City's communication infrastructure will be necessary.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implement through existing emergency preparedness activities. Protection of critical infrastructure are supported by City Ordinance 2020-0009.

Responsible Agency/ Department/Partners: Emergency Operations Center, City Department of Utilities, Department of Information Technology

Cost Estimate: $300,000

Benefits (Losses Avoided): Ensured communication, faster response times

Potential Funding: Local funding, Grants

Timeline: Long-term

Project Priority (H, M, L): H

Action 9. Multi-lingual Disaster Education

Hazards Addressed: Multi-Hazard - Floods, Severe Weather, Fires, Earthquakes, Dam/Levee Failure,

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento is a diverse city. The City must establish a method to inform our diverse population of seasonal disaster safety issues and general emergency preparedness. The City of Sacramento Office of Emergency Management established citywide translation services contracts accessible to all City Departments.

Project Description: Develop Public Service Announcements, educational videos, a social media campaign, and other material in a variety of languages to provide our diverse community with information on how to develop a personal/family safety plan

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Program for Public Information Committee (Flooding Hazard) and Neighborhood Services activities

Responsible Agency/ Department/Partners: City Office of Emergency Management, Department of Utilities, Community Development Department

Cost Estimate: $50,000

Benefits (Losses Avoided): Vulnerable populations will be better prepared to protect themselves and property before and during an event. During an event, faster notifications and evacuations.

Potential Funding: FEMA Grants

Timeline: On-going

Project Priority (H, M, L): H

Action 10. Cal OES Safety Assessment Program Evaluators

Hazards Addressed: Multi-Hazard– Flood, Levee Failure, Dam Failure, Earthquake, Fire, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: A large disaster in Sacramento would have a major impact on the city's built environment. The city's ability to quick recovery from a disaster will require a large amount of personnel to inspect and evaluate the condition of structures in the impacted areas. It is important city staff to be trained in post-disaster assessment. This will allow the community to return to their homes and business in a timely manner as well has prohibit people from entering unsafe structures after a disaster.

Project Description: Increase the number of Cal OES Safety Assessment Program Evaluators within the City. The Safety Assessment Program utilizes volunteers and mutual aid resources to provide professional engineers and architects and certified building inspectors to assist local governments in safety evaluation of their built environment in the aftermath of a disaster.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implement through current Building Department personnel training program.

Responsible Agency/ Department/Partners: City Community Development Department

Cost Estimate: $3,000

Benefits (Losses Avoided): Life Safety, Correct Structural Evaluation

Potential Funding: City Community Development Department

Timeline: On going

Project Priority (H, M, L): H

Action 11. National Flood Insurance Program & Community Rating System Continuation

Hazards Addressed: Multi-Hazard – Flood, Levee/Dam Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento is susceptible to various types of flood events: riverine, flash, and localized stormwater flooding; and levee and dam failure flooding. Regardless of the type of flood, the cause is most often the result of severe weather patterns and excessive rainfall, either in the flood area or upstream reach. Flooding is the most significant natural hazard that the City faces.

Project Description: Continue to meet minimum NFIP requirements and exceed those requirements by participating in the CRS program.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Floodplain Management Staff

Responsible Agency/ Department/Partners: City Department of Utilities

Cost Estimate: $25,000 and staff time

Benefits (Losses Avoided): Increased flood insurance, increased public awareness, and community preparedness

Potential Funding: Local

Timeline: On-going

Project Priority (H, M, L): H

Action 12. Develop a Master Generation Plan for Pump Stations

Hazards Addressed: Multi-Hazard - Severe weather, Earthquakes, Floods, Dam/Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The city is divided into approximately 120 drainage basins. Drainage from most of these basins flows to local rivers or creeks or drainage channels through pumping. The City owns and operates 105 storm drainage pumping stations throughout the city. The drainage canals and local creeks eventually drain into the Sacramento and American Rivers.

Project Description: Develop a plan for identifying, prioritizing, and implementing power generation needs for pumping stations. Perform a power audit to identify needs. Plan will identify needs, costs, funding, and lead personnel. Plan will include the purchase and installation of necessary built-in and mobile generators and additional equipment. The City has a robust generator plan but a master plan is still in the process. Sumps that need generators have been identified but the program has been delayed due to funding.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implement through existing Capital Improvement Program.

Responsible Agency/ Department/Partners: City Department of Utilities

Cost Estimate: $200,000

Benefits (Losses Avoided): Avoids flooding during power outages to pumping stations

Potential Funding: FEMA Grant

Timeline: 2026

Project Priority (H, M, L): H

Action 13. Develop a Disaster Housing Plan

Hazards Addressed: Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Effective disaster housing is a critical step on the road to long-term recovery. A balance between providing housing assistance rapidly in the wake of a disaster and meeting the diverse needs of individuals and households within the community for a longer period of time during disaster recovery.

Project Description: Develop a Disaster Housing Plan to identify potential disaster housing partners and outline the principles, practices, and implantation phase of such a plan. Supplement with OEM Emergency Operations Plan and Pre-Disaster Recovery Plan.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Unknown

Responsible Agency/ Department/Partners: City Community Development Department, City Office of Emergency Management, Office of Innovation and Economic Development

Cost Estimate: $30,000

Benefits (Losses Avoided): Increased community resiliency, avoid potential financial losses

Potential Funding: Grants

Timeline: 2026

Project Priority (H, M, L): H

Action 14. Disaster Resistant Business Program

Hazards Addressed: Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: During a disaster, businesses are disrupted. This disruption can cause loss in revenue, costumers, and potentially employees.

Project Description: Provide materials and administrative support for a comprehensive Business Continuity Planning (BCP) program, to include presentation s to business, non-profits and professional groups, Chamber of Commerce events, etc. The program would include a one-day event with an overview on developing a Business Continuity Plan and breakout sessions addressing specific BCP issues.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: None

Responsible Agency/ Department/Partners: City of Sacramento, Local Business Partners

Cost Estimate: $80,000

Benefits (Losses Avoided): Increased community resiliency and avoided financial losses.

Potential Funding: Grants, Local Funding

Timeline: 2026

Project Priority (H, M, L): H

Action 15. Develop Enhanced Emergency Planning for Special Needs Populations in the City of Sacramento Emergency Operations Plan and Other Planning Documents

Hazards Addressed: Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Special needs populations will require additional measures in order to support alerts and warnings, evacuation, and medical response.

Project Description: By working with local advocacy groups, and by identifying weaknesses and gaps in the City's emergency planning, the increased capabilities of the enhanced plan will enable emergency responders to more effectively support the most vulnerable segment of the population. Access and Functional Needs (AFN) is included throughout the Emergency Operations Plan (EOP) and Pre-Disaster Recovery Plan. OEM continues to meet with AFN leaders to ensure accessibility and inclusion are maintained in compliance with the Americans with Disabilities Act. OEM plans are updated on a continuous basis and ensure that AFN is included throughout the entirety of the plan. Efforts to strengthen inclusivity continues as OEM networks and attends trainings, seminars, and events pertaining to AFN and diversity.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Emergency Operations Plan

Responsible Agency/ Department/Partners: City Office of Emergency Management

Cost Estimate: $20,000

Benefits (Losses Avoided): Preservation of life and ability to evacuate more effectively

Potential Funding: Grants, City Office of Emergency Management

Timeline: On-going

Project Priority (H, M, L): H

Action 16. Establish a Post-Disaster Action Plan

Hazards Addressed: Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: As home of the State Capitol, it is imperative that the city of Sacramento can recover quickly from a disaster. The amount of time it takes for the City's infrastructure, cultural resources, and the economy to recover will impact the ability of California's government to function.

Project Description: Establish a City post-disaster action plan that outlines the procedures for public information, post-disaster damage assessment, code enforcement, financial recovery, and redundant operations. Continue to update the plan.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2019 Pre-Disaster Recovery Plan and Emergency Preparedness Planning

Responsible Agency/ Department/Partners: City Office of Emergency Services, Department of Utilities, Community Development Department

Cost Estimate: $50,000

Benefits (Losses Avoided): A more resilient community and avoided economic loss.

Potential Funding: Grants

Timeline: On-going

Project Priority (H, M, L): H

Action 17. Flood Recovery Plan

Hazards Addressed: Multi-Hazard - Flood, Localized Flooding, Levee/Dam Break

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Immediately following a flood, the City will be left with massive amounts of debris and debilitated infrastructure. A proactive approach to this portion of the recovery process with increase the community's resiliency.

Project Description: Create a plan that addresses key elements of flood recovery, such as, restoring infrastructure, debris removal, water quality, building inspection, facilitating access to individual assistance, providing temporary housing, assisting with business recover, and identify needed resources to support recovery efforts. Continue to update plan.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Emergency Response Protocols for Floods

Responsible Agency/ Department/Partners: City Department of Utilities, Office of Emergency Management

Cost Estimate: $20,000 or staff time

Benefits (Losses Avoided): Improved Community Resilience

Potential Funding: Department Budgets, Grants

Timeline: Ongoing

Project Priority (H, M, L): M

Action 18. Public Information Flood Response Plan (Action #18 from 2016)

Hazards Addressed: Flood, Levee/Dam Failure, Localized Flooding

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Program for Public Information (PPI) Committee recommends the development of outreach materials that will be implemented during and after a flood. These projects are drafted and made ready for production and dissemination after a flood warning. The PPI Committee also discussed the use of the City's website during a flood event. General emergency preparedness information and citywide evacuation routes are on the website, however, special elements will need to be added during a flood threat. Press releases providing information about the flood threat levels, conditions, evacuation routes, and preparedness actions will be posted on the City's website. The proposed projects are included in the City's Comprehensive Flood Management Plan.

Project Description: Develop a pre-flood plan for public information projects that will be implemented during and after a flood. The plan will include a collection of outreach projects templates including key messages that need to be disseminated before, during, and after a flood. The plan will also include written procedures that explain how the materials will be disseminated and when the information should be released.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Program for Public Information Committee

Responsible Office/Partners: City of Sacramento, Department of Utilities and City of Sacramento Office of Emergency Management

Cost Estimate: Staff Time

Benefits (Losses Avoided): Quicker flood warning response, better quality of information to the public during a flood event, coordinated disaster recovery information

Potential Funding: City of Sacramento, Department of Utilities and City of Sacramento Office of Emergency Management Budgets

Timeline: 2025

Project Priority (H, M, L): High

Action 19. Construction of a New Emergency Operation Center (EOC) (Action 19 from 2016 plan)

Hazards Addressed: Multi Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The city of Sacramento's EOC is the central location of authority and information, and allows for face-to-face coordination among personnel who must make policy-level emergency decisions. The EOC can be activated and staffed to the extent deemed necessary to deal with the existing or impending emergency. The current size of the City EOC is inadequate for personnel needs and disrupts the face-to-face coordination necessary during an emergency.

Project Description: Build and equip a new Emergency Operations Center, to replace the inadequate EOC currently located in the city of Sacramento's dispatch center. The new facility would be developed to FEMA 361 standards. Grant funding would be used to supplement normal construction costs with the additional cost for increasing the armoring of the facility to meet the FEMA 361 standards for Community SafeRooms.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: None

Responsible Office/Partners: City of Sacramento Office of Emergency Management

Cost Estimate: $10,000,000

Benefits (Losses Avoided): More space for operations & upgraded information technology systems

Potential Funding: City of Sacramento Emergency Management Budget, Grants

Timeline: 2025

Project Priority (H, M, L): Medium

Action 20. Emergency Operation Center (EOC) Expansion and Information Technology Upgrade (Action 20 from 2016 plan)

Hazards Addressed: Multi Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The city of Sacramento's EOC is the central location of authority and information, and allows for face-to-face coordination among personnel who must make policy-level emergency decisions. The EOC can be activated and staffed to the extent deemed necessary to deal with the existing or impending emergency. The current size and information technology infrastructure of the City EOC is inadequate for personnel needs during an emergency situation.

Project Description: Improvements to the City current EOC is necessary to meet the demands of a large-scale natural disaster. The facility has size limitations that will restrict the amount of personnel located in the same room. Potentially unit will have to operate in separate rooms or building which would reduce real-time communications. Also, the facility needs improvements on the usability of the information technology infrastructure. A network separate from the police dispatch's system is needed. Currently there is a shared network which has high security restrictions. The security restrictions make it difficult for a city employee to sign in at the EOC and be fully functional.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Department of Information Technology's updates and maintenance schedule for the EOC.

Responsible Office/Partners: City of Sacramento Emergency Management Budget, Grants

Cost Estimate: $3,000,000

Benefits (Losses Avoided): More space for operations & upgraded information technology systems, facilitates a more effective emergency response

Potential Funding: City of Sacramento Emergency Management Budget, Grants

Timeline: 2025

Project Priority (H, M, L): Medium

Action 21. Protection of Transportation Infrastructure (Action 21 from 2016 plan)

Hazards Addressed: Multi Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City's roadway network consists of a combination of Federal interstates, a United States highway, California State highways, and city streets. This roadway network is used extensively for personal vehicle travel. Approximately 86 percent of all city residents travel from home to work by automobile.

Project Description: Retrofit all bridges in the city of Sacramento to current seismic standards. Elevate roads and bridges above the base flood elevation to maintain dry access. In situations where flood waters tend to wash roads out, construction, reconstruction, or repair can include not only attention to drainage, but also stabilization or armoring of vulnerable shoulders or embankments.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Department of Transportation Capital Improvement Project Planning Process

Responsible Office/Partners: City of Sacramento Department of Transportation

Cost Estimate: $200,000,000

Benefits (Losses Avoided): Enhanced bridge safety, increased evacuation routes possibilities, shorter disaster recovery timeline

Potential Funding: Grants, Capital Improvement Project Funding

Timeline: 2025

Project Priority (H, M, L): High

Action 22. Public Education Campaign for Everbridge System (Action 22 from 2016 plan)

Hazards Addressed: Multi Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The County Office of Emergency Services has replaced the Reverse 911 system with "Everbridge", a faster system than Reverse 911. Residents must register for this system in order to received emergency alerts.

Project Description: Outreach will be performed using a variety of methods to inform residents about the City emergency alert system, Everbridge. The campaign will direct resident to sign up for emergency alerts.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Neighborhood Services and Emergency Management Efforts

Responsible Office/Partners: City of Sacramento Office of Emergency Management

Cost Estimate: $100,000

Benefits (Losses Avoided): Avoided Loss of Life, More Evacuation Time

Potential Funding: City of Sacramento Emergency Management Budget, Grants

Timeline: 2025

Project Priority (H, M, L): High

Action 23. Regional Emergency and Disaster Preparedness Exercises to Test Operational & Emergency Plans (Action 23 from the 2016 plan)

Hazards Addressed: Multi Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento has an Emergency Operation Plan that addresses the City's planned response to extraordinary emergency situations associated with natural disasters, technological incidents, and nuclear defense operations. The City of Sacramento has adopted the Standardized Emergency Management System for managing response to multi-agency and multi-jurisdiction emergencies and to facilitate communications and coordination between all levels of the system and among all responding agencies. Additionally, Sacramento is part of the State's mutual aid system and can give or receive support in an emergency situation.

Project Description: Conduct regional, multi-agency emergency and disaster preparedness exercises to test operational and emergency plans. Tests will include levee or dam failure and other natural hazards.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Emergency Services Training Program

Responsible Office/Partners: City of Sacramento Office of Emergency Services, City of Sacramento Department of Management

Cost Estimate: $10,000

Benefits (Losses Avoided): Identify weaknesses in current plans and communications, better prepared for a disaster.

Potential Funding: Training Budgets, Grants

Timeline: Ongoing

Project Priority (H, M, L): High

Action 24. Special Needs and Critical Facilities Database and Advanced Warning System (Action 24 from 2016 plan)

Hazards Addressed: Multi Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Public alert and warning systems are necessary to increase public awareness of an impending threat and provide clear instructions. In the city of Sacramento, existing systems include the Emergency Alert System, fire and law enforcement vehicle loudspeakers, Everbridge, and agency websites. The Emergency Alert System is designed to provide emergency information via radio and television. The city of Sacramento's Everbridge system can send pre-recorded messages to individuals who sign up for the service. However, an advanced warning system for special needs populations and critical facilities has not been developed.

Project Description: Through outreach activities, develop a database of vulnerable population groups and critical facilities in need of advance warning or evacuation assistance. Development and implementation of an advanced warning procedure. Successful programs have been developed in Houston, San Antonio and Florida and could serve as a model for implementation and personnel training.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Emergency Action Plan

Responsible Office/Partners: Office of Emergency Management

Cost Estimate: $200,000

Benefits (Losses Avoided): Avoid loss of life and critical facilities. Faster & more coordinated emergency response times.

Potential Funding: Grants or Emergency Management Budget

Timeline: Short-Term

Project Priority (H, M, L): High

Action 25. Asset Inventory

Hazards Addressed: Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: A current detailed list of city assets itemized by facility is needed in the case of disaster recovery. In the event that a city facility was damaged a during a natural disaster a detailed list of the assets impact would be needed.

Project Description: Development of a list of all city assets with specific location information that can be easily maintained by all departments. The list will include information technology equipment, communication equipment, machinery, office furniture, etc. The list will also indicate which facilities and assets are located in a hazard area.

Other Alternatives: Current Inventory Lists

Existing Planning Mechanism(s) through which Action Will Be Implemented: Each department within the City has asset tracking methods.

Responsible Office/Partners: City of Sacramento Asset Management

Cost Estimate: $200,000

Benefits (Losses Avoided): Identification of assets in hazard area may prompt relocation or protection of assets. Also, quick assessment of what city assets have been damaged or lost during a disaster which will allow for a quicker recovery period.

Potential Funding: City of Sacramento and Grants

Timeline: 2025

Project Priority (H, M, L): Medium

Action 26. Protection of City Information Technology Infrastructure (Action 27 from 2016 plan)

Hazards Addressed: Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Due to the massive amount of destruction that can be caused by cyber terrorism it is vital to protect the City's network from attacks. Disruption of the City's information technology infrastructure will weaken and potentially disable the City's ability to respond to a natural disaster.

Project Description: Develop a system to withstand the variety of natural disaster the City is vulnerable to, such as, flooding, fire, and severe storms and wind.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Information Technology's maintenance and upgrade schedule.

Responsible Office/Partners: City of Sacramento Department of Information Technology

Cost Estimate: Unknown

Benefits (Losses Avoided): Protection of the city's ability to operate vital systems during emergency events and the protection of technical infrastructure and data.

Potential Funding: Possible Grants, Department of Information Technology Budget

Timeline: Ongoing

Project Priority (H, M, L): High

Action 27. Travel Time Model for Lower American and Sacramento Rivers and their Major Tributaries (Action 29 from 2016 plan)

Hazards Addressed: All

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Drinking water source water is potentially vulnerable to watershed spills, which can be caused or contributed to by natural disaster events. It is important to be able to estimate the travel time from the location of a spill to the water treatment plant intakes. The City of Sacramento has developed a river travel time estimating tool for the Lower American River and Sacramento River using model information obtained from the National Oceanic and Atmospheric Administration (NOAA) CA/NV River Forecast Center. The river travel time tool was developed to allow a rough estimate for the amount of time it will take for water to move downstream from selected locations on the rivers to the City's water treatment plant intakes. The existing tool is shared with the other Lower American and Sacramento River water utilities, but the information is not developed for other intake locations. The current river model has limitations, including locations modelled and other features that an updated model may be able to address. To our best knowledge, there is no information available on travel time for major tributaries to the Lower American River and Sacramento Rivers within or proximate to Sacramento County.

Project Description: Provide resources for improved travel time modeling of the Lower American and Sacramento Rivers, and develop model for travel time on major tributaries and other water bodies of interest. Translate model results into resource(s) readily available for Lower American and Sacramento River water treatment plant operators and water utility management to use as a tool for preparedness, response, and recovery for watershed hazardous material spill events. There is potential to include water quality modeling in the model capabilities, or develop the model for future expansion to include water quality.

Other Alternatives: Continue to use current rough estimating tool for river travel time and networking with NOAA for other opportunities.

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Source Water Protection Program. Potentially through Lower American River and Sacramento River Joint Source Water Protection Programs

Responsible Office/Partners: City of Sacramento Department of Utilities, Engineering and Water Resources Division, Environmental and Regulatory Compliance Section or Potential for other Responsible Office/Other Drinking Water Utilities that Treat Lower American River and Sacramento River Water/Potential for Partnership with National Oceanic and Atmospheric Administration (NOAA)

Cost Estimate: $500,000-$3,000,000

Benefits (Losses Avoided): Protection of public health, reducing cost for emergency response or other alternate water supplies.

Potential Funding: Grant, to be determined

Timeline: 2-5 years

Project Priority (H, M, L): High

Action 28. Watershed Spill Contamination to Drinking Water Quality: Preparedness for Events and Recovery

Hazards Addressed: All

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: When utilizing surface water as a source of drinking water, the source water is potentially vulnerable to watershed spills that can enter the supply. Watershed spills can be caused or contributed to by natural hazards. Spills have the potential to impact source water quality and therefore water treatment plant operations. Changes in source water quality may necessitate a response action at a drinking water treatment plant, such as implementing an increased level of treatment, alternate treatment, or avoiding diversion altogether. Both during a spill and after a watershed spill has ended, it is important to determine if there is residual contamination in the surface water and if the water treatment plant intakes and treatment facilities have been impacted. There could be a wide range of contaminants released in watershed spills, including petroleum products from fuel spills, a wide range of synthetic chemicals, and those associated with wastewater such as bacteria, viruses, and protozoa. The contamination may constitute a hazard to public health for regulated and unregulated water quality contaminants.

Project Description: Provide resources to support water utility preparedness and recovery planning for chemical and wastewater hazardous spills in the watersheds upstream of water treatment plant intakes . This includes development of information and resources to identify the potential impacts of the spill, conduct emergency exercises, plan coordination with emergency response agencies regarding environmental mitigation and cleanups, and prepare information and resources for water treatment facilities and treatment recovery. The project may also include providing supplies to support spill containment and watershed/surface water clean-up, and water treatment plant intake, clean-up and restoration.

Other Alternatives: Continue to support and develop resources to support City of Sacramento Water Treatment Plant Operations, and continue to share information with other Sacramento and American River water utilities. Continue to coordinate and manage the Lower American River and Sacramento River Water

Utilities Voluntary Spill Notification Program including potential opportunities to develop additional preparedness resources together. Continue to coordinate with and participate in the American River Water Utilities Voluntary Spill Notification Program.

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Source Water Protection Program/Potentially through Lower American River and Sacramento River Joint Source Water Protection Programs

Responsible Office/Partners: City of Sacramento Department of Utilities, Engineering and Water Resources Division, Environmental and Regulatory Compliance Section or Potential for other Responsible Office/Other Local Drinking Water Utilities that Treat Lower American River and Sacramento River water.

Cost Estimate: $250,000-$500,000

Benefits (Losses Avoided): Protection of public health, reducing cost for emergency response or other alternate water supplies.

Potential Funding: Grant, to be determined

Timeline: 1-2 years

Project Priority (H, M, L): High

Action 29. Purchase Drones for Use in Disaster Preparedness, Mitigation, and Response

Hazards Addressed: Multi-hazard. (Compromised or failing structural integrity that would cause a critical facility to not withstand a hazard or disaster event as designed or as expected/anticipated. Earth movement or subsidence, or a change in earth properties which jeopardizes an area's intended purpose or gives rise to unanticipated negative consequences. Levee deterioration, damage and failure. Loss of protective banks (barriers/constraints) over time.)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Critical facilities are assessed and a determined to be able to withstand hazards/events at a certain level. As the structural integrity of a facility deteriorates, its ability to perform as anticipated is compromised, possibly leading to increased damages/costs. A primary California hazard is earthquake activity, which can result in liquefaction. Due to its location, the City of Sacramento relies heavily on its levee system for flood control/ protection. The City of Sacramento area has numerous creeks/channels with a bank network that serves as barriers or water constraints.

Project Description: Integrate the use of drones into the City's scheduled facility inspection program. Implement inspection of areas that may have been impossible and/or very difficult to inspect in the past, with a program goal to increase efficiency, comprehensiveness, and frequency of inspections as a best practices measure.

Integrate the use of drones in establishing a program (if one does not already exist) to (1) document the position of baseline land markers in areas identified as being susceptible to liquefaction and (2) verify/ update the positions of the land markers on a scheduled basis. Following a seismic event, use drones to conduct a priority re-check of land mark locations over a designated time span to determine whether a susceptible area is demonstrating signs of liquefaction and at what rate in order to take mitigating action.

Integrate the use of drones in the regulatory inspection process in order to capture, retain, and utilize imagery/GPS coordinates for geospatial analysis. The geospatial analysis would provide information and/or changes in condition of levees and banks not readily detectible by the human eye, and can be used to visually demonstrate the changes over time and potentially project out a timeline that could predict critical failure. This information can then be used by Operations & Maintenance to conduct proactive high-level maintenance and spot repair activities and by Engineering/Asset Management to analyze changes in noted anomalies in order to determine areas where large scale rehabilitation/reinforcement and/or CIP needs should be addressed to ensure levee and bank integrity. The drones can also be used to inspect levees from the water-side potentially increasing the safety of City staff as well as the efficiency with which they are conducted. Because of the numerous environmental regulatory guidelines in place, drones can be used to view areas where protected species are habituating, greatly increasing our ability to leave them as undisturbed as possible while conducting operations.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The current facility maintenance program is scheduled in Maintenance Connections and is performed visually by experienced City staff. Inspections are currently scheduled in CityWorks and conducted visually by experienced City staff.

Responsible Office/Partners: City of Sacramento, Department of Utilities, Drainage Levee Inspection Section

Cost Estimate: $35,000 - $45,000 per drone

Benefits (Losses Avoided): The benefits are as noted above the Project Description.

Potential Funding: FEMA Grant or Department of Utilities

Timeline: 1-3 years

Project Priority (H, M, L): High

Action 30. Map and Assess Vulnerability to Sea Level Rise (Action 32 from 2016 plan)

Hazards Addressed: Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The Sacramento and American Rivers are affected by sea level rise. When originally constructed, the majority of the City's drainage and levee systems did not account for future sea level rise. This rise may impact the City's levee freeboard and the drainage capacity.

Project Description: Model various "what-if" scenarios to estimate potential vulnerability in order to develop sea level rise mitigation priorities. Develop an inventory of critical facilities and infrastructure that may be particularly vulnerable to sea level rise.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento, Department of Utilities Capital Improvement Planning

Responsible Office/Partners: City of Sacramento, Department of Utilities

Cost Estimate: Unknown

Benefits (Losses Avoided): This study would allow the City of Sacramento to proactively safeguard development and improve systems to accommodate the Sea Level Rise.

Potential Funding: Possible grants and capital improvement funds

Timeline: 5 years

Project Priority (H, M, L): Medium

Action 31. Emission Study of City Sump and Pump Stations (Action 33 from 2016 plan)

Hazards Addressed: Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: During the last 200 years the atmospheric concentrations of greenhouse gases (GHGs) have been increasing. Human activities such as agriculture, industry, waste disposal, deforestation, and especially fossil fuel have been producing increasing amounts of GHGs.

Project Description: Determine the level of emissions from all 94 sumps and pumps operated by the City of Sacramento Department of Utilities. Provide recommendations for mitigation and reduction of emissions.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Capital Improvement Plans

Responsible Office/Partners: City of Sacramento Department of Utilities

Cost Estimate: $200,000

Benefits (Losses Avoided): Reduction in greenhouse gases. Improvement of air quality.

Potential Funding: City of Sacramento Wastewater and Stormwater Drainage Fund and Grants

Timeline: 2 years

Project Priority (H, M, L): Medium

Action 32. Climate Change Mitigation Actions/Climate Change Adaptation Plan for Drinking Water Quality (Action 34 from 2016 plan)

Hazards Addressed: Drought, Severe Weather

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Studies and evaluations by US EPA and others indicate that climate change may result in long-term significant changes to watersheds, watershed management, and drinking water source water quality. Changes can include snowpack, timing of storms and runoff, reservoir operations, and wildfires. The result of such changes can have a significant impact on drinking water source water quality, which can result in the need to modify water treatment operations and treatment facilities.

Project Description: Develop a City of Sacramento Climate Change Adaptation Plan for Drinking Water Quality. (Or potentially Multiple Jurisdiction Plan/Resources for some components). Project could include development/preparation of tools and long-term water quality data review and analysis on selected constituents.

Other Alternatives: Continue general tracking of climate change potential impacts to Sacramento and Lower American River water quality through the Lower American River Joint Source Water Protection Program, watershed sanitary survey reports, and other tracking of water industry information.

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Engineering and Water Resources Division

Responsible Office/Partners: City of Sacramento Department of Utilities, Engineering and Water Resources Division

Cost Estimate: $100,000-$750,000 (Large range to provide range of resources for developing a plan to also provide support for plan implementation including setting up tools and resources, long-term review/evaluations, etc.)

Benefits (Losses Avoided): Protection of public health, planning ahead for potential future changes to water treatment plant processes and facilities for cost efficiency, and potentially avoiding costs for response to impacted water quality from watershed emergencies that are linked to climate change.

Potential Funding: Grant, to be determined

Timeline: 2 years

Project Priority (H, M, L): High

Action 33. Harmful Algal Bloom (HAB) Surveillance and Response Planning (Action 35 from 2016 plan)

Hazards Addressed: Climate Change (Drought and Severe Weather)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: A harmful algal bloom (HAB) can occur in water bodies and can affect those who use these water bodies for recreation, agricultural, or drinking. People can be exposed to a HAB or HAB toxins when they swim, wade, or play in or near contaminated water; eat contaminated fish or shellfish; or use contaminated drinking water. The severity of illness and symptoms can vary depending on the type of exposure and the type of HAB toxin.

The main routes of exposure to HAB toxins are:

- Skin contact (through activities like swimming)
- Inhalation (by breathing in tiny airborne droplets or mist contaminated with HAB toxins)
- Ingestion (by eating or drinking food or water contaminated with HAB toxins)
- Reference: http://www.cdc.gov/habs/exposure-sources.html

Project Description: Develop a County-wide (preferred) or City of Sacramento plan for surveillance and response planning for Harmful Algal Bloom events that may impact drinking water source waters and/or water bodies with recreational use. The project could be used to support monitoring. The project could also be used to identify new technologies and develop opportunities to support national, state, regional, or local programs that may provide early warning and other environmental indicators to help local agencies prepare for HABs and mitigate their effects.

Other Alternatives: Continue City of Sacramento tracking and response efforts, which includes lead efforts by the Department of Utilities Engineering and Water Resources Division Water Quality Lab and R&D Section for preparedness and coordination with other local water utilities, as well as tracking information on source water surveillance programs and the latest drinking water industry research.

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Engineering and Water Resources Division to provide initial coordination to help identify the best fit for the lead role in the Sacramento County area.

Responsible Office/Partners: City of Sacramento Department of Utilities, Engineering and Water Resources Division /Potentially Sacramento County Environmental Health Department/Potentially Other Drinking Water Utilities that Treat Lower American River and Sacramento River Water

Cost Estimate: $100,000-$3,000,000 (large range to show range for potential efforts from Plan only to Plan plus supporting technical programs to provide monitoring, surveillance and early warning, and other ideas/technologies to protect public health.)

Benefits (Losses Avoided): Protection of public health, reducing cost for emergency response or other alternate water supplies.

Potential Funding: Grant, to be determined

Timeline: 2 -3 years

Project Priority (H, M, L): High

Action 34. Perform a Groundwater Recharge Feasibility Study (Action 37 from 2016 plan)

Hazards Addressed: Drought & Water Storage

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City currently operates 27 active municipal groundwater supply wells within the city limits. Twenty-five of these wells are located north of the American River in the communities of North Sacramento, South Natomas and Arcade-Arden. The City wells supply the City with a maximum total capacity of about 20.7 mgd. In 2010, the groundwater supply wells pumped approximately 21.1 mgd. The City also operates 14 wells for the irrigation of parks. Although the City relies predominantly on surface water as its primary source of water supply, the groundwater well system provides flexibility in providing domestic water to the City, especially in years when there are low river flows, as well as providing water that can be delivered on a retail or wholesale basis outside the area authorized to receive delivery of the City's surface water supply.

Project Description: Preform a groundwater recharge feasibility study to determine the most cost-effective way to replenish groundwater resources within Sacramento.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Department of Utilities Water Treatment

Responsible Office/Partners: City of Sacramento Department of Utilities

Cost Estimate: $80,000

Benefits (Losses Avoided): Increased water supply

Potential Funding: Grants

Timeline: 2025

Project Priority (H, M, L): Medium

Action 35. Retrofit Historical Buildings

Hazards Addressed: Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento has many older structures that are not protected against earthquakes because they were designed and constructed according to current building standards. These types of buildings are the single biggest contributor to seismic risk in the United States today. Seismic retrofitting of vulnerable structures is critical to reducing risk, protection of life and property, and preservation of historical points of interest.

Project Description: Evaluating older buildings and retrofitting structural and non-structural components.

Other Alternatives: Retrofit buildings when major improvement are made to structure.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Building Permit Process and Code Enforcement

Responsible Agency/ Department/Partners: City of Sacramento Community Development Department

Cost Estimate: $3,000,000-$20,000,000

Benefits (Losses Avoided): Protection of life and assets. Increased resilience after an earthquake. Preservation of historical structures within the City.

Potential Funding: City of Sacramento Community Development Department and Grants

Timeline: 2021

Project Priority (H, M, L): Medium

Action 36. Heating Centers in High Priority Locations

Hazards Addressed: Extreme Cold

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Cold weather does not occur in Sacramento as severely as it does in other regions of Northern California and other areas of the United States. The average lowest temperature in Sacramento during December is 38°F. However, for the vulnerable populations, especially persons experiencing homelessness, this cold weather can be harsh, resulting in the need to activate warming centers.

Project Description: This project entails the identification of the locations of the most vulnerable populations to extreme cold and working with recreational and faith-based centers to provide a refuge from the harsh weather to keep them warm throughout the night when temperatures drop to the lowest. This can

be achieved by providing a stipend for every night the center is in use to cover the costs of heat generation. Centers would be placed in locations closest to populations in need.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: This will be implemented through current offerings of warming centers and respite centers by the City, faith-based, and recreational facilities and can be upgraded to include city owned facilities not in use.

Responsible Agency/ Department/Partners: City of Sacramento – Homeless Coordination, Department of Community Response, Sacramento City Office of Emergency Management, Youth Parks and Community Enrichment, City Libraries

Cost Estimate: $10,000

Benefits (Losses Avoided): Homeless assistance, health & safety of vulnerable populations, less emergency room visits

Potential Funding: City of Sacramento, Grants

Timeline: Winter 2021

Project Priority (H, M, L): High

Action 37. Cooling Centers in High Priority Locations

Hazards Addressed: Extreme Heat

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: With increasing temperatures every summer, at risk residents of Sacramento City need a place to escape the harsh weather. At-risk populations such as low income, people experiencing homelessness and the elderly are at risk for heat exhaustion, heat stroke and dehydration among other illnesses. An increase from 20 heat-related fatalities in 2014 to 45 fatalities was observed in 2015.**Project Description**: This project includes the opening of cooling centers and respite centers in high priority locations throughout the City where these at risk populations are centered as well as high population areas where the general public may need to cool down. This can be an incentive for recreational centers and faith-based centers that can receive stipends for each day they are operational.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: This will be implemented through current offerings of cooling centers by the City, faith-based, and recreational facilities and can be upgrade to include city owned facilities not in use.

Responsible Agency/ Department/Partners: City of Sacramento Department of Community Response, City of Sacramento Office of Emergency Management, Youth Parks and Community Enrichment, City Libraries

Cost Estimate: $25,000

Benefits (Losses Avoided): Health & safety of residents, reduced emergency service calls

Potential Funding: City of Sacramento, Grants

Timeline: Summer 2021

Project Priority (H, M, L): High

Action 38. Extreme Weather Outreach Strategy

Hazards Addressed: Extreme heat/cold

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Extreme heat and cold weather are no stranger to the Sacramento region. In July of 2016, the temperature mark hit over 100F for five days straight. During the winter months, some residents of Sacramento experienced pipes freezing overnight. At-risk populations such as low income, people experiencing homelessness and the elderly are at risk for weather related illnesses.**Project Description**: This project is meant to serve as an outreach mechanism to the population in Sacramento City. It will be completed mainly by providing social media toolkits for the general population with access to internet. For more at-risk populations, such as the homeless, the outreach will be completed in person by targeting the areas of Sacramento where the homeless population tends to stay. Outreach will also be completed via food banks and homeless assistance centers.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Public Information Office

Responsible Agency/ Department/Partners: City of Sacramento – Homeless Coordination, Sacramento Steps Forward, Department of Community Response, Sacramento City Office of Emergency Management, Sacramento City Public Information Officer

Cost Estimate: $5,000 + Staff Time

Benefits (Losses Avoided): Reduced calls for emergency services, health & safety of Sacramento's population

Potential Funding: City of Sacramento, Grants

Timeline: Within 5 years

Project Priority (H, M, L): High

Action 39. Severe Weather Action Plan

Hazards Addressed: Extreme heat/cold

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Extreme heat and cold weather are no stranger to the Sacramento region. In July of 2016 the City saw the temperature mark hit over 100F for five days straight. During the winter months some residents of Sacramento experience pipes freezing overnight and low temperatures. There are individuals in the community who do not have adequate resources to keep themselves warm or cool during these harsh times. The largest group of people affected by Sacramento's severe weather is the homeless population and low-income areas around Sacramento.

Project Description: The Severe Weather Action Plan will outline key triggers, such as, when to begin weather monitoring and cooling/warming centers activations. The Plan would also outline media and boots-on-the-ground outreach to the populations in need. The Plan will also identify community partners who will provide shelter and/or services during severe weather events.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Office of EmergencyManagement Planning Process

Responsible Agency/ Department/Partners: City of Sacramento – Homeless Coordination, Sacramento Steps Forward

Cost Estimate: $50,000

Benefits (Losses Avoided): Reduced calls for emergency services, health & safety of Sacramento's population

Potential Funding: Local Funding, Grants

Timeline: Discussing City guidelines that meet the needs of our jurisdiction in relation to set County severe weather guidance plan thresholds

Project Priority (H, M, L): High

Action 40. Coordinate with Stakeholder on Proposed Flood Control Project on Magpie Creek

Hazards Addressed: Flooding

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Since the early 1990s, SAFCA has been working with USACE and CVFPB to improve the Magpie Creek Diversion Channel (MCDC) and levee to reduce the risk of overflow into the historic Magpie Creek floodplain downstream of the diversion channel. This effort has focused on a combination of floodplain storage and levee rehabilitation improvements that would be carried out as part of the American River Common Features General Reevaluation Report (ARCF GRR). This is a low priority on SAFCA's list.

Project Description: The project would raise approximately 2,100 feet of the MCDC left bank levee and extending the levee south along the west side of Raley Boulevard to Santa Ana Avenue, with floodgates at two driveways.

Other Alternatives: Increase pumping capacity at Magpie Creek and the NEMDC

Existing Planning Mechanism(s) through which Action Will Be Implemented: US Army Corps of Engineers, Sacramento District, General Reevaluation Report (GRR)

Responsible Agency/ Department/Partners: Sacramento Area Flood Control Association, US Army Corps of Engineers, County of Sacramento, Department of Water Resources, City of Sacramento, Department of Utilities

Cost Estimate: Unknown

Benefits (Losses Avoided): Protects the safety of residents and their structures. Flood insurance relief to residents in the Historic Magpie Creek floodplain.

Potential Funding: SAFCA/Grants/City

Timeline: 2023

Project Priority (H, M, L): Medium

Action 41. Adopt Additional Floodplain Development Standards

Hazards Addressed: Flooding

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City has created a Development Services Task Force that meets on a regular basis to discuss the City's floodplain development standards. Additional regulations may include evacuation and rescue requirements, additional freeboard, elevation of utilities, and 200-year level of protection.

Project Description: The Development Services Task Force will discuss the adoption of additional development standards related to floodplain management and best practices.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: The Development Service Task Force would implement necessary action.

Responsible Agency/ Department/Partners: City of Sacramento, Department of Utilities and Community Development Department

Cost Estimate: Staff time

Benefits (Losses Avoided): New and substantially improved structures will be better protected from flooding.

Potential Funding: City of Sacramento, Department of Utilities and Community Development Department

Timeline: 2025

Project Priority (H, M, L): Medium

Action 42. Drainage Projects for Repetitive Loss Properties

Hazards Addressed: Flooding

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City has set a goal to remove at least four repetitive loss (RL) structures from FEMA‟s Repetitive Loss List within the City by September 2018. A lot of the RL structure have flooded because undersized local drainage issues.

Project Description: Many potential drainage projects that have been identified in the City's Drainage Master Plans. These projects include upsizing pipelines, adding detention basins, adding bypass pipelines, retrofitting pump stations, and land acquisition. These projects will be ranked and grant funding will be pursued.

Other Alternatives: Promote flood insurance.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Mitigation of repetitive loss properties is a mitigation measure in the City's Corrective Action Plan approved by FEMA.

Responsible Agency/ Department/Partners: City of Sacramento, Department of Utilities

Cost Estimate: $0.2 million - $15 million per project

Benefits (Losses Avoided): No more structural damage and flood insurance claims.

Potential Funding: FEMA grants, Corrective Action Plan funding, and DOU

Timeline: On-going

Project Priority (H, M, L): Medium

Action 43. Emergency Notification and Evacuation Planning

Hazards Addressed: Flooding

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: As part of a corrective action plan approved by FEMA, the City of Sacramento in conjunction with the Sacramento Office of Emergency Services has committed to upgrading and improving emergency notification and evacuation planning systems and processes using the current Reverse 911 system, which is administered by the Sacramento Police Department, as the primary method.

Project Description: Enhancements to the existing Reverse 911 system to more effectively notify mass populations of evacuation orders and routes, consistent with FEMA guidelines, identifying special needs communities and transportation providers, targeted outreach to maximize the capabilities of Reverse 911, and strategic training to assure effective deployment of the enhanced capabilities.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: The multi-hazard response plan and ongoing training programs administered by Sacramento County Office of Emergency Services

Responsible Agency/ Department/Partners: Sacramento County Office of Emergency Services

Cost Estimate: Approximately $350,000

Benefits (Losses Avoided): Early notification times, better prepared evacuations, preventing loss of life and property

Potential Funding: $350,000 appropriated from the City's Community Development Department as part of the City's Corrective Action Plan to FEMA

Timeline: Within 5 years

Project Priority (H, M, L): High

Action 44. Historic Magpie Creek

Hazards Addressed: Flooding

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: For years, the City has used floodplain maps and data from the City's Drainage Master Plan and a Corps of Engineers study for development purposes in the Historic Magpie Creek floodplain.

The City would like to have this area studied and have the actual current floodplain and BFEs incorporated into FEMA's DFIRMs. FEMA is in the process of restudying this area.

Project Description: The Magpie Creek Diversion Channel is part of the Corps levee improvement project under the WRDA 16 authorization. The work consists of cutting off all (or the majority) of the spill into historic Magpie and keeping it contained in the diversion channel as it heads north then west.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: FEMA is in the process of restudying historic Magpie Creek.

Responsible Agency/ Department/Partners: City of Sacramento, DOU

Cost Estimate: $0

Benefits (Losses Avoided): Base Flood Elevations provided for development will be more accurate, and the correct data will be on the DFIRMs. Structures that will be put into the floodplain will be required to carry flood insurance, which will protect those structures.

Potential Funding: $0 (Funded by FEMA)

Timeline: 2024

Project Priority (H, M, L): Medium

Action 45. Natomas Internal Drainage Canals/Levees

Hazards Addressed: Flooding and Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Based on the hydrology and hydraulics modeling, the majority of the area greater than 3 feet in the 200-year Natomas interior floodplain is confined to the drainage basins, parks, and street flooding. Contrarily, the internal levees along the canals were last certified to the 100-year in 1989. Once the exterior levee work around the Natomas Basin is complete (approx. 10 years), the internal levees will need to be recertified. The recertification will need to be submitted to FEMA. Also, while in the process of recertifying to the 100-year, the internal levees should be certified to the 200-year (meet the State ULDC requirements).

Project Description: Certify the Natomas Internal Drainage Canals/Levees to the 100-year and 200-year Level. DOU currently has a contract with KSN to provide the evaluation and recertification of the interior levees in the Natomas Basin.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: The regional coordination process facilitated through Sacramento Area Flood Control Association (SAFCA).

Responsible Agency/ Department/Partners: SAFCA, USACE, City of Sacramento Department of Water Resources, City of Sacramento Department of Utilities, Reclamation District 1000, Sutter County

Cost Estimate: $800,000

Benefits (Losses Avoided): Once completed the protection level of the Natomas Internal Basin will be verified. Weakness within the system will be identified and addressed. This will also allow residents to purchase PRP flood insurance and development will be protected.

Potential Funding: City of Sacramento Department of Utilities, County of Sacramento Department of Water Resources, Sutter County, Reclamation District 1000, Grants

Timeline: 2025

Project Priority (H, M, L): High

Action 46. Drainage Projects from the City's Priority Drainage Project List

Hazards Addressed: Local Flooding, Severe Rain and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City is continually improving the local drainage system and the combined sewer and storm water system.

Project Description: Many potential drainage projects that have been identified in the City's Drainage Master Plans and have been prioritized on a Basin Master Planning and Improvement Projects priority list. These projects include upsizing pipelines, adding detention basins, adding pipelines, retrofitting pump stations, and land acquisition. These projects are ranked by priority.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: The Department of Utilities has a Drainage CIP Group

Responsible Agency/ Department/Partners: City of Sacramento, Department of Utilities

Cost Estimate: $200,000 to 15,000,000 per project

Benefits (Losses Avoided): Eliminate structural damages and flood insurance claims, avoid economic loss from flooded streets, and life safety

Potential Funding: FEMA grants and DOU CIP funds

Timeline: 2022-2026

Project Priority (H, M, L): Medium

Action 47. Projects Identified in the Combined Sewer System Improvement Plan Update

Hazards Addressed: Localized Stormwater Flooding and Severe Rain and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento (City) owns and operates a combined sewer system (CSS) that conveys residential and commercial wastewater and storm water runoff from approximately 11.7 square miles in downtown Sacramento, East Sacramento, Oak Park, and the Land Park area. There are 5.8 square miles of separated sewer areas of the City north, east, and south of the CSS that contribute sanitary flows to the CSS. The City also includes approximately 76 square miles of separated areas that are not served by the CSS. The CSS serves approximately 101,700 people. The CSS includes four key facilities to manage the collected flow: Sumps 1/1A, Sumps 2/2A, Pioneer Reservoir, and the Combined Wastewater Treatment Plant (CWTP). Sumps 1/1A and 2/2A pump up to 60 million gallons per day (mgd) of flows to the Sacramento Regional County Sanitation District's Regional Wastewater Treatment Plant (SRWTP). Pioneer Reservoir and CWTP provide additional storage and, when needed, primary treatment, and disinfection of combined sewage prior to discharge to the Sacramento River. The CSS is regulated under the August 2020 National Pollutant Discharge Elimination System (NPDES) waste discharge permit, No. CA0079111. The permit allows for CSS discharge to the Sacramento River at six locations: three for primary treated (plus disinfection) effluent, and three that can discharge untreated combined sewage. The secondary treated effluent from SRWTP is discharged to the Sacramento River at a permitted location under a separate NPDES permit. The Combined Sewer System Improvement Plan outlines improvement projects and programs to reduce flooding, constructability and cost/benefit analysis, and project prioritization for implementation.

Project Description: Identified projects were categorized into storage and conveyance. The storage projects are located upstream or downstream of local flooding areas, and are intended to detain flows until the CSS has re-generated capacity (i.e., peak of the storm has passed and HGL in the system has receded from peak conditions) and the storage facilities can be dewatered. The storage projects can be linear or parcel based. Conveyance projects would generally be located in proximity to or just downstream of localized flooding areas. Their objective would generally be to convey peak flows from and through the flood-prone areas to points downstream with greater capacity. The analysis carefully considered whether the increased conveyance had the potential to cause or exacerbate downstream flooding. If that was determined to be true, the conveyance project(s) were combined with upstream or downstream storage projects to mitigate the downstream flood exacerbation risk. Conveyance projects included upsizing existing pipes or constructing new pipes. Where baseline flooding occurred in a location with no opportunities for storage, a new pipe was sized to convey the 10-year storm design peak flows to the downstream system. Factors such as ground cover requirements, right-of-way width, and existing system pipe invert elevations (to which linear storage facilities must connect) were factored into the storage configurations

Other Alternatives: No improvements to the system.

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Wastewater & Storm Drain Engineering Program.

Responsible Agency/ Department/Partners: City of Sacramento Department of Utilities Wastewater & Storm Drain Engineering Program.

Cost Estimate: Projects range from $510,000 to $22,000,000.

Benefits (Losses Avoided): Reduced of localized flooding. Increased system resiliency and capacity.

Potential Funding: City of Sacramento Department of Utilities and Grants

Timeline: 2021-2025

Project Priority (H, M, L): High

Action 48. Easements for Open Land Along Levees

Hazards Addressed: Flood and Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The Urban Levee Design Criteria (ULDC) requires fee title or an easement for the entire levee prism extending to a minimum of 20 feet beyond the landside toe of the flood protection system needs to be acquired. This is needed to provide adequate room for maintenance, inspection, flood-fighting and protection of the levees.

Project Description: Analysis of current levee easements and setback to determine where additional and future easements will be needed. Develop a method and funding source to acquire the needed easements and open space to meet the ULDC standards.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Development Review

Responsible Agency/ Department/Partners: City of Sacramento, Department of Utilities and Community Development Department, Sacramento Area Flood Control Agency

Cost Estimate: $2,000,000

Benefits (Losses Avoided): Quicker detection of levee distress during high water events, higher level of flood projection, the ability to widen the levee in the future, if needed.

Potential Funding: City of Sacramento and Grants

Timeline: 2021

Project Priority (H, M, L): High

Action 49. Emergency Management Planning and Levee Security

Hazards Addressed: Flood

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento focuses its emergency management activities within the City on four phases: preparedness, response, recovery, and mitigation. Public outreach, warning systems, post-flood building entry, levee security, and EOC operations are examples of the City's extensive emergency management system.

Project Description: Implementation of the emergency management and levee security action items outlined in the City of Sacramento's Comprehensive Flood Management Plan. Highlighted projects include continued National Incident Management System (NIMS) and Standardized Emergency Management System (SEMS) exercises and training, creation of a disaster housing plan, increased public education and alerts efforts, development of an intergovernmental flood management and control standards, annual review of the Levee Security Plan, and improvement of flood warning systems.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implementation of the Comprehensive Flood Management Plan

Responsible Agency/ Department/Partners: City of Sacramento, Department of Utilities, Office of Emergency Services, and other maintaining agencies responsible of levee systems within the region.

Cost Estimate: $100,000 and staff time

Benefits (Losses Avoided): These projects would decrease the loss of life and property and establishes clear guidelines for recovery from a flood.

Potential Funding: City of Sacramento Department Budgets, Grants

Timeline: Within 5 years

Project Priority (H, M, L): High

Action 50. Flood Fighting Equipment

Hazards Addressed: Flood and Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: During high water events an effort will be made to prevent the effects of flood waters. The City of Sacramento currently has to borrow necessary equipment from neighboring agencies to conduct levee repair and flood fighting operations.

Project Description: Purchase flood fighting equipment such as a utility landing craft, long reach excavator, and the tuck (tractor) trailer.

Other Alternatives: Borrow equipment from neighboring agencies.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Operations and Maintenance equipment budgetary and procurement process.

Responsible Agency/ Department/Partners: City of Sacramento Department of Utilities Operations and Maintenance

Cost Estimate: $550,000

Benefits (Losses Avoided): These projects would decrease the loss of life and property and establishes clear guidelines for recovery from a flood.

Potential Funding: City of Sacramento Department Budgets, Grants

Timeline: Within 5 years

Project Priority (H, M, L): High

Action 51. Flood Management Land Use Planning and Development

Hazards Addressed: Flood

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Both land use planning and development guidelines are implemented using the City's zoning, building, and subdivision codes. The City is currently implementing various federal, state, and local mandates for land use planning and development.

Project Description: Implementation of the land use planning and development action items outlined in the City of Sacramento's Comprehensive Flood Management Plan. Highlighted projects include 200-year floodplain ordinance and projection plan, development guidelines for rescue and evacuation areas, City Code update for new development adjacent to levees.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implementation of the Comprehensive Flood Management Plan

Responsible Agency/ Department/Partners: City of Sacramento, Department of Utilities and Community Development Department

Cost Estimate: Staff time

Benefits (Losses Avoided): Decrease the number of structures at risk from flooding and an increased in levee and structure protection measures.

Potential Funding: City of Sacramento Department Budgets, Grants

Timeline: Within 5 years

Project Priority (H, M, L): High

Action 52. Florin Creek Pump at Pomegranate Avenue

Hazards Addressed: Localized Flooding, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The U.S. Army Corps of Engineers (Corps) has constructed improvements to the Florin Creek Channel from Highway 99 to Franklin Boulevard. In addition, Sacramento Area Flood Control Agency (SAFCA) constructed a multi-use detention basin upstream. These improvements will increase the channel capacity and enable the conveyance of 100-year event flood flows within the channel. These public safety improvement projects will reduce the risk of flooding in the area during extreme storm events and ultimately provide financial relief to several-hundred property owners currently subject to mandatory, high-cost flood insurance. To expand flood protection in this area, a relief pipeline and small pump station are needed near Pomegranate Avenue .

Project Description: Construction of a relief pipeline and a pump stationnear Pomegranate Avenue.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: SAFCA's South Sacramento County Streams Project

Responsible Agency/ Department/Partners: City of Sacramento Department of Utilities

Cost Estimate: $800,000

Benefits (Losses Avoided): Increased flood protection to local residence. Decrease in property damage and insurance claims.

Potential Funding: City of Sacramento Department of Utilities Stormwater Drainage Fund and Grants

Timeline: 1 year

Project Priority (H, M, L): High

Action 53. Internal Drainage System Improvements

Hazards Addressed: Flood

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: In addition to the risk of flooding from levee failure, a considerable flood risk exists due to aging internal drainage infrastructure. Although levee failure may result in much more catastrophic damage than flooding from internal drainage, most of the City's flood damage since 1955 has resulted from drainage deficiencies. In 1995, for instance, approximately 100 homes in four south area drainage basins incurred flood damage due to internal drainage system failure during a particularly intense storm.

Project Description: Implementation of the internal drainage system improvements outlined in the City of Sacramento's Comprehensive Flood Management Plan. Highlighted projects include development of a grant program to fund drainage improvements, develop an Engineering Services efficiency plan, work on the passage of Proposition 218 drainage fee increase, and drainage master planning.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implementation of the Comprehensive Flood Management Plan

Responsible Agency/ Department/Partners: City of Sacramento Department of Utilities

Cost Estimate: Range of staff time to $800,000

Benefits (Losses Avoided): These projects would decrease property damage and the number of flood insurance claims. Drainage system improvements will also increase the City's resiliency after a large scale weather event.

Potential Funding: City of Sacramento Department of Utilities Stormwater Drainage Fund and Grants

Timeline: 2021 and ongoing

Project Priority (H, M, L): High

Action 54. Levee and Structural Flood Management Improvements

Hazards Addressed: Flood

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento works alongside the Sacramento Area Flood Control Agency, US Army Corps of Engineers, Central Valley Flood Protection Board, Reclamation District No. 1000,

Maintaining Agency 9, American River Flood Control District, and others to implement and maintain flood control projects that protect the City.

Project Description: Implementation of the levee and structural improvement action items outlined in the City of Sacramento's Comprehensive Flood Management Plan. Highlighted projects include support of local efforts to improve flood facilities, plan and implement modernization phase of levee accreditation and ULDC, and participate in the Regional Flood Management Plan.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implementation of the Comprehensive Flood Management Plan

Responsible Agency/ Department/Partners: City of Sacramento Department of Utilities, Community Development Department, SAFCA

Cost Estimate: Range of staff time to $1,000,000

Benefits (Losses Avoided): These projects would decrease the loss of life and property and decrease the number of flood insurance claims.

Potential Funding: City of Sacramento, SAFCA, and possible grants

Timeline: 2021 and ongoing

Project Priority (H, M, L): High

Action 55. Master planning to identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding

Hazards Addressed: Localized Stormwater Flooding and Severe Rain and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The majority of the City has master plans in place, however with additional development needs and infrastructure projects master planning is needed in portions of the City

Project Description: Develop master plans to identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding in areas of the City that do not currently have master planning. Prioritize the projects and formulate timeline for the identified projects. Execute the projects to provide protection from flooding.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Wastewater & Storm Drain Engineering Program

Responsible Agency/ Department/Partners: City of Sacramento Department of Utilities Wastewater & Storm Drain Engineering Program

Cost Estimate: $900,000

Benefits (Losses Avoided): Protection of life and property and reduced flooding on roadways

Potential Funding: City of Sacramento Department of Utilities and Grants

Timeline: 2021 and ongoing

Project Priority (H, M, L): High

Action 56. Retrofit Pumping Plans with Discharge Monitoring Devices

Hazards Addressed: Localized Stormwater Flooding and Severe Rain and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: All our drainage master plans recommend retrofit of our pumping plants with discharge measuring/monitoring devices. The average test capacity of pumps is approximately 75 percent of Rated Capacity.

Project Description: Retrofit pumping plants to measure discharge and monitor devices. Identify pumps that are underperforming and raise Reliable Capacity to 90 percent service factor.

Other Alternatives: Check pumping capacity when issues arise or develop a testing schedule.

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Operations and Maintenance Procedures

Responsible Agency/ Department/Partners: City of Sacramento Department of Utilities Operations and Maintenance

Cost Estimate: $500,000

Benefits (Losses Avoided): Protection of life and property, increased pumping capacity, and early identification of device fatigue.

Potential Funding: City of Sacramento Department of Utilities Capital Improvement Funds and Grants

Timeline: 2021 and ongoing

Project Priority (H, M, L): High

Action 57. Risk Communication and NFIP/CRS Projects

Hazards Addressed: Flood

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento residents hold over 40,000 National Flood Insurance Program (NFIP) policies and the City has a Class 5 standing in FEMA's Community Rating System (CRS). In coordinate with these two programs, the City has also established a Program of Public Information (PPI) Committee which develops communication strategies related to flood and flood insurance information.

Project Description: Implementation of the risk communication and NFIP/CRS action items outlined in the City of Sacramento's Comprehensive Flood Management Plan. Highlighted projects include implementation of the City's Program of Public Information, develop a Flood Response PPI projects, increase freeboard development to two feet, write a Levee Failure Response Plan for Critical Facilities, and sign a Memorandum of Agreement with the County of Sacramento for flood control planning of the South Sacramento County Streams.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implementation of the Comprehensive Flood Management Plan

Responsible Agency/ Department/Partners: City of Sacramento, Department of Utilities, Community Development Department, Sacramento County and City Office of Emergency Management

Cost Estimate: Projects range from $10,000 to $200,000

Benefits (Losses Avoided): Increased public awareness and preparedness which would decrease the amount of property damage and loss of life. Also, increase awareness of flood risk areas and impacts of development.

Potential Funding: City of Sacramento and Grants

Timeline: 2021 and ongoing

Project Priority (H, M, L): High

Action 58. Trash Racks and Debris Cages

Hazards Addressed: Flood

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City relies heavily on our pumping stations and other drainage facilities to reduce our localized flooding risk. Trash rack and debris cages prevent debris from entering the intake of a pumping station or water conveyance system while still allowing water to flow though.

Project Description: Identify high impact locations in need of trash racks or debris cages. Install devices and develop maintenance schedule.

Other Alternatives: No Improvements to the system

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Wastewater & Storm Drain Engineering Program

Responsible Agency/ Department/Partners: City of Sacramento Department of Utilities Wastewater & Storm Drain Engineering Program

Cost Estimate: $1,250 to $4,000 per rack or cage

Benefits (Losses Avoided): Loss of life and property avoided. Increased system resiliency and capacity.

Potential Funding: City of Sacramento Department of Utilities and Grants

Timeline: 2021 and ongoing

Project Priority (H, M, L): High

Action 59. Multi-Jurisdictional Modeling for Drainage Watersheds Greater than 10 Square Miles

Hazards Addressed: Flooding and Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City of Sacramento encompasses several streams, creeks and associated watersheds. The majority of these watersheds drain into the City from the County of Sacramento. Some of the major drainage watersheds in the City are identified as Natomas Area Stream Group, American River Stream Group, Sacramento Stream Group, and Natural Stream Groups. These groups are identified in the County of Sacramento Watershed Management Plan (2011).

Project Description: Development of a unified model for each watershed that extends over jurisdictional lines. The model would be maintained to reflect changes to the watershed, including development.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Sacramento Area Flood Control Agency Coordination Group

Responsible Agency/ Department/Partners: Sacramento Area Flood Control Agency, County of Sacramento Department of Water Resources, City of Sacramento Department of Utilities

Cost Estimate: $350,000, plus annual fee to maintain the model

Benefits (Losses Avoided): Accurate modeling of development impacts and flood control planning

Potential Funding: Cost Share Between Sacramento Area Flood Control Agency, County of Sacramento Department of Water Resources, City of Sacramento Department of Utilities

Timeline: 2021 and ongoing

Project Priority (H, M, L): High

Action 60. Post-Flood Water Treatment Facility Recovery

Hazards Addressed: Flood, Local Flooding

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Flood waters may impact drinking water system infrastructure such as wells, intakes, and treatment plants by transporting contaminants carried by surface waters or saturated soil. There could be a wide range of contaminants, depending on the severity of the flood and its impacts to the surrounding area. Contaminants may include bacteria, viruses, protozoa, petroleum products from fuel spills, and other known or unknown synthetic chemicals. The contamination may constitute a hazard to public health for regulated and unregulated water quality contaminants.

Project Description: Provide resources for planning and implementing facility cleaning, monitoring, and actions to restore water treatment services.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: City of Sacramento Department of Utilities Water Quality Incident Response Planning

Responsible Agency/ Department/Partners: City of Sacramento Department of Utilities, Engineering and Water Resources, Water Quality Laboratory and R&D

Cost Estimate: $100,000 - $900,000,000 (large range includes planning, cleanup, monitoring and potential costs for repair/replacement of facilities for full recovery)

Benefits (Losses Avoided): Protection of public health, reducing cost for continuing emergency or other alternate water supplies.

Potential Funding: Grant, to be determined

Timeline: 1-2 years with updates on a to-be-determined frequency

Project Priority (H, M, L): High

Action 61. Tree Trimming & Debris Removal

Hazards Addressed: Severe Wind

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Dead branches fall very easily during high winds or a severe storm. These falling branches are a threat to nearby power lines. Trimming of trees treat diseases that can weaken the tree and make it susceptible to toppling during severe winds and storms.

Project Description: This project includes the year-round pruning of trees throughout the City that can pose a threat to power lines.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Department of Public Works Operations & Maintenance

Responsible Agency/ Department/Partners: Department of Public Works, SMUD, PG&E

Cost Estimate: $80,000 - $100,000

Benefits (Losses Avoided): Reduced power outages, cost savings

Potential Funding: Department of Public Works Maintenance Budget

Timeline: Ongoing

Project Priority (H, M, L): High

Action 62. Install redundancies and Loop Feeds for Power Lines & Infrastructure

Hazards Addressed: Severe Wind

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: During times of severe wind and weather Sacramento sees an increase in power outages. These outages have at times lasted up to 2-3 days, such as the winter storm of 2008. A need to redundancies and loop feeds is needed to reduce power outages and provide residents a means of communication should they have an emergency during such an event.

Project Description: This project involves reducing the deficiencies in the electrical transmission lines and the electrical transmission system radial feeds to substations. High voltage lines will be installed that allow the energy to travel longer distances and then be dropped for consumption at distribution transformers.

Other Alternatives: Increased inspection and maintenance on the system

Existing Planning Mechanism(s) through which Action Will Be Implemented: SMUD Infrastructure

Responsible Agency/ Department/Partners: Department of Utilities, SMUD, PG&E

Cost Estimate: $175,000/mile

Benefits (Losses Avoided): Reduction of power outages, community resiliency

Potential Funding: Possible Grants, SMUD Capital Improvements

Timeline: 2021 and ongoing

Project Priority (H, M, L): High

Action 63. Stabilization of Erosion Hazard Areas

Hazards Addressed: Streambank Erosion

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Bank erosion is a critical concern in Sacramento River because the eroding stream banks threaten levee integrity. Over 50% of the rivers 193 miles have been riprapped in the last 40 years according to the US Fish and Wildlife Service and over a hundred erosion sites have been identified along the river in recent years. It is critical to mitigate these sites to reduce their threats to the integrity of Sacramento's levee system.

Project Description: This project will include the identification and mitigation of erosion sites along the Sacramento river and other rivers in the region that pose a threat to levees and raise flooding concerns.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: The US Army Corp of Engineers has headed the Sacramento River Bank protection Project and this mitigation action will be channeled through them as an expansion to their ongoing efforts.

Responsible Agency/ Department/Partners: California Department of Water Resources, Army Corps of Engineers, City and County of Sacramento

Cost Estimate: $1,000,000

Benefits (Losses Avoided): Preventing levee failure and flooding, reduced risk to life and nearby structures

Potential Funding: Grants

Timeline: 2021 and ongoing

Project Priority (H, M, L): High

Action 64. Implement a Fire Education and Information Program

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Sacramento is a developed city that has relatively few remaining wildland areas. Areas of the city that have been identified as fairly susceptible to an urban wildfire are generally along the American River Parkway from Watt Avenue to the Sacramento River and along the Garden Highway in the Natomas area. The American River Parkway is a stretch of dense trees and brush on both sides of the American River. The property is owned by the State of California, maintained by the Sacramento County Parks Department, and protected from fire by the Sacramento City Fire Department. The area consists of natural habitat with no fire break areas. Fire equipment access is difficult and limited to the paved stretches of the bicycle path. Some of the potential fire areas are not accessible to vehicular traffic.

Project Description: Implement an urban-wildfire safety program using materials for the community. Train educators and inspectors, identifies high risk neighborhoods and buildings, and develop agreed-upon, area specific solutions to fire issues.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Add to the Sacramento City Fire Department's current outreach activities

Responsible Agency/ Department/Partners: Sacramento City Fire Department

Cost Estimate: $10,000

Benefits (Losses Avoided): Educated and more prepared community, increased defensible space for at risk structures

Potential Funding: FEMA & State Grants, Community Wildfire Planning Grant

Timeline: 2019

Project Priority (H, M, L): High

Action 65. Fuels Reduction on the American River Parkway

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The American River Parkway is identified as a State Recognized Fire Hazard. The vegetation along the parkway would be a source of fuel to any fire that could burn due to its wild interface. In addition, an invasive series of plants and weeds growing in the area would allow the fire to burn and spread rapidly.

Project Description: The goal of the project would be to maintain the vegetation growing along the parkway and rid the area of the invasive species which are a greater source of fuel for fires.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: The Sacramento Regional Conservation Corp works on fuel reduction projects and their work will be expanded to cover areas at risk along the American River Parkway.

Responsible Agency/ Department/Partners: Sacramento City Fire District

Cost Estimate: $80,000-$100,000

Benefits (Losses Avoided): Reduced risk to nearby homes and structures

Potential Funding: Grants

Timeline: Ongoing

Project Priority (H, M, L): High

Action 66. Outreach on the Effects of Smoke on Air Quality

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The Sacramento region is surrounded by a large number to locations that have recently caught ablaze over the last several years. The Northern California fire season has been highly active with large scale wildfires. These fires have affected Sacramento's air quality. Winds will carry the smoke from fires a significant distance into Sacramento.

Project Description: The purpose of the project is to educate Sacramento residents on the effects of smoke in the air and provide resources to check the air quality in their area. This will be carried out via social and network media. The city will utilize its social media pages and radio advertisements to convey knowledge and resources residents can use to know when to use precaution. The project will also provide helpful tips to decrease the impacts of poor air quality in their homes and through the daily routines.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing city webpages, Spare the Air Sacramento Region

Responsible Agency/ Department/Partners: Sacramento City Fire Department, City of Sacramento Public Information Office, Spare the Air Sacramento Region

Cost Estimate: $5,000 plus staff time

Benefits (Losses Avoided): Greater public awareness, health risk reduced

Potential Funding: Local Funding

Timeline: Ongoing

Project Priority (H, M, L): High

Action 67. Implement 2040 Climate Action and Adaptation Plan

Hazards Addressed: Climate Change, Multi-Hazard

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: In recent decades, human activities (e.g., burning of fossil fuels for transportation and energy, increasing rates of deforestation and development) have contributed to elevated atmospheric greenhouse gas (GHG) concentrations. Human-caused emissions of GHGs above natural ambient concentrations are responsible for intensifying the greenhouse effect, leading to a trend of unnatural warming of the Earth's climate, known as global climate change, or global warming. Global climate change has a number of adverse effects on natural resources and the human population. These include:

- rising sea levels due to thermal expansion of ocean water and melting of polar ice caps and sea ice, which can inundate low-lying areas exposed to tidal action and increase the severity of flooding risk;
- changes in the timing, severity, and amounts of rainfall and snowfall, leading to changes and greater variability in wet and dry periods that will affect water supply and flood risk;
- increased stress to vegetation and terrestrial and aquatic habitats, leading to adverse effects on biological resources and sensitive species;
- changes in the frequency and duration of heat waves and droughts, which can affect human populations and community infrastructure; and
- increases in wildfire hazards.

Over the long term, these changes create the potential for a wide variety of secondary consequences, including human health and safety risks, economic disruptions, diminished water supply, shifts in ecosystem function and habitat qualities, and difficulties with provision of basic services. Addressing climate change requires an integrated approach, or plan, that targets both the sources and the potential effects of climate change.

Project Description: This project would include the implementation of the GHG reduction measures and adaptation strategies contained within the City of Sacramento's Climate Action and Adaptation Plan (projected adoption date 2022). Projects could include the following: revisions to adopted plans and codes, creation of new programs, incentives, education and outreach, demonstration projects, capital improvements, land acquisition, and carbon sequestration projects.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Updates to the Planning and Development Code and Building Code.

Responsible Agency/ Department/Partners: Community Development Department, Department of Public Works, Office of Emergency Management, SacRT, SMUD, SMAQMD, non-governmental and community-based organizations'

Cost Estimate: Varies depending on project size and scope. Order of magnitude of tens to hundreds of thousands of dollars most common.

Benefits (Losses Avoided): Because climate change exacerbates most other hazards, the benefits of this mitigation action include those associated with most other mitigation actions in this annex. Additionally, the centralized and coordinated all-hazards approach of addressing climate change through this mitigation action will provide economies of scale, multiple co-benefits, and the policy and legal framework to assure that climate adaptation, resiliency, and meaningful greenhouse gas (GHG) reductions occur.

Potential Funding: FEMA hazard mitigation program. Local, state and private funding. Other grants, incentives, and donations, including in-kind services.

Timeline: Ongoing

Project Priority (H, M, L): High

Annex G American River Flood Control District

G.1 Introduction

This Annex details the hazard mitigation planning elements specific to American River Flood Control District (ARFCD or District), a new participating jurisdiction to the 2021 Sacramento County Local Hazard Mitigation Plan (LHMP) Update.

Note: ARFCD participated in the original 2005 Sacramento County LHMP. A copy of that document could not be located by ARFCD, Sacramento County, Cal OES, or FEMA. Additionally, staff turnover in the past 16 years has reduced institutional memory of that 2005 Plan. It can be assumed that none of ARFCD's proposed mitigation actions were completed, ARFCD's mitigation priorities at that time are unknown, and that the 2005 Plan was not incorporated into any ARFCD planning mechanisms. Development in the District since 2005 was described by ARFCD as minimal, and a general description of more recent development in the District is included in Section G.5.2 of this Annex.

This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to ARFCD, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

G.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District conducted their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table G-1. Additional details on plan participation and District representatives are included in Appendix A.

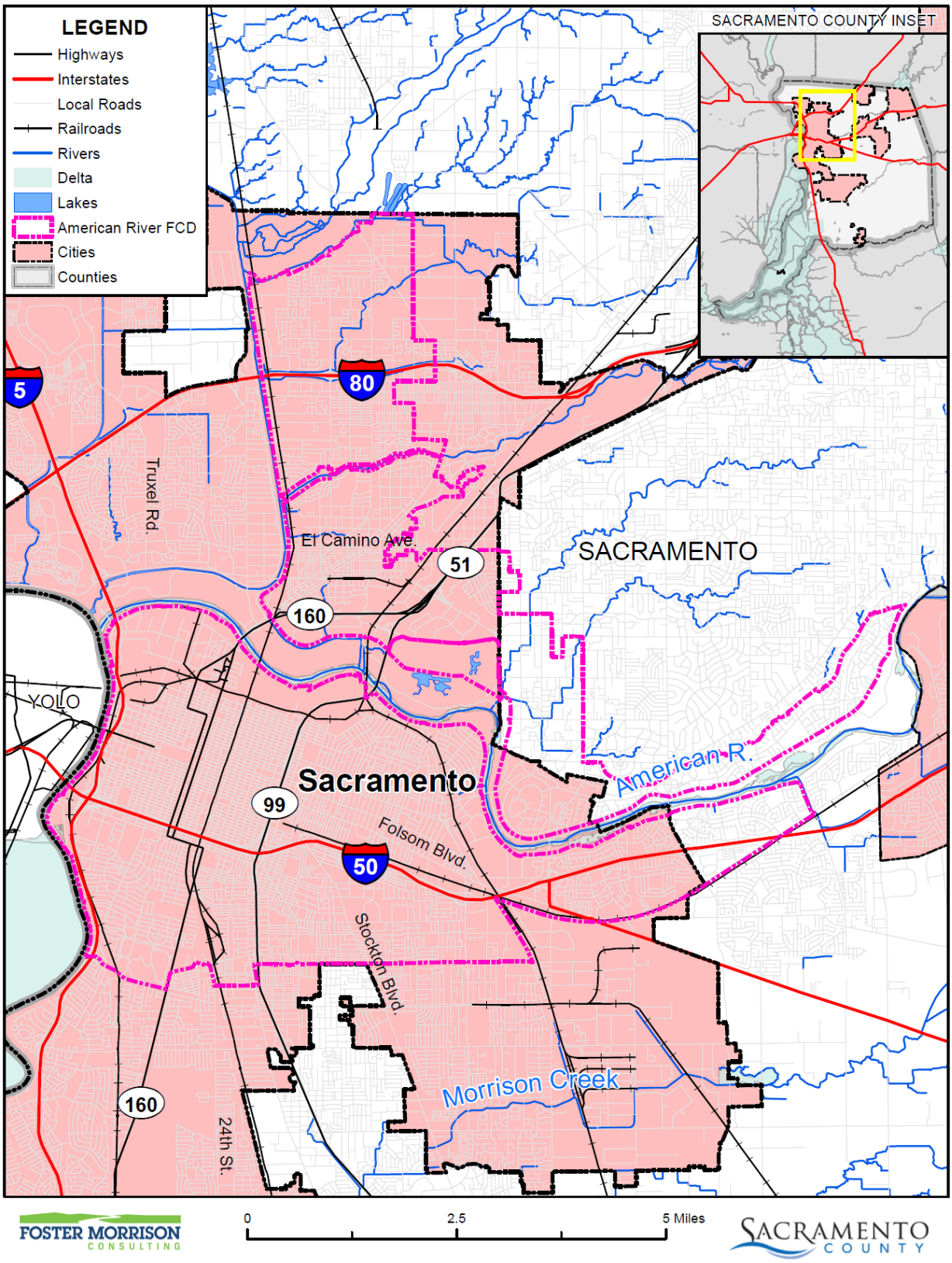
Table G-1 ARFCD – Planning Team

Name	Position/Title	How Participated
Tim Kerr	General Manager	Attended meetings, reviewed documents, submitted mitigation action plans

G.3 District Profile

The District profile for the ARFCD is detailed in the following sections. Figure G-1 displays a map and the location of the District within Sacramento County.

Figure G-1 ARFCD



Data Source: American River Flood Control District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

G.3.1. Overview and Background

The American River Flood Control District has been providing flood protection to the citizens of the Sacramento community for over 75 years. Formed by an act of the State Legislature in 1927 their mission is to protect the citizens in the District by maintaining the 40 miles of levees along the American River and portions of Steelhead, Arcade, Dry, and Magpie Creeks.

The District is governed by a five member Board of Trustees, each of whom is elected by the voters within the District's jurisdiction. Revenues to run the District's operations are raised through a special benefit assessment on properties in the District that benefit from the flood protection provided. The assessment appears on the annual Sacramento County property tax bill as a direct levy and is designated American River Flood Zone A, Zone B, or Zone C.

G.4 Hazard Identification

ARFCD identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table G-2).

Table G-2 ARFCD—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Significant	Occasional	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Low	High
Earthquake	Extensive	Occasional	Limited	Low	Low
Earthquake Liquefaction	Limited	Occasional	Catastrophic	Medium	Low
Floods: 1%/0.2% annual chance	Significant	Occasional	Limited	High	Medium
Floods: Localized Stormwater	Extensive	Highly Likely	Limited	Low	Medium
Landslides, Mudslides, and Debris Flow	Limited	Occasional	Limited	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Highly Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Low	Low
Subsidence	Significant	Likely	Limited	Low	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Limited	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

G.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

G.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section G.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table G-2) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

G.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the ARFCD's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table G-3 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. ARFCD's physical assets, valued at over $2 billion, consist of the buildings and infrastructure to support the District's operations.

Table G-3 ARFCD Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Headquarters Building	Structure and contents	$6,000,000	Flooding, Fire
Equipment Fleet	Mobile Equipment	$3,000,000	Flooding, Fire
Staging Yards	Land, Infrastructure	$200,000	Flooding
Levees*	Infrastructure	$2,000,000,000	Flooding
Total		**$2,009,200,000**	

Source: ARFCD

The levees are owned by the State of California with a replacement cost of over $2 Billion. ARFCD does not technically own the levees but are the stewards of them for O&M. ARFCD may be required to repair the damage.

Natural Resources

ARFCD has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

ARFCD has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Future Development

The District has no control over future development in areas the District services. Future development in these areas parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

G.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table G-2 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan. The District noted that it is possible to experience a PSPS.

The District does not have back-up power arrangements to continue operations at the Headquarters Building.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the District noted that climate change is of concern, no specific impacts of climate change could be recalled. The District and HMPC members did, however, note that in Sacramento County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability to and Impacts from Climate Change

The 2014 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

Assets at Risk

The District noted that its facilities will most likely not be at risk from climate change. The District noted that it is thought that climate change contributes to wildfires. The main risk from wildfire is a temporary loss of sod covering on the levees. This could trigger significant erosion during rain events.

Dam Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

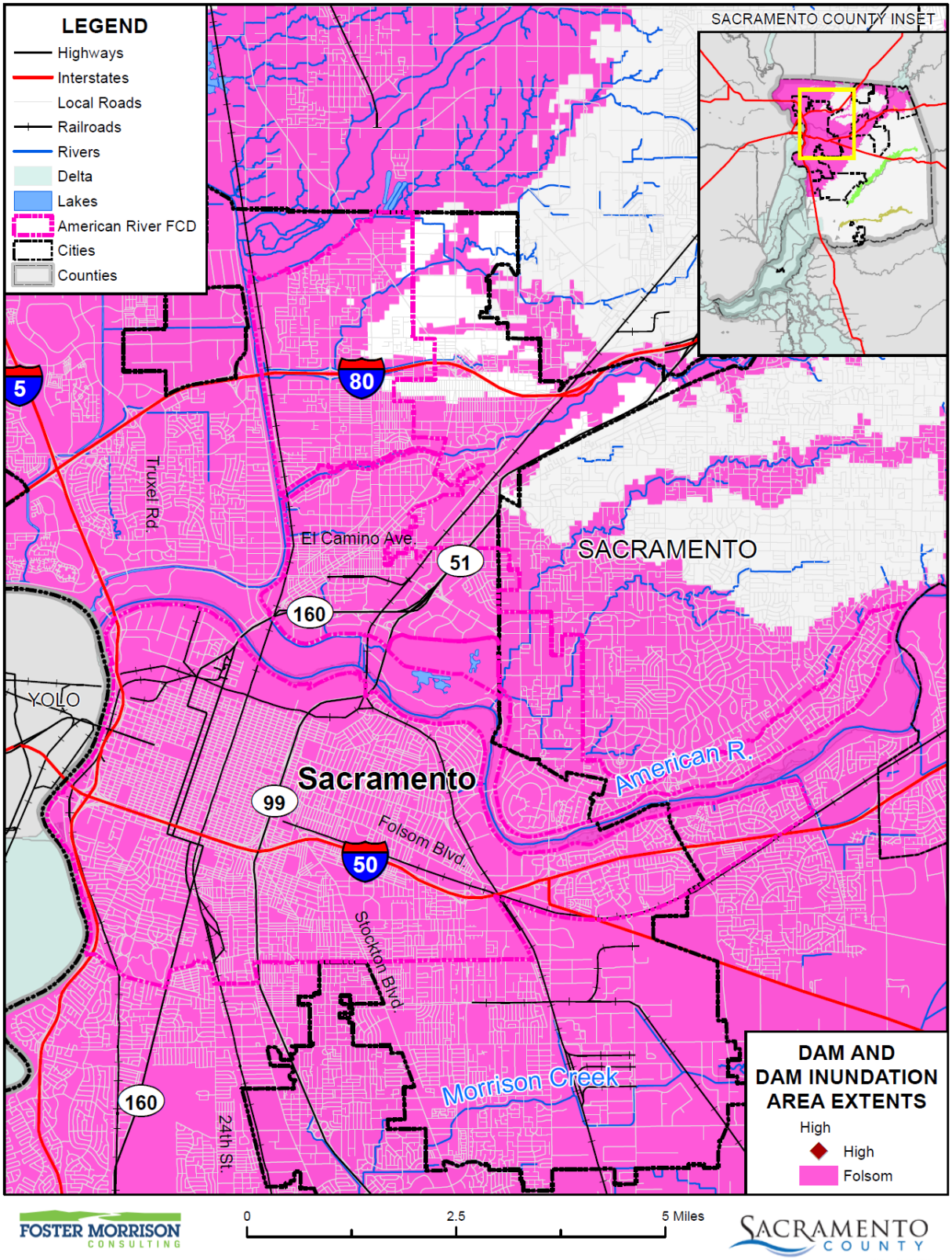
Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water

the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

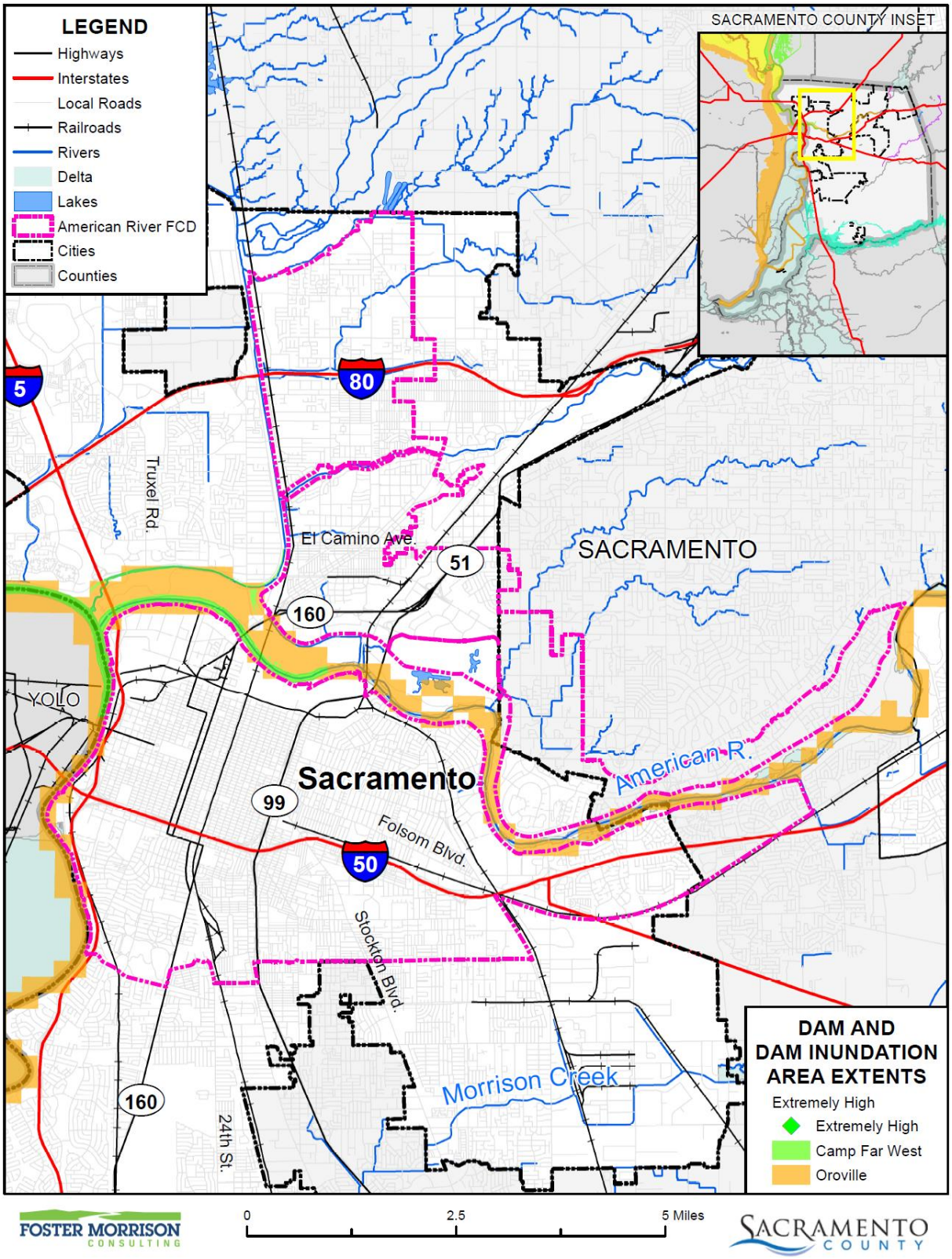
Based on dam inundation data obtained from CA DWR and Cal OES the was discussed in Section 4.3.7 of the Base Plan, dams inside the County that can affect the District can be seen on Figure G-2. Dams outside the County that can affect the District can be seen on Figure G-3. The Folsom Dam 235,000 cfs scenario is shown in Figure G-4. While Figures G-2 and G-3 illustrate dam inundation areas from an actual dam failure, Figure G-4, the Folsom 235,000 cfs scenario reflects the likely inundation area associated with a possible "super" release of water from Folsom. This updated Folsom scenario reflects the Folsom dam improvements which make a dam failure unlikely, with any resulting downstream inundation from Folsom associated with an intentional release of water from the dam. It is anticipated that the worst case scenario would be a 235,000 cfs release, which is comparable to a 200-year flood.

Figure G-2 ARFCD – Dam Inundation Areas from Dams Inside the County



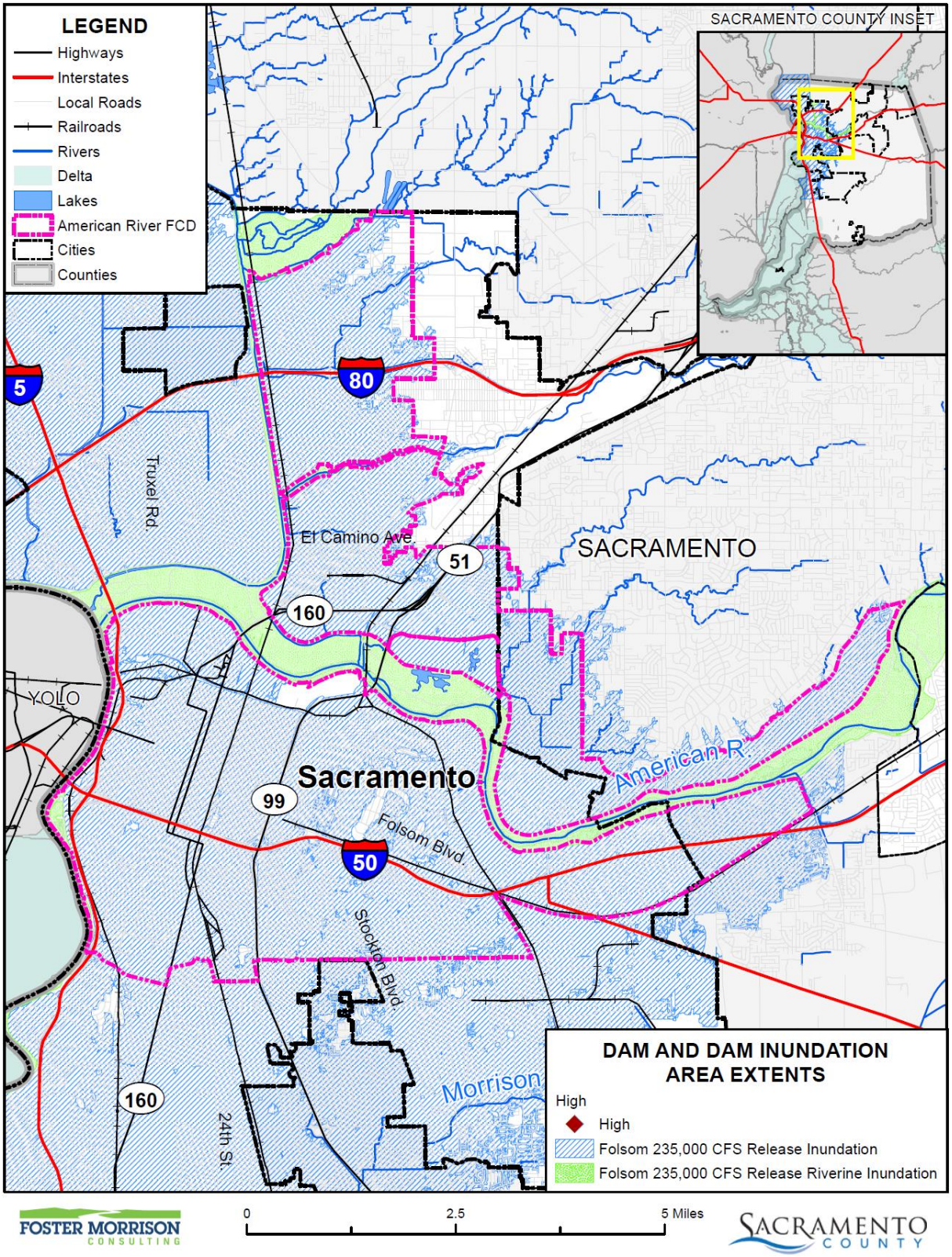
Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 2/2021.

Figure G-3 ARFCD – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, American River Flood Control District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure G-4 ARFCD – Dam Inundation Areas from Folsom Dam 235,000 cfs Scenario



Data Source: County-provided dam inundation data (CA_DWR_200YEAR_FLOODPLAIN.zip 2020), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 02/2021.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

A dam failure at Folsom Dam would cause significant overtopping on the 12-mile levied stretch of the Lower American River. It is likely the overtopping would cause severe erosion on the back side of the levees and ultimately destroy the levees.

Assets at Risk

District assets at risk from a dam failure include the District Headquarters Building, its contents, and the Equipment Fleet. Approximately 12-miles of State owned levees would also be at risk of failure.

Earthquake: Liquefaction

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the County are rebuilt or leveed areas are dewatered, and the levees rebuilt. In Sacramento County, the Delta and areas of

downtown Sacramento are at risk to liquefaction. The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand and silt in the levees and their foundations indicates that liquefaction is also a possibility.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquake liquefaction or that affected the District in any meaningful way.

Vulnerability to and Impacts from Liquefaction

Earthquake is discussed above, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas. In Sacramento County, two of these areas have been identified: downtown Sacramento and the Delta area, which could lead to a possible collapse of delta levees and any above ground structures. While this levee failure differs from the levee failure discussion below which generally focuses on levee failure due to high water conditions or other types of structural failure, the resulting impacts would be similar and include those related to a large flood event.

Districts risks would primarily be due to flooding from liquefaction causing a levee failure.

Assets at Risk

District assets at risk from liquefaction and flooding include the District Headquarters Building, its contents, and the Equipment Fleet. Approximately 12-miles of State owned levees would also be at risk.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

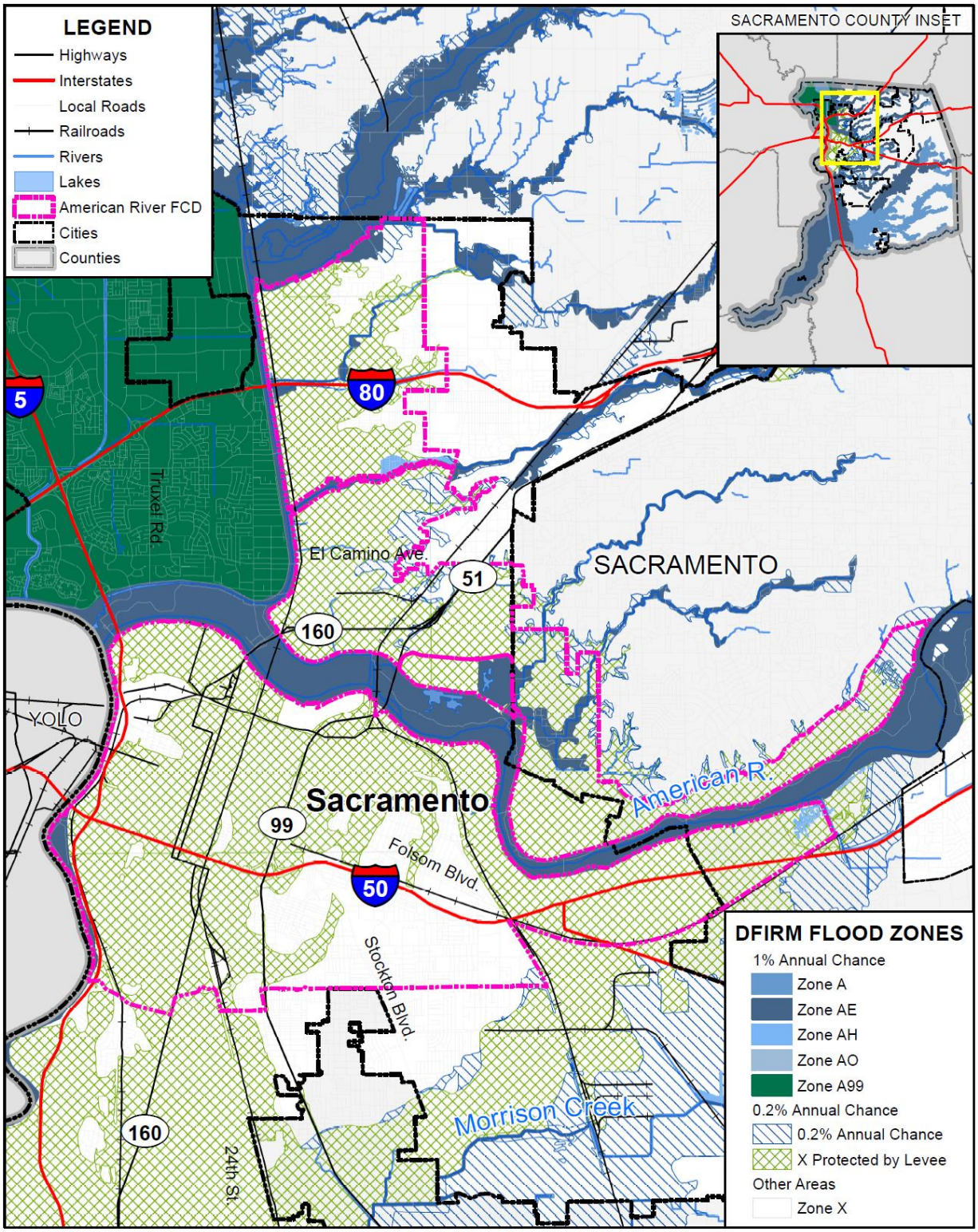
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the ARFCD have been subject to historical flooding.

Location and Extent

The ARFCD has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure G-5.

Figure G-5 ARFCD – FEMA DFIRM Flood Zones



FOSTER MORRISON CONSULTING

SACRAMENTO COUNTY

Data Source: FEMA NFHL 07/19/2018, American River Flood Control District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table G-4 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table G-4 ARFCD– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X
X	Outside flood zone	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table G-5. These events also likely affected the District to some degree.

Table G-5 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

In the 2017 Flood Events, damage to District levees primarily consisted of damage to patrol roadways. Waterside toe roads were submerged and stripped of aggregate base rock from flood flows. Levee crown roadways were heavily rutted from extensive patrolling during wet conditions. Approximately 10-miles of gravel roadways had to be resurfaced after the floods at a cost of roughly $100,000.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

District assets at risk from include the District Headquarters Building, its contents, and the Equipment Fleet. Approximately 12-miles of State owned levees would also be at risk.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

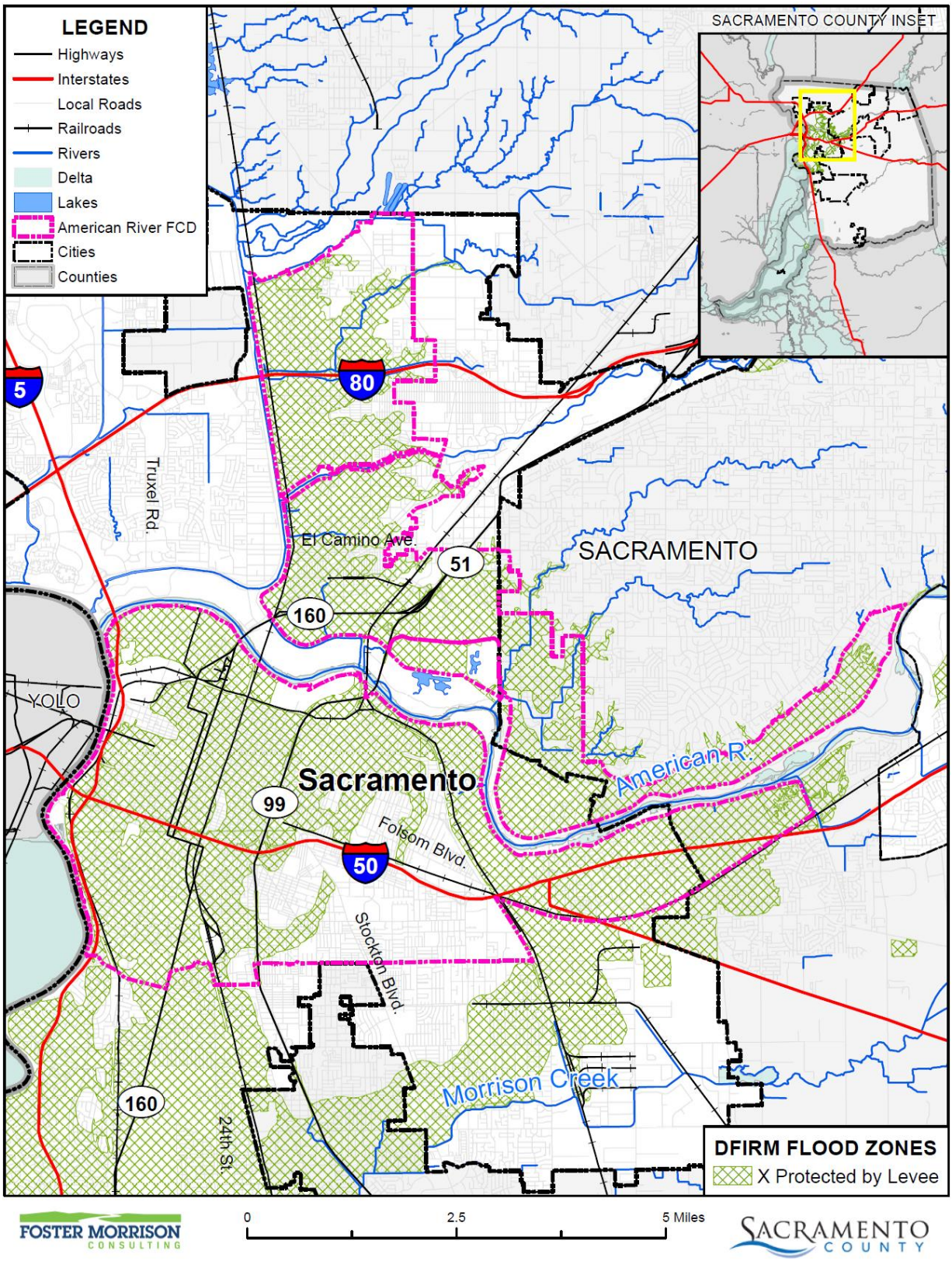
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure G-6.

Figure G-6 ARFCD – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, American River Flood Control District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. Levee failures have occurred in Sacramento in 1852, 1862, and 1950. A neighborhood was flooded on Arcade Creek in 1986 due to a breached floodgate on Norwood Avenue.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

The District is concerned with scour and erosion events at extremely high flows. A levee failure in the District would inundate most of Sacramento and would prevent the District from continuing flood patrolling during the flood event for a large section of the region.

Assets at Risk

District assets at risk include the District Headquarters Building, its contents, and the Equipment Fleet. Approximately 12-miles of State owned levees would also be at risk.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter,

and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power outage and failure can be found at the beginning of Section G.5.3 above, as well as in Section 4.3.3 of the Base Plan.

District impacts would include a temporary loss of access to District information systems and communications. Lights and electricity for fleet maintenance would also be down.

Assets at Risk

What District assets from Table G-3 are at risk from this hazard.

G.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

G.6.1. Regulatory Mitigation Capabilities

Table G-6 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the ARFCD.

Table G-6 ARFCD Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan		
Capital Improvements Plan		
Economic Development Plan		
Local Emergency Operations Plan	2015	Emergency Action Plan (no, no, no)
Continuity of Operations Plan		
Transportation Plan		
Stormwater Management Plan/Program		
Engineering Studies for Streams		
Community Wildfire Protection Plan		
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code		Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score		Score:
Fire department ISO rating:		Rating:
Site plan review requirements		
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance		
Subdivision ordinance		
Floodplain ordinance		
Natural hazard specific ordinance (stormwater, steep slope, wildfire)		
Flood insurance rate maps		
Elevation Certificates		
Acquisition of land for open space and public recreation uses		

Erosion or sediment control program
Other
How can these capabilities be expanded and improved to reduce risk?
Test the EAP periodically with a functional exercise with other stakeholders.

Source: ARFCD

G.6.2. Administrative/Technical Mitigation Capabilities

Table G-7 identifies the District department(s) responsible for activities related to mitigation and loss prevention in ARFCD.

Table G-7 ARFCD's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission		
Mitigation Planning Committee		
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)		
Mutual aid agreements	Y	We participate in the mutual aid agreement with Sac County and partners
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official		
Floodplain Administrator		
Emergency Manager		
Community Planner		
Civil Engineer	Y, FT	Yes, yes, & yes
GIS Coordinator		
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)		
Hazard data and information		
Grant writing		
Hazus analysis		
Other		
How can these capabilities be expanded and improved to reduce risk?		
Due to financial constraints, it is difficult for the District to expand these capabilities. Additional revenue would be needed to expand.		

Source: ARFCD

G.6.3. Fiscal Mitigation Capabilities

Table G-8 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table G-8 ARFCD's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	General Fund, Reserve Funds
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	At our formation in 1928
Incur debt through private activities	Y	None yet
Community Development Block Grant	N	
Other federal funding programs	Y	Funding has not been used yet, but it is the intent of the District to use this LHMP to seek federal grant opportunities.
State funding programs	Y	Yes, funding for O&M and Equipment, Yes
Other		
How can these capabilities be expanded and improved to reduce risk?		
The District is subject to Prop 218 and cannot raise rates without getting on the ballot. This limits the District's ability to take on new projects. Establishing additional revenue sources would help the District with implementation of mitigation and other key District projects.		

Source: ARFCD

G.6.4. Mitigation Education, Outreach, and Partnerships

Table G-9 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table G-9 ARFCD's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.		

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Annual District Newsletter
Natural disaster or safety related school programs		
StormReady certification		
Firewise Communities certification		
Public-private partnership initiatives addressing disaster-related issues		
Other		
How can these capabilities be expanded and improved to reduce risk?		
The District could expand outreach to community groups		

Source: ARFCD

G.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

Autumn and Winter Maintenance Schedule

During autumn, the District's levee staff focuses on preparation for the rainy season. Sandbags and flood fight materials are inventoried. Excess vegetation is trimmed and removed to allow visibility. Levee roads are resurfaced to provide all-weather drivability. Levee staff attends an annual flood fight training sponsored by the CA Department of Water Resources.

Crews begin patrolling the levees around the District to locate any areas which need last minute maintenance before the rain comes. Once winter sets in, the levees are inspected on a daily basis. If necessary, crews are put on a 24-hour patrol to ensure the integrity of the levee and the safety of the surrounding properties

Improving the River Park Levee Slope

In the past, some residents whose property is next to the River Park levee obtained permits to install landscaping and vegetation terraces at the bottom of the levee, also known as the levee toe. For some, these features were even permitted on the levee slope. Over time many of these landscape features were not maintained and eventually became overgrown or deteriorated. Many sites became a mysterious lump on the side of the levee or a mound at the levee toe. These encroachments interfere with the District's ability to mow and traverse the levees on foot. They also limit ARFCD's ability to inspect the levees and identify new problem areas during a flood event.

In an ongoing effort to keep District levees accessible and safe, the American River Flood Control District developed a collaborative project with River Park residents to improve the condition of their levee slope.

To maintain a clean and uniform levee slope and a levee toe with clear access for maintenance and flood inspection, in 2008 the District began working with numerous landowners to remove abandoned encroachments. ARFCD used a long-reach excavator positioned at the top of the levee to remove deteriorating retaining walls, debris, and mounds of dirt. The result was a clean levee slope free of obstructions that will no longer compromise levee safety. ARFCD then restored each site with a grass seed mix and erosion control straw and wattles (a tube of straw used to slow water run-off). With the help of participating landowners, we placed timed watering systems at each site to provide the optimum amount of watering for healthy germination. These sites now have a lush mat of grass to help the slope resist erosion.

Flood Fight Training

Every fall there are the reminders that winter is coming. Leaves change colors and start to fall; clouds gather and sprinkle us with rain; and crews of levee maintenance personnel and flood fighters flock to the annual Flood Fight Training along the American River levee. New recruits and old hands train to properly fill and install sandbags and practice other necessary tasks like applying plastic wave wash protection to levee slopes.

Each year the District's crew as well as the crew of the County of Sacramento and other local levee maintenance districts gather for training in Flood Fight Techniques. This training is provided by the State of California's Department of Water Resources and the trainers are veterans of flood fight situations all across the State.

Deferred Maintenance Program - Levee Pipe Project

The District recently completed a levee pipe study with support from State DWR grant funding. The District created a levee pipe database, performed geophysical investigations on historic pipe locations, and removed a previously abandoned pipe from the levee prism.

Flood Maintenance Assistance Program

The District received grant fund from the State to get caught up on levee operations and maintenance. Funds were used to remove a high hazard tree in the levee and to replace aging or outdated equipment due to air resource constraints.

G.7 Mitigation Strategy

G.7.1. Mitigation Goals and Objectives

The ARFCD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

G.7.2. Mitigation Actions

The planning team for the ARFCD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and

administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Earthquake Liquefaction
- Floods: 1%/0.2% annual chance
- Levee Failure
- Severe Weather: Heavy Rains and Storms

After a review of mitigation actions, Earthquake: Liquefaction was removed as a hazard of concern. The District noted that threat is for Delta levees as they are on softer foundations and have constant high water loading on them. Our levees are typically dry unless there is an event

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Arcade Creek Erosion Repair Project

Hazards Addressed: Climate Change, Dam Failure, Floods: 1%/0.2% annual chance, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Arcade Creek is a narrow channel constrained by flood control levees. Frequent flood flows from heavy rains (made worse by climate change) exhibit high velocities and cause downcutting of the channel. This occurrence has created a tall 8-foot vertical bank that has encroached into the levee cross-sectional prism in 4 discrete locations. If an upstream dam failure occurred, these erosion areas would need to be fixed for the levees to stand a chance of surviving a dam failure event.

Project Description: The Arcade Creek Erosion Repair Project will repair the vertical erosion cuts by laying back the vertical slope and placing rip rap in each of the four damage sites. The sites will then be covered with 1-foot of soil topping and re-seeded with sod covering.

Other Alternatives: The 'no-action' alternative would require continued monitoring and possible flood fights.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The project is currently being proposed as an operation and maintenance activity under the US Army Corps of Engineers Section 404 process.

Responsible Agency/ Department/Partners: American River Flood Control District (Resp. Agency), CA Central Valley Flood Protection Board (Regulatory Authority)

Cost Estimate: $620,000

Benefits (Losses Avoided): This project will prevent the District from having to perform an expensive flood fight during a high water event and possible flood inundation of North Sacramento (potential 19-foot flood depths)

Potential Funding: ARFCD General Fund, CA DWR FMAP Grant Funding

Timeline: Planning, Design, and Permitting – 2021, Construction - 2022

Project Priority (H, M, L): H

Action 2. American River Emergency Rock Revetment Preparedness Stockpile

Hazards Addressed: Climate Change, Dam Failure, Floods: 1%/0.2% annual chance, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: During major catastrophic flood events in the Sacramento Valley, rock revetment (rip rap) can be in short supply or only found in quarries long distances from the flood control levees. Also, many quarries do not make revetment sized material unless there is a need. This effort proposes to purchase revetment and store it at strategic locations near the Sacramento levees for use during critical flood emergencies.

Project Description: The American River Emergency Rock Revetment Preparedness Stockpile project will acquire rock revetment of a suitable size and specification to place at staging areas currently operated by the District. The material will be ordered, prepared, and hauled to the sites during non-critical operational periods to best utilize staff time and budget.

Other Alternatives: An alternative to this project would be to order rock revetment during the time of critical need.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The work will be done in accordance with the ARFCD flood operations plan and its Emergency Action Plan.

Responsible Agency/ Department/Partners: American River Flood Control District

Cost Estimate: $500,000

Benefits (Losses Avoided): The benefit of this project will be to ensure availability of rock revetment to conduct an emergency flood fight. Rock will be difficult to obtain in a timely manner during a flood.

Potential Funding: ARFCD General Fund

Timeline: ARFCD 5-year Plan

Project Priority (H, M, L): High

Action 3. Highway 160 Bridge Gap Levee Access

Hazards Addressed: Climate Change, Dam Failure, Floods: 1%/0.2% annual chance, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: State Highway 160 crosses the American River with two elevated bridge structures to convey northbound and southbound traffic. There is an isolated segment of the South Levee of the American River in the gap between these two structures. This levee segment is completely cut-off and there is no way to access the levee segment for maintenance or inspection accept by boat. The waterside slope of the levee downstream of the bridge crossing is extremely steep and is not traversable on foot without rappelling gear. There is some rock revetment evident under the bridge but there is no pathway to traverse the site.

Project Description: This proposed project would study and construct waterside levee access ramps upstream and downstream of the highway and a short length of waterside bench for an access pathway that would allow crews to take maintenance equipment under the bridge. This would allow crews to operate and maintain the currently isolated segment of levee between the spans and allow bridge crews to inspect the highway bridge.

Other Alternatives: The only other feasible alternative is to use a boat to inspect the site and a barge to bring maintenance equipment to the site for repairs.

Existing Planning Mechanism(s) through which Action Will Be Implemented: This project would require a Section 408 permit from the US Army Corps of Engineers

Responsible Agency/ Department/Partners: ARFCD, CA Central Valley Flood Protection Board, US Army Corps of Engineers

Cost Estimate: $3,000,000

Benefits (Losses Avoided): This project would allow operation and maintenance activities to identify potential defects in the levee. A levee failure at this location would inundate downtown Sacramento and the State Capitol

Potential Funding: ARFCD General Fund

Timeline: 10-year planning and construction window

Project Priority (H, M, L): High

Annex H Citrus Heights Water District

H.1 Introduction

This Annex details the hazard mitigation planning elements specific to CHWD (CHWD or District), a new participating jurisdiction to the 2021 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to CHWD, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

H.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table H-1. Additional details on plan participation and District representatives are included in Appendix A.

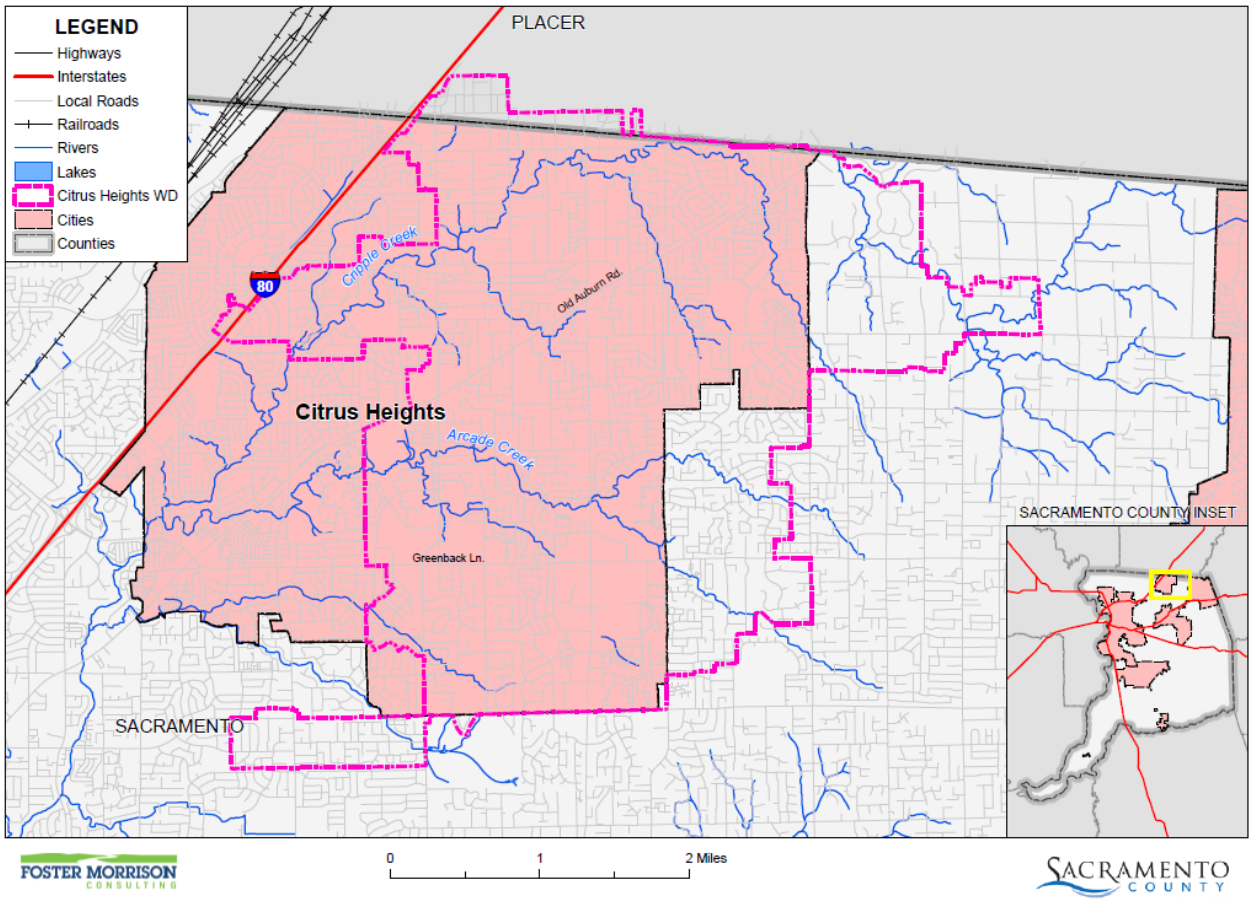
Table H-1 CHWD – Planning Team

Name	Position/Title	How Participated
Rebecca Scott	Director of Operations	Attended meetings. Assisted with Plan development
Brian Hensley	Water Resources Supervisor	Assisted with Plan development
Kelly Drake	Senior Water Efficiency Specialist	Assisted with Plan development

H.3 District Profile

The District profile for the CHWD is detailed in the following sections. Figure H-1 displays a map and the location of the District within Sacramento County.

Figure H-1 CHWD



Data Source: Citrus Heights Water District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

H.3.1. Overview and Background

The Citrus Heights Water District is an Irrigation District, founded in 1920, operating under the State of California Water Code. CHWD provides drinking water to an estimated service area population of 67,000 customers via approximately 19,600 water service connections in Sacramento and Placer Counties, including about 60% of the area within the boundaries of the City of Citrus Heights. The District constructs and maintains water facilities and supplies domestic water in an area of approximately 12.8 square miles, including a system of approximately 250 miles of underground pipes, approximately 2,200 fire hydrants and valves, and nearly 20,000 water service connections. The District has 22 interconnections with neighboring water agencies to provide water in the event water from Folsom Lake or its wells are unable to provide adequate water supply.

H.4 Hazard Identification

CHWD identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table H-2).

Table H-2 CHWD—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Significant	Unlikely	Catastrophic	Medium	Medium
Drought & Water Shortage	Extensive	Likely	Limited	High	High
Earthquake	Extensive	Occasional	Limited	Medium	Low
Earthquake Liquefaction	Limited	Occasional	Limited	Low	Low
Floods: 1%/0.2% annual chance	Significant	Likely	Negligible	Low	Medium
Floods: Localized Stormwater	Extensive	Highly Likely	Negligible	Low	Medium
Landslides, Mudslides, and Debris Flow	Limited	Occasional	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Negligible	Low	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Occasional	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Negligible	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Negligible	Low	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Negligible	Low	Low
Subsidence	Significant	Unlikely	Negligible	Low	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Significant	Unlikely	Negligible	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

H.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

H.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section H.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table H-2) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

H.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the CHWD's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table H-3 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. CHWD's physical assets, valued at over $6.3 million, consist of the buildings and infrastructure to support the District's operations.

Table H-3 CHWD Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Corporation Yard	Land & Buildings	$4,300,000	Earthquake
Well Sites	Wells & Buildings	$2,000,000	Earthquake
Total		**$6,300,000**	

Source: CHWD

Natural Resources

CHWD has a variety of natural resources of value to the District. These natural resources parallels that of Citrus Heights as a whole. Information can be found in the City of Citrus Heights Annex to this Plan Update.

Historic and Cultural Resources

CHWD has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole Information can be found in the City of Citrus Heights Annex to this Plan Update.

Growth and Development Trends

General growth in the District parallels that of the City of Citrus Heights as a whole. Information can be found in Section 4.3.1 of the Base Plan. Information can be found in the City of Citrus Heights Annex to this Plan Update.

Future Development

The District has no control over future development in areas the District services. Future development in these areas parallels that of the Citrus Heights. Though development is not controlled by CHWD, the District does plan for future water uses. New connections are added by the District as new development occurs. The 2015 CHWD Urban Water Management Plan noted CHWD plans to construct an additional three wells over the next seven years to provide additional dry-year supplies. The District plans to maintain groundwater supply equivalent of 5,000 AFY from its well system. However, groundwater production could increase up to the full well capacities in successive dry year scenarios. Well site availability could impact the number of wells constructed or the construction implementation schedule. The District continues to monitor its service area for potential well sites and obtains the land as available. The District is currently evaluating its needs for new wells in the future as it completes a new UWMP (in draft state as of April 2021) which will update the number or timing of new wells as appropriate. Future supply projects are summarized in Table H-4.

Table H-4 CHWD – Expected Future Water Supply Projects and Programs

Name of Future Projects or Programs	Joint Project with other suppliers?	Description	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply
Well #7	No		2023	All Year Types	
Well #8	No			All Year Types	
Well #9	No			All Year Types	
Well #12	No			All Year Types	

Source: 2021 Draft CHWD Urban Water Management Plan

Projected supply needs are summarized in Table H-5. As the San Juan Water District (SJWD) provides CHWD sufficient supply to meet its needs, SJWD supply is set equal to projected demands minus groundwater usage. Groundwater usage from "maintenance" pumping during normal years is assumed to be an average 900 acre-feet per year.

Table H-5 CHWD – Projected Water Supplies

Water Supply	Additional Description	2025	2030	2035	2040	2045
Purchased or Imported Water	SJWD	10,949	11,273	11,537	12,006	12,455
Groundwater (not desalinated)	CHWD	900	900	900	900	900
Total	**–**	**11,849**	**12,173**	**12,437**	**12,906**	**13,355**

Source: 2021 Draft CHWD Urban Water Management Plan

H.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table H-2 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan. The District has not seen any of these events. The District noted it has sufficient backup power to mitigate against any power outages in the future.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the District noted that climate change is of concern, no specific impacts of climate change could be recalled. The District and HMPC members did, however, note that in Sacramento County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability to and Impacts from Climate Change

The 2014 California Adaptation Planning Guide (APG), prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

CHWD participated in the American River Basin Study as a member of the RWA The American River Basin (Basin) region conducted a climate change study in partnership with local water purveyors and the United States Bureau of Reclamation (USBR). The purpose of the American River Basin Study (ARBS or Study) was to develop data tools and analyses, identify supply-demand imbalances, and climate change adaptation strategies specific to the Basin. Under the "new normal" of a changing climate, the ARBS aims to improve the resolution of regional climate change data and to develop regionally-specific mitigation and adaptation strategies. These are not yet published as of June 2021.

Assets at Risk

The District noted that its facilities will most likely not be at risk from climate change.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

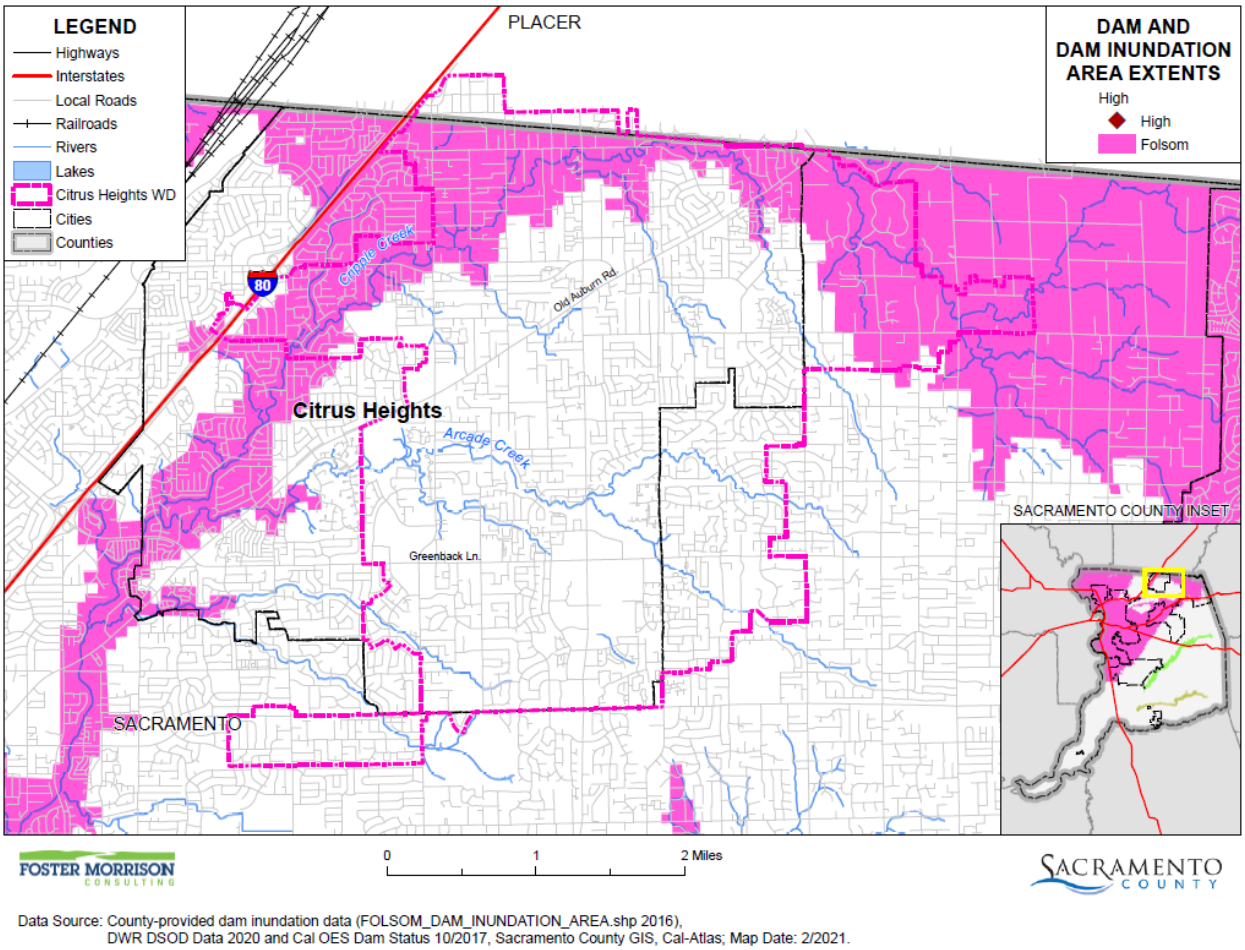
Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

Dams inside the County that can affect the District can be seen on Figure H-2. This includes inundation from a Folsom Dam failure event, which with the most recent improvements of the Folsom Dam, is more unlikely to occur. The District is not affected by dams from outside the County. The District is also not affected by the Folsom Dam 235,000 cfs scenario discussed in Section 4.3.7 of the Base Plan, which is considered the likely Folsom Dam scenario since improvements on the Dam have been completed.

Figure H-2 CHWD – Dam Inundation Areas from Dams Inside the County



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 2/2021.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant. The District noted that flooding has a small chance of affecting the City of Citrus Heights, but not CHWD.

Assets at Risk

No District assets from Table H-3 are at direct risk from this hazard.

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the District, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the District and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There has been two state and one federal disaster declaration due to drought since 1950. This can be seen in Table H-6.

Table H-6 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the District are the same as those for the County and includes 5 multi-year droughts over an 85-year period. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the District, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult.

According to the CHWD website, CHWD's main source of surface water is Folsom Lake. The US Bureau of Reclamation controls the Folsom Lake water supply. The water is treated by the San Juan Water District (SJWD) and provided to CHWD and other water agencies. Groundwater from CHWD's six wells is used to supplement the Folsom Lake surface water supply for customers. Even with these water sources, it is important to conserve water as the ever-increasing need for water in CHWD.s region and throughout California will continue to place demands on both surface and groundwater supplies. Water use efficiency and conservation are keys to meeting future demands. Total annual water consumption by CHWD customers peaked in 1999 at 23,000 acre-feet. Since then, it has ranged from a high of about 21,100 acre-feet to a low of about 9,970 acre-feet.

The 2021 Draft Urban Water Management Plan for CHWD noted that CHWD maintains two connections with SJWD to receive its water supply, one on the CHWD 42-inch transmission main and three on the SJWD 72-inch Cooperative Transmission Pipeline (CTP). Barring failure of these connections, there are no physical constraints to obtaining the required SJWD supply. The SJWD UWMP addresses any restraints within SJWD's facilities to diverting, treating, and delivering the necessary supplies to CHWD.

The 2021 Draft Urban Water Management Plan for CHWD noted SJWD's water supplies are subject to legal constraints through the Central Valley Project (CVP) and State Board cutbacks and use restrictions as described in the 2020 SJWD Urban Water Management Plan. Total supply availability is also influenced by the Water Forum Agreement (WFA). Both CHWD and SJWD are signatories of the WFA. The WFA stipulates that SJWD supply can be cut back to a minimum of 54,200 AFY, however, it is not a legal

mandate such as the CVP and State Board restrictions. The quality of water from Folsom Reservoir is considered good as the drainage basin is mostly alpine-based snowpack at the higher elevations and forest at the lower elevations with little to no urbanization. There are no water quality impacts expected that would reduce the supply.

CHWD's groundwater supplies are subject to factors that could impact reliability. Groundwater basin issues could impact CHWD's groundwater supply. If the wells begin to produce contaminated groundwater, the supply could either be eliminated, reduced or treated. The basin elevation levels have historical decreased, and only recently stabilized or even increased in some locations. If the groundwater levels decrease further, CHWD well capacities could be impacted or even eliminated. However, the SGA has a groundwater accounting framework implemented by the region's water agencies to mitigate and improve the groundwater basin conditions. It is assumed the only issue that could impact supply availability is groundwater contamination. Should this occur, CHWD will evaluate pump-and-treat alternatives versus drilling new wells.

Climate change may create additional impacts to drought and water shortage in the County and the District. During periods of drought, vegetation can dry out which increases fire risk. Drought that occurs during periods of extreme heat and high winds can cause Public Safety Power Shutoff (PSPS) events to be declared in the County. More information on power outage and failure can be found in the discussion at the beginning of Section H.5.3, as well as in Section 4.3.3 of the Base Plan.

Assets at Risk

No District assets from Table H-3 are at direct risk from this hazard.

Earthquake

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The District is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the District fall within a low to moderate shake risk, with most of the moderate risk in the Delta area of the County.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquakes or that affected the District in any meaningful way.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured buildings can be very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those

constructed of unreinforced masonry (URM) and soft story buildings. The District noted no URM or soft story buildings owned by the District.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The CHWD is within the less hazardous Zone 3.

Impacts from earthquake in the District will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

Assets at Risk

The District noted that the Corporation Yard & Well Buildings could be impacted, and well casings could collapse in an earthquake event.

Severe Weather: Extreme Cold and Freeze

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the National Weather Service (NWS), extreme cold often accompanies a winter storm or is left in its wake. Freezing temperatures can also occur without the accompanying winter storm.

Location and Extent

Extreme cold and freeze are regional issues, meaning the entire City is at risk to cold weather and freeze events. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of extreme cold and freeze, temperature data from the County from the WRCC indicates that there are 21.8 days that fall below 32°F in western Sacramento County. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days to weeks at a time.

Past Occurrences

There has been no federal or state disaster declarations in the County for cold or freeze. The District noted that cold and freeze is a regional phenomenon; events that affected the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.2. During some of these past events, clay valves at well sites cracked, all additional damage was on private property.

Vulnerability to and Impacts from Severe Weather: Freeze and Winter Storms

The District experiences temperatures below 32 degrees during the winter months. Freeze can cause injury or loss of life to residents of the District. While it is rare for buildings to be affected directly by freeze,

damages to pipes that feed building can be damaged during periods of extreme cold. The District noted that this concern was already mitigated by installing protective bags over these valves.

Assets at Risk

No District assets from Table H-3 are at direct risk from this hazard.

H.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, and mitigation education, outreach, and partnerships.

H.6.1. Regulatory Mitigation Capabilities

Table H-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the CHWD.

Table H-7 CHWD Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	N	
Capital Improvements Plan	Y: 2020	N/A
Economic Development Plan	N	
Local Emergency Operations Plan	Y: 2019	Yes, addresses hazards
Continuity of Operations Plan	Y: 2021	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	N	
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:

Site plan review requirements	N	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
CHWD staff will periodically review all plans for accuracy and make any necessary revisions. In addition, annual emergency trainings will be held to ensure that all staff are aware of the steps and procedures related to an emergency.		

Source: CHWD

Citrus Heights 2021 Draft Urban Water Management Plan

The Urban Water Management Act (Act) became part of the California Water Code with the passage of Assembly Bill 797 during the 1983-1984 regular session of the California Legislature. The California Water Code requires every urban water supplier providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually (AFY) to adopt and submit an Urban Water Management Plan (UWMP) every five years to the California Department of Water Resources (DWR). The specific planning requirements are in the California Water Code Division 6, Part 2.6 Urban Water Management Planning.

Subsequent legislation has been passed that updates and provides for additional requirements for UWMPs and water management. In particular, SB X7- 7 Water Conservation, requires the State to achieve a 20 percent reduction in urban per capita water use by December 31, 2020, known as 20x2020. 20x2020 requirements are incorporated into the 2015 UWMP requirements. In summary, the UWMP must include the baseline demand analysis, water use target analysis use for 2015 and 2020, and present a compliance plan to achieve the target demand reductions in the UWMP.

The core requirements for the UWMP include:

- A description of the water service area.
- A description of the existing and planned supply sources.
- Estimates of past, present, and projected water use.
- 20x2020 analysis and target compliance.
- A description of water conservation Demand Management Measures (DMMs) already in place and planned, and other conservation measures.
- A description of the Water Shortage Contingency Plan/Conservation Program.

Ordinance No 01-2021

This ordinance establishes a water conservation program within CHWD. It lays the groundwork on why the District needs such an ordinance, sets water conservation stage definitions, declarations, and regulations, and enforcement measures.

H.6.2. Administrative/Technical Mitigation Capabilities

Table H-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in CHWD.

Table H-8 CHWD's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	
Mutual aid agreements	Y	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	N	
Community Planner	N	
Civil Engineer	Y	
GIS Coordinator	Y	
Other	N	
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	(We can use the County's Reverse 911 system if needed)
Hazard data and information	Y	
Grant writing	Y	
Hazus analysis	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
CHWD will hire an additional engineer in the next several years to assist with assessing water mains. In addition, staff will look for opportunities to attend grant writing trainings.		

Source: CHWD

H.6.3. Fiscal Mitigation Capabilities

Table H-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table H-9 CHWD's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Y: new wells (water sources), yes, can be used for future mitigation actions
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	Y	Grant funding: new well
State funding programs	Y	Grant funding: new well
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
CHWD will continue to look for grant opportunities for new wells. In addition, CHWD will allocate funding for capital improvement projects in its annual budget.		

Source: CHWD

H.6.4. Mitigation Education, Outreach, and Partnerships

Table H-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table H-10 CHWD's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Water Efficiency messaging, drought messaging

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
CHWD is hiring a Communications Manager to assist with increased public information efforts. In addition, the District will continue to expand its Water Efficiency classes and programs for the local community.		

Source: CHWD

H.7 Mitigation Strategy

H.7.1. Mitigation Goals and Objectives

The CHWD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

H.7.2. Mitigation Actions

The planning team for the CHWD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Severe Weather: Extreme Cold and Freeze

After a review of mitigation actions and efforts, because District infrastructure is primarily underground, it's not at risk from flooding/storms, etc. The one thing that used to be an issue (freeze) was mitigated years ago with a wrap around the above-ground appurtenances that were prone to freezing/breaking. As a result, the following hazards were dropped from concern:

- Dam Failure
- Severe Weather: Extreme Cold and Freeze

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts

are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Implement ASR Technology

Hazards Addressed: Climate Change, Drought & Water Shortage

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Historical droughts

Project Description: Increase water supply during dry periods

Other Alternatives: Storage tank

Existing Planning Mechanisms through which Action will be Implemented: Regional and CHWD-specific ASR Studies

Responsible Office: Operations Department

Priority (H, M, L): H

Cost Estimate: $250K per well site

Potential Funding: CHWD CIP Budget

Benefits (avoided Losses): Additional water storage capabilities

Schedule: TBD, requires 2 months for retrofitting, adding to a new well would be built into the cost.

Action 2. Construction of a New Storage Tank

Hazards Addressed: Drought & Water Shortage, Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Historical droughts have occurred which have affected the District. There is concern that future climate change will increase droughts and water shortages.

Project Description: Increase water supply during dry periods

Other Alternatives: Groundwater banking

Existing Planning Mechanisms through which Action will be Implemented: Regional and CHWD-specific ASR Studies

Responsible Office: Operations Department

Priority (H, M, L): L

Cost Estimate: $9 Million

Potential Funding: CHWD CIP Budget, State or Federal Grant

Benefits (avoided Losses): Additional water storage capabilities

Schedule: TBD, One year for construction

Action 3. Construction of a New Operations Building

Hazards Addressed: Earthquake

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Potential for earthquake damage

Project Description: Increase building resiliency to earthquakes. The new Operations building will be built to withstand earthquake.

Other Alternatives: Retrofitting the building.

Existing Planning Mechanisms through which Action will be Implemented: Staffing Study, Pre-Architectural Planning Study

Responsible Office: Operations & Engineering Departments

Priority (H, M, L): H

Cost Estimate: $4 Million

Potential Funding: CHWD CIP Budget, State or Federal Grant

Benefits (avoided Losses): Additional water storage capabilities

Schedule: TBD, 2 years for construction

Annex I Cosumnes Community Services District and Fire Department

I.1 Introduction

This Annex details the hazard mitigation planning elements specific to Cosumnes Community Services District and Fire Department (CSD or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to Cosumnes CSD, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

I.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table I-1. Additional details on plan participation and District representatives are included in Appendix A

Table I-1 Cosumnes CSD – Planning Team

Name	Position/Title	How Participated
Matthew DeMarco	Administration Battalion Chief	Attended meetings and provided information
Troy Bair	Deputy Chief	Attended meetings and provided information

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table I-2.

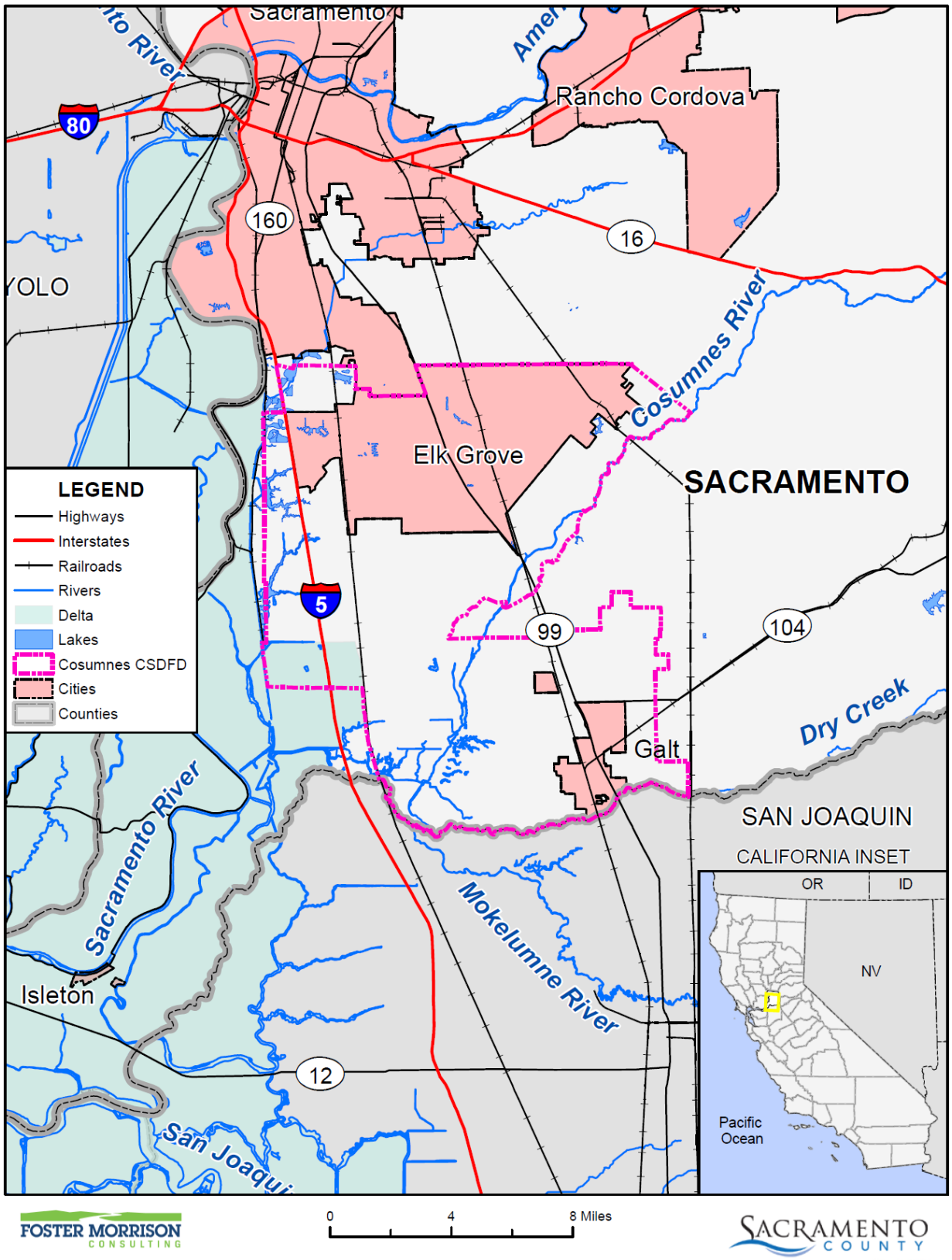
Table I-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
None	No related planning was done by the District since 2016.

I.3 District Profile

The District profile for the Cosumnes CSD is detailed in the following sections. Figure I-1 displays a map and the location of the District within Sacramento County.

Figure I-1 Cosumnes CSD



Data Source: Cosumnes Community Services District Fire Department, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

I.3.1. Overview and Background

The Cosumnes Community Services District Planning Area encompasses the former territory of six Plains Miwok tribelets along the Cosumnes River drainage and two, possibly three tribelets along the Sacramento River. In 1850, Elk Grove was established as a hotel stop and a stop for the stage. It is located about 15 miles south of historic Sutter's Fort and thus became a crossroads for business, entertainment, mail service and agriculture, and acted as home base for gold miners in nearby communities.

The roots of the Cosumnes Community Services District Fire Department date back to 1893, when the Elk Grove Fire Department started with a single hose cart and a small group of volunteers, and 1921, when the all-volunteer Galt Fire Protection district was formed. Today, the two fire departments operate as one, servicing growing communities with progressive, modern firefighter practices and equipment.

The Cosumnes CSD Fire Department is the product of two mergers. The first occurred in 1985 when the Elk Grove Fire Department merged with the Elk Grove Parks and Recreation District, one of the oldest park districts in the state, to become the Elk Grove Community Services District. The second merger was in 2006, when the CSD merged its fire services with the Galt Fire Protection District forming the Cosumnes Community Services District.

Initially, the town of Elk Grove developed around a stage stop on the Monterey Trail, though after the railroad passed by east of town, Elk Grove's center shifted to its present location. "Old Town" Elk Grove is located about a mile east of State Route 99 (formerly U.S. Route 99, the north-south artery of the California Central Valley).

America's first transcontinental highway, the Lincoln Highway, ran through Galt until it was ultimately replaced by State Route 99. Lincoln Way in central Galt is a remnant of this historic route. Galt grew around the rail depot and State Route 99 throughout the first half of the twentieth century. Improvements to State Route 99 in recent years have made Galt more accessible, which has resulted in increased population and growth to the west and northeast.

The original 1850 Spanish land grant, Rancho del los Moquelumnes, was purchased in 1861 by Dr. Obed Harvey, considered today as Galt's founder. His purchase included much of the Dry Creek Township which was later established as the town of Galt in 1869 by the Western Pacific Railroad company. A prominent early settler, John McFarland, named the town after his former home in Ontario, Canada, which was named after a Scottish novelist, John Galt. The combination of favorable land for agriculture and the proximity to the railroad provided Galt with the economic support to continue to grow.

With the decline of gold mining in the Sierra Nevada foothills by the end of the eighteenth century, Galt, like many other Central Valley towns, saw the arrival of miners looking to start anew in agriculture. The City's proximity to several major rivers and the water resources of the Sacramento-San Joaquin River Delta made Galt ideal for the establishment of agriculture early in California's history.

Today, Galt is at a strategic location between the growing areas of Sacramento and Stockton. The city's proximity to I-5 and SR 99 provides Galt excellent access to the rest of the Central Valley and California.

Despite fast growth in the region, the city continues to maintain its small-town character while balancing the needs for housing and acknowledging its important agricultural heritage.

Cosumnes Fire Department provides all risk emergency services to the cities of Elk Grove, and Galt. Additionally, services are provided to the communities of Sheldon, Pleasant Grove Laguna, Laguna West, and Franklin.

The District has a Mediterranean climate, characterized by damp to wet, mild winters and hot, dry summers. The wet season is generally October through April, though there may be a day or two of light rainfall in June or September. The mean annual temperature is 61.1°F, with monthly means ranging from 45.8°F in December to 75.4°F in July. Summer heat is often moderated by a sea breeze known as the "delta breeze" which comes through the Sacramento-San Joaquin River Delta from the San Francisco Bay.

On average, 96 days in the year experience some degree of fog, which usually occurs in the morning (tule fog). The foggiest months are December and January. Tule fog can be extremely dense, lowering visibility to less than 100 feet and making driving conditions extremely hazardous. Chilling tule fog events have been known to last for several consecutive days or weeks. During tule fog events temperatures do not exceed 50 degrees.

Snowfall is exceptionally rare in the District (at an elevation of only 45 to 47 feet above sea level). The all-time record snowfall was 3.5 inches on January 4, 1888. Dustings occur every 5–10 years, with up to an inch accumulation in outlying areas. During especially cold winter and spring storms, intense showers do occasionally produce a significant amount of hail, which can create hazardous driving conditions. Significant snow accumulations occur each year in the foothills located 40 miles (65 km) east of the city.

On average, there are 74 days where the high exceeds 90°F, and 15 days where the high exceeds 100°F; on the other extreme, freezing nights occur 16 nights per year. At Sacramento International Airport, extremes have ranged from 18°F on December 22, 1990, to 115°F on June 15, 1961.

The average annual precipitation is 21.45 inches. On average, precipitation falls on 62 days each year in Sacramento region, and nearly all of this falls during the winter months. Average January rainfall is 3.84 inches, and measurable precipitation is rare during the summer months. In February 1992, Sacramento region had 16 consecutive days of rain, resulting in an accumulation of 6.41 inches for the period. A record 7.24 inches of rain fell on April 20, 1880. On rare occasions, monsoonal moisture surges from the Desert Southwest can bring upper-level moisture to the Sacramento region.

I.4 Hazard Identification

Cosumnes CSD identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table I-3).

Table I-3 Cosumnes CSD—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Medium	High
Earthquake	Significant	Occasional	Limited	Low	Low
Earthquake Liquefaction	Limited	Unlikely	Limited	Low	Low
Floods: 1%/0.2% annual chance	Significant	Occasional	Critical	High	Medium
Floods: Localized Stormwater	Significant	Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Significant	Occasional	Limited	Low	Medium
Pandemic	Extensive	Likely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Limited	Occasional	Limited	Low	Low
Subsidence	Limited	Unlikely	Negligible	Low	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Limited	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

I.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

I.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section I.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table I-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

I.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the Cosumnes CSD's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table I-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. Cosumnes CSD's physical assets, valued at over $120 million, consist of the buildings and infrastructure to support the District's operations.

Table I-4 Cosumnes CSD Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Cosumnes Fire Training Center	EMS, Fleet Maintenance Support, Prevention, and Training	$25,000,000	Flood/Pandemic
Cosumnes Fire Stations (8)	Emergency Response	$80,000,000	Flood/Pandemic
Cosumnes CSD Administration	CSD Administration	$15,000,000	Flood/Pandemic
Total		**$120,000,000**	

Source: Cosumnes CSD

Natural Resources

Cosumnes CSD has a variety of natural resources of value to the District. These natural resources parallels that of the cities of Elk Grove, Galt and Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan and in the Annexes for Elk Grove and Galt.

Historic and Cultural Resources

Cosumnes CSD has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of the cities of Elk Grove, Galt and Sacramento County as a whole as a whole. Information can be found in Section 4.3.1 of the Base Plan and in the Annexes for Elk Grove and Galt.

Growth and Development Trends

General growth in the District parallels that of the cities of Elk Grove, Galt and Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan and in the Annexes for Elk Grove and Galt.

Residential growth is occurring and over the course of the next 5 years there will be potential additions of Fire Station 77, Fire Station 78, Fire Station 79, EEG Community Center, and Morse Community Center.

Development since 2016

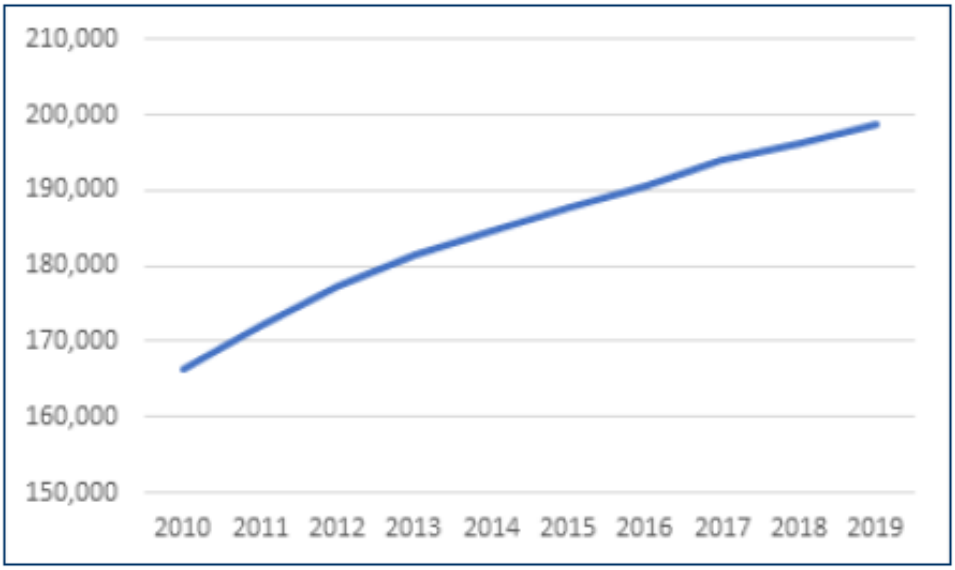
No District facilities have been constructed since 2016. Fire damage occurred at Cosumnes CSD Administration building. The building was reconstructed/remodeled at the original location preserving the original historical façade.

Future Development

The District has seen substantial population growth within the boundaries, as shown in Figure I-2. With the addition of residential, commercial, and industrial properties comes greater demand for District services. This growth has continued throughout the Great Recession, during which time the resources the District had available to operate current service levels, let alone any growth, was stressed. Whether it is fire suppression, emergency medical, prevention, asset development, recreation programs, or landscape

maintenance all are impacted by the squeeze presented by service demand increase, while financial resources have not kept pace to match. (2019 data is utilized in these figures, as the 2020 data is heavily influenced by the Covid-19 pandemic).

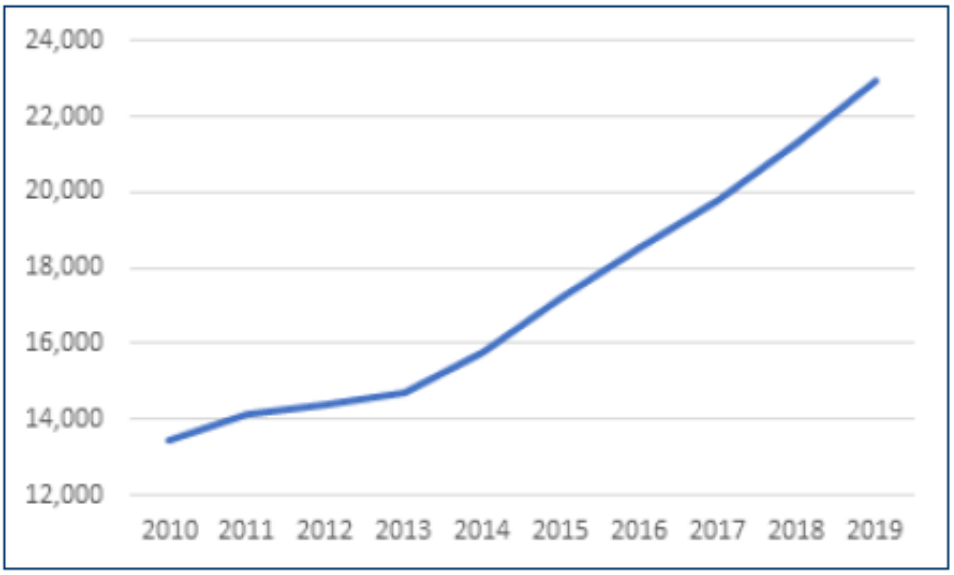
Figure I-2 Cosumnes CSD – Population Growth Since 2010



Source: Cosumnes CSD 20201 Strategic Plan

To measure demand for fire suppression services, the District measures calls for service (Figure I-3). The calls for service have significantly increased over the past ten years. During this time, the District has added only one additional permanent response units. It is anticipated with the growth occurring in Laguna Ridge and Southeast Planning Area, the demand for services will continue to rise. With the additions of Fire Station 77, and later Fire Station 78 and Fire Station 79 we aim to meet those increased demands without placing further stress on existing units. The District needs to closely monitor response times as well as unit hour utilization to ensure that risk mitigation of both the community, as well as District personnel continues.

Figure I-3 Cosumnes CSD – Calls for Service Since 2010



Source: Cosumnes CSD 20201 Strategic Plan

The demand for services for parks and recreation services are more difficult to clearly measure. The Park Design Principles provide clear direction on the development of new parks spaces, however there is not a reliable methodology to measure the number and frequency of residents utilizing existing park spaces. During the Parks and Recreation Department's Master Plan process casual surveys suggest that over 95% of District residents visited a park space within the previous year, and a large majority utilize park spaces with regular frequency. In regard to park maintenance specifically, the cost of providing "regular and standard" services has exceeded permissible assessment rate increases in many benefit assessment zones. As previously stated, Stations 77 and Station 78 are in the planning phases.

The District has no control over future development in areas the District services. Future development in these areas parallels that of the cities of Elk Grove, Galt and Sacramento County. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan and in the Annexes for Elk Grove and Galt.

I.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table I-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow.

Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan. With increasing wildfire danger, PSPS continues to be a potential threat to the District.

The District falls in SMUDs service territory, and has not experienced a PSPS event.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing. Over time, Climate Change is expected to influence the activities and services offered by the Cosumnes CSD, as well as the public health of those within southern Sacramento County.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the District noted that climate change is of concern, no specific impacts of climate change could be recalled. The District and HMPC members did, however, note that in Sacramento County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability to and Impacts from Climate Change

The California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

The Cosumnes CSD Climate Action Plan (CAP) discusses specific impacts to the District as sourced from the Safeguarding California Plan. These plans focus on the increasingly visible effects of climate change, with specific focus on how climate change is currently impacting, and will continue to impact, some of California's most valuable assets. While many of the climate change impacts identified in the Safeguarding California Plan act on a statewide or global scale, the District's CAP/SAP focuses on those impacts that could directly impact the Cosumnes CSD and the service population.

Based on the CAP and the Safeguarding California Plan, global climate change will cause the following modifications to local conditions:

- More intense and frequent heat waves. This could impact:
  - ✓ irrigation requirements in parkland and outdoor spaces;
  - ✓ biodiversity in wildland spaces;
  - ✓ cancellation of programs and events;
  - ✓ expenditures required to keep Cosumnes CSD facilities cool; and
  - ✓ increased demand on emergency services to respond to incidences of heat exhaustion and heat stroke.

- More intense and frequent drought, shrinking snowpack, less precipitation. This could impact:
  - ✓ irrigation requirements in parkland and outdoor spaces;
  - ✓ biodiversity in wildland spaces; • water availability for Cosumnes CSD facilities, including spray-parks, aquatic centers, and fire services; and
  - ✓ the cost of potable water leading to fiscal impacts to the Cosumnes CSD's operating budget.

- More severe and frequent wildfires. This could impact:
  - ✓ biodiversity in wildland spaces; demand for fire protection services through mutual aid agreements;
  - ✓ the cost of water for fire suppression;
  - ✓ cancellation of programs and events;
  - ✓ the cost associated with hiring and training additional staff, especially fire personnel; and
  - ✓ increased demand for emergency services to respond to community members impacted by asthma and other acute respiratory health impacts.

Assets at Risk

The District noted that its facilities will most likely not be directly at risk from climate change. The indirect impacts to District assets and services are discussed above in the specific vulnerabilities of Consumnes CSD to climate change.

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

A review of wildfire threat zones in the District based on fuel type, density, and percent of slope range from moderate to high – some of this is based upon the drought situation that occurred from 2012-2016. The Department's response plan has been designed to deliver the right mix of structural and wildland engines capable of rough terrain firefighting.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the District, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the District and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There has been two state and one federal disaster declaration due to drought since 1950. This can be seen in Table I-5.

Table I-5 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the District are the same as those for the County and includes 5 multi-year droughts over an 85-year period. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, (including the District and the cities of Elk Grove and Galt) is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult.

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. With a reduction in water, water supply issues based on water rights becomes more evident. Climate change may create additional impacts to drought and water shortage in the County and the District.

During periods of drought, vegetation can dry out which increases fire risk. Drought that occurs during periods of extreme heat and high winds can cause Public Safety Power Shutoff (PSPS) events to be declared in the County. More information on power outage and failure can be found in the discussion at the beginning of Section I.5.3, as well as in Section 4.3.3 of the Base Plan.

The biggest impact to the District would be a reduction in training opportunities by not being able to utilize water, due to a shortage.

Assets at Risk

No District assets from Table I-4 are at risk from this hazard.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the Cosumnes CSD have been subject to historical flooding.

Location and Extent

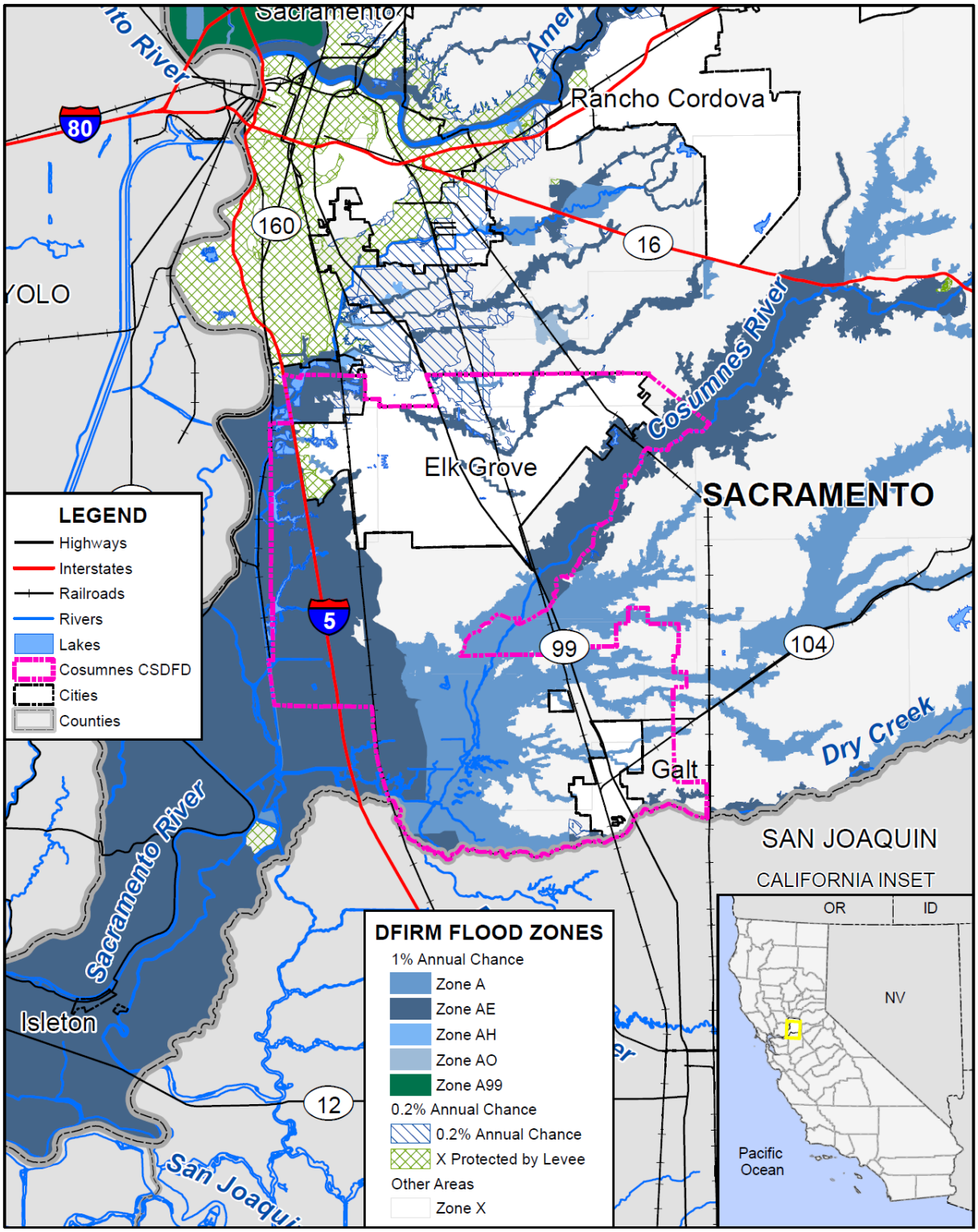
Major surface waters in the area of the District include the Morrison Creek Stream Group, and include Elder, Elk Grove, Laguna (and tributaries), Morrison, Strawberry, and Whitehouse Creeks near Elk Grove. Badger Creek, Willow Creek, Laguna Creek, Skunk Creek, Deadman Gulch, and Dry Creek, which drain to the Cosumnes River are near Galt. These can be seen on Figure I-4.

Figure I-4 CFD Major Waterways and Sources of Flooding

Source: Cosumnes CSDFD

The Cosumnes CSD has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure I-5.

Figure I-5 Cosumnes CSD – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Cosumnes Community Services District Fire Department, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table I-6 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table I-6 Cosumnes CSD– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	X
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	X
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X
X	Outside of flood zone	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table I-7. These events also likely affected the District to some degree.

Table I-7 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The areas serviced by the Cosumnes CSD experienced a significant flood in January 1997. During this time, major transportation corridors, Interstate 5 and Highway 99 were shut down due to rising water levels. The loss of transportation corridors had a major impact on emergency services delivery to quickly respond to routine and flood related emergencies. The rising waters from the Cosumnes River essentially divided the district into two separate areas

In January 2017, the District had major flooding that compromised Emerald Lakes Golf Course, railroad tracks, Highway 99, and local roadways. The damage to Emerald Lakes Golf Course consisted of erosion and fallen trees. The impact to the railroad consisted of erosion underneath the tracks that caused a train derailment. Highway 99 was impacted by flooding at Dillard Road. The local roadways in west Elk Grove were closed due to flooding.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

The District is most vulnerable to the impacts of flooding on local roadways and freeways.

Elk Grove

Elk Grove area is part of the Sacramento River watershed, which covers approximately 27,000 square miles, with 400 miles of river from Lake Shasta to the convergence of the Sacramento-San Joaquin Delta. The City is also a part of this larger watershed. More specifically, surface water resources in Elk Grove are a part of the Morrison Creek Stream Group, and include Elder, Elk Grove, Laguna (and tributaries), Morrison,

Strawberry, and Whitehouse Creeks. Florin, Gerber, and Union House creeks are located close to the City. Deer Creek is located in the eastern portion of the City, parallel to the Cosumnes River. The Cosumnes River is the eastern border of the City; however, all of the creeks in the area drain into the Morrison Creek Stream Group, then eventually into the Sacramento River. Runoff from precipitation and snowmelt from the Sierra Nevada mountains are the main sources of surface water supply in the City.

Laguna Creek, the Cosumnes River, and the Sacramento River are the main surface hydrological features in the City. The Morrison Creek Stream Group drainage basin covers 192 square miles. The nine creeks that drain into Morrison Creek flow southwest and eventually drain into the Beach Stone Lakes area west of Interstate 5.

Laguna Creek, the main creek that flows through the City of Elk Grove, has been altered by development. There have been channels, levees, and culverts created to alleviate the possibility of flooding, as well as to accommodate different development scenarios. Some of the other creeks in the City have also been altered to accommodate development or alleviate flooding potential. Structures and assets at risk, population at risk, and critical facilities at risk for Elk Grove can be found in their annex (Annex B) to this Plan Update.

Galt

Although the City is located outside of the major flood plain area, the City experiences two types of flooding. The first is associated with local water courses. The second is associated with localized flood events resulting from inadequate surface flow. Heavy rainfall causes these types of flooding events.

Runoff from the City's study area is drained by a variety of local streams and creeks including Badger Creek, Willow Creek, Laguna Creek, Skunk Creek, Deadman Gulch, and Dry Creek, which drain to the Cosumnes River. The areas near the confluence of these smaller water courses with the Cosumnes River includes large areas of flood plain, which absorb excess flows from local watersheds during heavy rains and spring floods. Much of the storm water of this floodplain is maintained through a complex system of levees and dikes. Structures and assets at risk, population at risk, and critical facilities at risk for Galt can be found in their annex (Annex D) to this Plan Update

Assets at Risk

Parks and Greenbelts may be impacted within the flood prone areas. Buildings and infrastructure may have minimal impact.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from

November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The Cosumnes CSD is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted the following past occurrences of localized flooding:

- As mentioned previously, the localized flooding events were Emerald Lakes Golf Course, Highway 99, local roadways and railroad line.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Elk Grove

Historically, the City of Elk Grove has been at risk to flooding primarily during the spring months when river systems in the County swell with heavy rainfall. Localized flooding also occurs at various times throughout the year with several areas of primary concern unique to the City of Elk Grove. In the "Sheldon" area of Elk Grove, local flooding is widespread but generally minor; the flat land causes floodwaters to spread out, reducing threats to life. These areas of concern are shown in Annex B: City of Elk Grove of this Plan Update.

Galt

Flooding events can occur any time during the rainy season (November to April). These events result from prolonged, heavy rainfall and are characterized by high peak flows of moderate duration and large volumes of runoff. Flooding is more severe when prior rainfall has resulted in saturated ground conditions. Other localized flooding hazards are caused by obstacles to natural drainage flows, such as small creek dams and dikes formed by freeway and railroad fills.

Cloudburst storms, sometimes lasting as long as three hours, can occur any time from the late fall to early spring, and may occur as an extremely severe sequence within a general winter rainstorm. Flooding from cloudburst activity is characterized by high peak flow, short duration of flood flow, and a small volume of runoff.

Potential issues of concern include a general lack of curbs and gutters in portions of the City of Galt. The lack of curb and gutters along with inadequate or incomplete storm drains can result in standing water that is both a public health nuisance and a potential hazard. Other sources of flooding concern are the size and capacity of small agricultural drainage structures that do not accommodate large storm flows.

More information on localized flooding in the City of Galt can be found in Annex D: City of Galt of this Plan Update.

Assets at Risk

The District noted no specific District assets at risk to localized flooding.

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the District, County, and surrounding region is at risk, as pandemic is a regional, national, and international event. The speed of onset of pandemic is usually short, while the

duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table I-8.

Table I-8 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic.

- The 1918-1919 Influenza Pandemic (H1N1)
- The February 1957-1958 Influenza Pandemic (H2N2)
- The 1968 Influenza Pandemic (H3N2)

To date, the 21st century has seen two acknowledged pandemics.

- 2009 Swine Flu (H1N1)
- 2019/2020 COVID 19

Vulnerability to and Impacts from Pandemic

Pandemics have and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding the current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent the spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the District. Pandemic can have varying levels of impact to the citizens of the District and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently), and unemployment rose significantly. Supply chains for food and essentials can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

The District was vulnerable to the pandemic because workforce was unable to come into the office and perform their daily functions. The unique concerns were delays in supply and delivery of emergency

medical equipment. The District was not ready for the high volume of employees who needed equipment and access to facilitate their jobs from home.

Assets at Risk

Pandemics do not affect District facilities, but can affect District personnel who operate District facilities.

Severe Weather: Extreme Cold and Freeze

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the National Weather Service (NWS), extreme cold often accompanies a winter storm or is left in its wake. Freezing temperatures can also occur without the accompanying winter storm.

Location and Extent

Extreme cold and freeze are regional issues, meaning the entire City is at risk to cold weather and freeze events. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of extreme cold and freeze, temperature data from the County from the WRCC indicates that there are 21.8 days that fall below 32°F in western Sacramento County. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days to weeks at a time.

Past Occurrences

There has been no federal or state disaster declarations in the County for cold or freeze. The District noted that cold and freeze is a regional phenomenon; events that affected the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.2.

On several occasions, the District opened up a Warming Center to help those who were affected by the drop in temperature.

Vulnerability to and Impacts from Severe Weather: Freeze and Winter Storms

The District experiences temperatures below 32 degrees during the winter months. Freeze can cause injury or loss of life to residents of the District. While it is rare for buildings to be affected directly by freeze, damages to pipes that feed building can be damaged during periods of extreme cold.

Assets at Risk

No District assets from Table I-4 are at risk from this hazard.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature." Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the District, there are risk to the built environment from extreme heat. While extreme heat on its own does not usually affect structure, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat and high winds can cause power outages and PSPS events, causing issues in the District.

Location and Extent

Heat is a regional phenomenon and affects the whole of the District. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for heat. The District Planning Team note that since extreme heat is a regional phenomenon, events that affected the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.3.

Record high temperatures in the District are shown in Table I-9.

Table I-9 Record Temperatures in the Cosumnes Fire Department

Month	Temperature	Date	Month	Temperature	Date
January	74°	1/12/2009	July	114°	7/13/1972

Month	Temperature	Date	Month	Temperature	Date
February	76°	2/19/1964	August	110°	8/10/1996
March	88°	3/26/1988	September	108°	9/01/1950
April	95°	4/30/1996	October	104°	10/02/2001
May	105°	5/28/1984	November	87°	11/01/1960
June	115°	6/15/1961	December	72°	12/28/1967

Source: Western Regional Climate Center, Sacramento FAA Airport Station

The District has been affected by extreme heat events and has provided cooling center facilities.

Vulnerability to and Impacts from Extreme Heat

The District experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-110°F in rather extreme situations. During these times, drought conditions may worsen. Also, power outages and PSPS events may occur during these times as well. Health impacts are the primary concern with this hazard, though economic impacts are also an issue.

The District Planning Team noted that reliance on air conditioning can cause a strain on the electrical energy in the Cosumnes Fire Department operational area. Occasionally peak demands outweigh supply and a condition known as brown-out occurs. This is an extremely dangerous situation for electrical equipment as it operates without the needed electricity causing damage to the systems. Days of extreme heat have been known to result in medical emergencies, civil unrest, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts.

Assets at Risk

No District assets from Table I-4 are at risk from this hazard.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power outage and failure can be found in the discussion at the beginning of Section I.5.3, as well as in Section 4.3.3 of the Base Plan.

As stated previously, roadways can be difficult to access due to flooding.

Assets at Risk

The District noted no assets at risk to heavy rains. However, calls for service may increase due to heavy rainfall events. The likelihood of increase of vehicle related incidents during the event and timing may have a limited duration impact on the District.

Wildfire

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

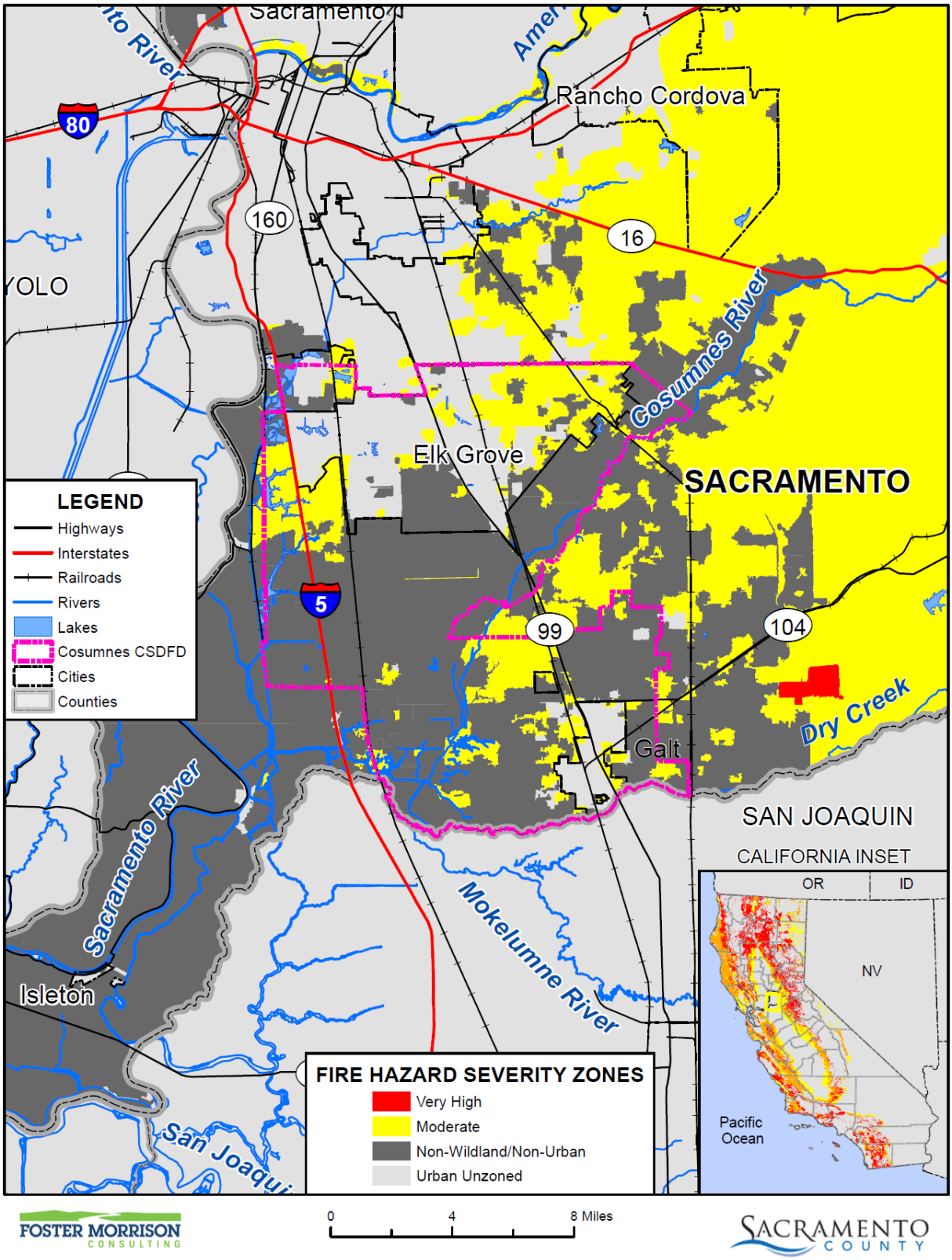
Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the Cosumnes CSD. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

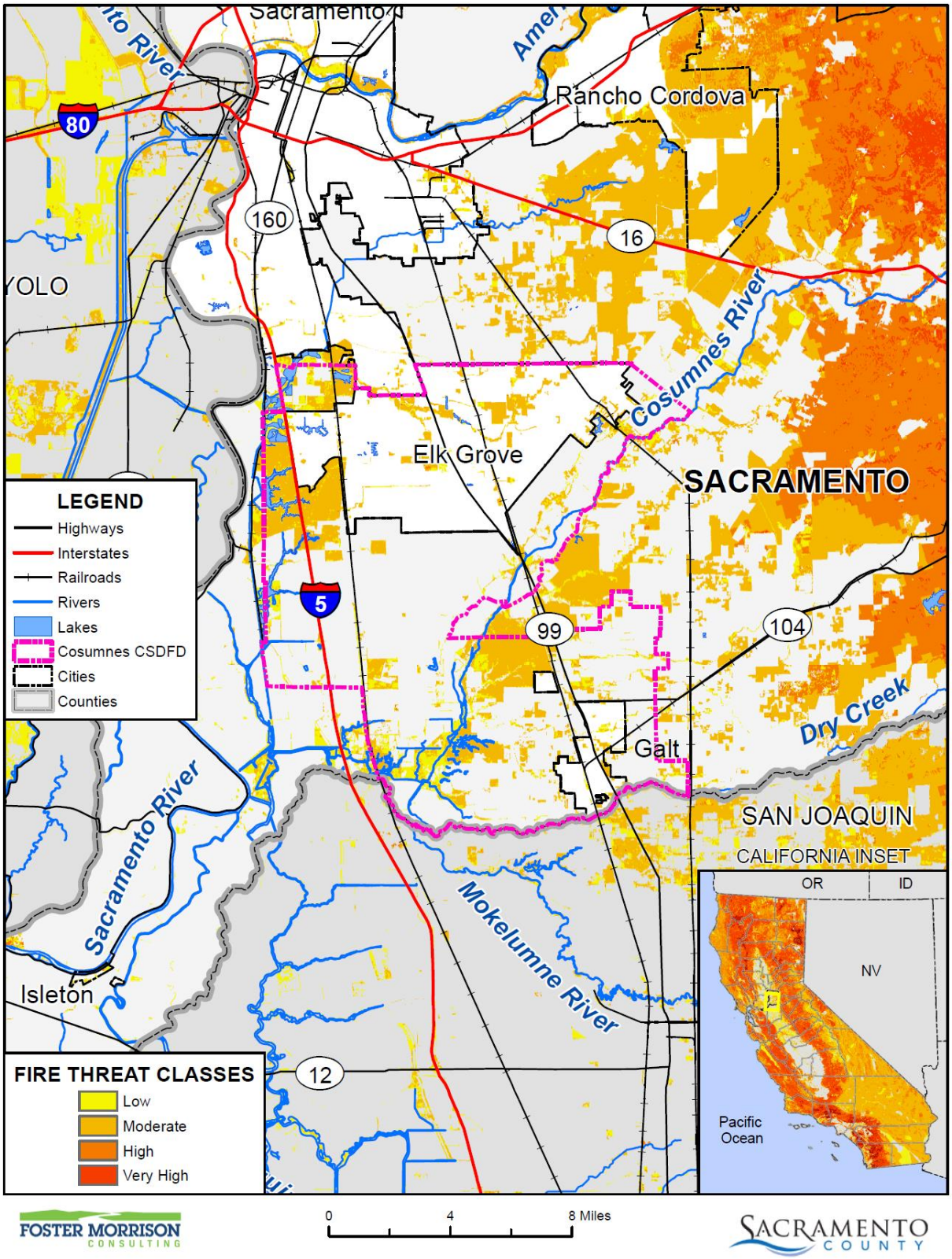
Wildfire can affect all areas of the District. CAL FIRE has estimated that the risk varies across the District and has created maps showing risk variance. Following the methodology described in Section 4.3.16 of the Base Plan, wildfire maps for the Cosumnes CSD were created. Figure I-6 shows the CAL FIRE FHSZ in the District. As shown on the maps, fire hazard severity zones within the District range from Urban/Unzoned to Moderate. Figure I-7 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, fire threat within the District ranges from No Threat to High.

Figure I-6 Cosumnes CSD – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Cosumnes Community Services District Fire Department, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure I-7 Cosumnes CSD – Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Cosumnes Community Services District Fire Department, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more.

Past Occurrences

There has been one state and no federal disaster declarations for Sacramento County from fire. It should be noted that this was from Southern Pacific Railroad Fires and Explosions (Roseville), so it was not truly a wildfire.

Table I-10 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

The District annually deploys strike teams within the State of California that impact the District by reducing the availability of line personnel and increasing the District's overtime costs. Smoke and air quality in the region has been a growing issue over the last five years.

Vulnerability to and Impacts from Wildfire

Risk and vulnerability to the Sacramento County Planning Area and the District from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in the Planning Area, combined with a large built environment and population, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. During the May to October fire season, the dry vegetation and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and the District, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Generally, the undeveloped portions of the Cosumnes Fire Department do not pose a high risk due to existing agricultural practices on the land. Most lands are actively cultivated with irrigated crops that have minimal fire fuel. However, grass fires can occur on uncultivated lands, particularly where there is native vegetation, such as the riparian corridors near local water courses. Fire hazards also exist in urbanized areas of the Cosumnes Fire Department. Residential and Commercial structure fires can occur particularly in neighborhoods where you have a mix of undeveloped parcels adjacent to developed parcels which requires a higher level of emergency resources for suppression activities. Additionally, in the rural setting the use of propane gas is commonly used for heating and cooking by residents. The propane is stored in large tanks ranging in size from 300 gallons up to 1,000 gallons and will create additional safety concerns for responding fire personnel in the wildland urban interface environment.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the District. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the District by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the District; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from large fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate PSPSs which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. More information on power outage and failure can be found at the beginning of Section I.5.3 above, as well as in Section 4.3.3 of the Base Plan. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

District operations are affected by the reduction in apparatus availability and line personnel.

Assets at Risk

The District has assets at risk to wildfire. The District maintains the ability to protect the District facilities from wildfires.

I.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, and mitigation education, outreach, and partnerships.

I.6.1. Regulatory Mitigation Capabilities

Table I-11 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Cosumnes CSD.

Table I-11 Cosumnes CSD Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y	There is a park and recreation facilities master plan for Elk Grove but we don't control the general plan, please see www.yourcsd.com for current information.
Capital Improvements Plan	Y	Yes, for District Facilities, please see www.yourcsd.com
Economic Development Plan	N	
Local Emergency Operations Plan	Y	Discusses potential hazards and outlines mitigation strategies.
Continuity of Operations Plan	N	Y – The COOP is in progress and should be completed in 2021.
Transportation Plan	N	
Stormwater Management Plan/Program	Y	Discusses stormwater management plan District has MS-4 Small Municipal Permit in accordance with Sacramento Regional Water Resources Control Board annual requirements.
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	Y	Weed abatement and Prevention Plans
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Climate action plan in place. Board approved Climate Action Plan/Sustainability and Adaption Plan in October 2020, please see www.yourcsd.com
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/2019: CBC 2019 CFC
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	Y	Rating: 2/9 (urban/rural)
Site plan review requirements	Y	They are 100% reviewed
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	Y	The District acquires land for the purposes of public recreation and open space through developer dedications and separate purchase acquisitions on an as needed basis to meet Quimby requirements of 5 acres per 1000 residents, in Elk Grove.
Erosion or sediment control program	N	
Other		

How can these capabilities be expanded and improved to reduce risk?
Cosumnes CSD does not provide full municipal services and does not have land use jurisdiction (planning authority). Depending on the location, City of Elk Grove, City of Galt, and County of Sacramento have that authority. Cosumnes CSD does have authority when it comes to provision of fire and emergency services within the entire District and park and recreation services in Elk Grove and areas outside of the City of Galt. However, all planning, development and infrastructure is provided and controlled by other agencies. To improve these capabilities, all agencies need excellent record-keeping and communication to ensure jurisdiction needs are being met properly.

Source: Cosumnes CSD

Cosumnes CSD Strategic Plan (2021)

The Cosumnes CSD is dedicated to enhancing the quality of life of the residents, businesses, visitors, and employees within our diverse community by protecting lives, property, and the environment through superior fire suppression, emergency medical services, fire prevention, and special operations response; and by providing parks and recreation services through well maintained parks and recreational opportunities for health, wellness, and social interactions.

This Strategic Plan is the parent document for a dozen of additional planning documents including the Climate Action Plan/Sustainability Action Plan, Communications Plan, Information Technology Strategic Plan, Fire Department Strategic Plan, and Parks and Recreation Department Strategic Plan. This Plan provides a planning bridge between those service specific plans and provides overall direction in other areas, not directly covered in those plans. The Board provided both individual input and collective direction for this plan with a view to the future.

I.6.2. Administrative/Technical Mitigation Capabilities

Table I-12 identifies the District department(s) responsible for activities related to mitigation and loss prevention in Cosumnes CSD.

Table I-12 Cosumnes CSD's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	The District Park Operations and Facilities teams manage upkeep of tree trimmings, landscape, etc.
Mutual aid agreements	Y	Local and State
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	Y	The District has a Chief of Planning, Design and Construction staff member.
Floodplain Administrator	N	

Emergency Manager	Y	
Community Planner	N	
Civil Engineer	Y	
GIS Coordinator	Y	
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	
Hazard data and information	Y	
Grant writing	Y	There aren't assigned personnel to grant writing, however there are personnel who write grants as part of their duties but it isn't their sole job function,
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The Cosumnes CSD Fire Department is working with legislative efforts to implement better early warning systems for wildland fires across the State.		

Source: Cosumnes CSD

I.6.3. Fiscal Mitigation Capabilities

Table I-13 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table I-13 Cosumnes CSD's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	N	
Community Development Block Grant	Y	
Other federal funding programs	Y	
State funding programs	Y	
Other		

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
How can these capabilities be expanded and improved to reduce risk?		
The District will continue to look for opportunities to expand its capabilities by finding grant funds. The District is always on the lookout for local, federal, and state grant opportunities.		

Source: Cosumnes CSD

I.6.4. Mitigation Education, Outreach, and Partnerships

Table I-14 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table I-14 Cosumnes CSD's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	CERT
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Community Outreach Programs through the Fire Department
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
It is the ongoing goal of the Cosumnes CSD Fire Department to utilize new technology and procedures to help further educate the community that we serve. The Cosumnes CSD Fire Department continues to provide outreach to local schools to provide education on fire prevention and safety. The Cosumnes CSD Fire Department is also exploring social media platforms to give the ability to reach more members of the community. The Community Emergency Response Team (CERT) goals include maximizing participation and exposure to the communities of Elk Grove and Galt. Part of the Cosumnes CSD Fire Department social media platform will include highlighting CERT to help reach those goals.		

Source: Cosumnes CSD

I.7 Mitigation Strategy

I.7.1. Mitigation Goals and Objectives

The Cosumnes CSD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

I.7.2. Mitigation Actions

The planning team for the Cosumnes CSD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Drought & Water Shortage
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Wildfire

After a review of District capabilities and possible mitigation action alternatives, the following hazards were dropped to a low priority for mitigation planning purposes:

- Pandemic
- Severe Weather: Extreme Cold and Freeze

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide and the District's public outreach actions, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Drought Mitigation Planning

Hazards Addressed: Drought & Water Shortage, Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The District services a territory that is at risk to drought. Drought dries out fuels and is a contributing factor of wildfire in and around the District. Drought in general puts the community at risk to drought related impacts.

Project Description: The District is seeking to reduce water usage where possible in order to reduce drought risk and has a water conservation plan, WaterLess. The District maintains over 1,000 acres of irrigated parks, streetscape and trails. The goal of the WaterLess campaign is to protect water resources through the use of water-efficient practices and monitoring. Current actions include the use of drip-irrigation systems where practicable, monitoring of spray irrigation systems to ensure use, and monitoring of precipitation events to avoid over-watering. All of these measures help support the District's Climate Action Plan which was adopted by the Board of Directors in October 2020. The District utilizes a 24/7 on-call/standby system to address urgent maintenance issues, including water issues such as broken water lines or malfunctioning sprinklers, in an effort to maximize water savings and efficiency. As part of the District's drought planning efforts, when the State requires limited water usage, the District cancels all necessary training and also suspends all vehicle washing to help the District's impact of water use. The District is looking into future mitigation planning to include implementing a recycled water, or grey water, program to irrigate landscaped areas with treated wastewater from Cosumnes CSD facilities. Grey water refers to reusable wastewater from bathroom sinks , bath and shower drains, and clothes washing drains, that can be reused on-site, often for landscape irrigation. The use of grey water for irrigation is known to reduce the demand for fertilizer use.

Other Alternatives: No action.

Existing Planning Mechanisms through which Action will be Implemented: WaterLess and Consumnes CSD Climate Action Plan

Responsible Office: Senior Management Team

Priority (H, M, L): Medium

Cost Estimate: Unknown and depends on the various activities conducted by the CSD

Potential Funding: Local budgets, Local and State grant sources.

Benefits (avoided Losses): Reducing water usage during periods of drought provides multiple benefits. Studies show saving water reduces greenhouse gas emissions. This will also help in preserving the overall water supply and helping ensure adequate supply for fire suppression purposes.

Schedule: Within 5 years, and ongoing

Action 2. Enhance the District's Public Education, Awareness, and Outreach Program to Include all Hazards of Concern

Hazards Addressed: Multi-Hazard (Climate Change, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The Cosumnes CSD plays a key role in public education and outreach efforts to communicate the potential risks of fires/natural disasters and other hazards that could affect the community. The Cosumnes CSD's multi-hazard public education program helps raise community understanding and awareness of these types of events.

Project Description: Cosumnes CSD works alongside other local, cities, counties, and state agencies in an effort to educate and enhance the community members' awareness concerning the risks and vulnerabilities of fires, natural hazards, and other disasters. This public education and outreach effort helps the public be better prepared for and educated on measures to reduce the damages and other impacts from a hazard event. Specifically, these public educational efforts help community members understand how to prepare for these disasters, to implement measures to limit or mitigate the impacts from hazard events, and in some instances to be able to prevent these events from occurring at all. Public education program enhancements will include expanding existing efforts to include all hazards of concern and to assist the public in understanding their role in natural hazard mitigation. Examples of program enhancements may include educating the public on:

- Drought mitigation measures such as water conservation, use of drought resistant landscaping, ensuring access to sufficient water for fire suppression
- Flood mitigation measures such as keeping storm drains and ditches free of debris, flood proofing measures, benefits of maintaining wetlands
- Fire mitigation measures such as ignition resistant structure retrofits, regular vegetation maintenance, defensible space, water supply. Cosumnes Fire Department also provides continuous education to the community with fire hazard concerns, preventative measures, and providing information on the dangers of illegal fireworks through social media campaigns and on our website.
- Severe weather mitigation measures such as availability of cooling/warming centers, use of home generators
- Other hazard mitigation efforts, depending on the hazard, environment, and affected community

Other Alternatives: Continue existing outreach program as is.

Existing Planning Mechanisms through which Action will be Implemented: The District's existing Public Education and Awareness Program

Responsible Office: Cosumnes Fire Department

Priority (H, M, L): High

Cost Estimate: Costs to be determined depending on the scope and frequency of education activities.

Potential Funding: Local and State budgets, State grant sources

Benefits (avoided Losses): To assist community members in understanding their role in natural hazard mitigation. Implementation of mitigation efforts by the community will reduce impacts to property and protect lives.

Schedule: Ongoing

Action 3. Integrate the LHMP into Cosumnes CSD Strategic Plans

Hazards Addressed: Multi-Hazard (Climate Change, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background:

Project Description: In an effort to address the hazards facing the District, the District will integrate the local hazard mitigation plan into its Strategic Plans as it develops its priorities, goals, objectives, and implementation measures. There are three current Strategic Plans in the Cosumnes CSD. These are the Cosumnes Community Services District Strategic Plan, The Cosumnes Fire Department Strategic Plan and the Cosumnes Community Services District Parks Department Strategic Plan. These plans guide the agency in its efforts to better serve the community and implement policies and programs that help mitigate potential hazards in the community.

Other Alternatives: No action; maintain and implement all plans independently

Existing Planning Mechanisms through which Action will be Implemented: The Cosumnes Community Services District Strategic Plan, The Cosumnes Fire Department Strategic Plan and the Cosumnes Community Services District Parks Department Strategic Plan

Responsible Office: Senior Management Team

Priority (H, M, L): High

Cost Estimate: Unknown but anticipated to be limited

Potential Funding: Local budgets

Benefits (avoided Losses): Integration (and resulting implementation) of the LHMP into the District's 3 Strategic plans will help align all hazard priorities, goals and implementation measures and assist in making hazard mitigation a standard business practice within the District. Better alignment of plans and focused implementation will reduce impacts to property, life safety, and the environment.

Schedule: Within first year following LHMP adoption

Action 4. Continue to Implement Cosumnes CSD's Comprehensive Climate Action Plan

Hazards Addressed: Multi-Hazard (Climate Change, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The effects of climate change are being felt by California communities including those within the Sacramento County Planning Area. Climate change is becoming a significant factor in its exacerbation of natural hazards of concern to the CSD. This includes changes in precipitation patterns and increases in extreme heat events as well as its effects on the District's drought, flood and wildfire hazards. Past efforts have not been sufficient to mitigate the impacts of climate change. A comprehensive climate action plan, developed by the District, is in the process of being implemented to address the realities of climate change.

Project Description: The District strives to achieve sustainability by allocating staff and resources based on sound operational practices to ensure long-term operation and maintainability with a Climate Action Plan. The Climate Action Plan is intended to increase the environmental sustainability of the District in terms of GHG emission reductions as well as long-term operational efficiency, water and waste prevention, reduction in the consumption of natural resources, economic prosperity, and minimization or elimination of potential adverse effects to the environment that could otherwise occur during District operations. Cosumnes CSD will continue to implement their comprehensive climate action plan to reduce the effects of climate change on the District. This effort will include a variety of actions to incorporate the principles of green/renewable energy wherever possible, reduce the District's carbon footprint, and employ strategies to mitigate the District's future impacts on climate change and to reduce the exacerbation of climate change on other natural hazards. The Climate Action Plan to reduce emission measures and sustainability practices will be incorporated into the District's daily operations as well as the planning and development of future facilities and parks and considerations to be made when purchasing new equipment.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Cosumnes CSD Comprehensive Climate Action Plan (CAP)

Responsible Office: Senior Management Team

Priority (H, M, L): Medium

Cost Estimate: The costs associated with CAP implementation will vary depending on the action implemented

Potential Funding: Local and state budgets, FEMA and State grant sources.

Benefits (avoided Losses): The benefit is reduced carbon footprint and utilizing green/renewable energy. CAP implementation will also help reduce the exacerbating effects on other natural hazards, with the goal of reducing overall hazard vulnerabilities.

Schedule: Ongoing

Action 5. Mutual Aid Agreements

Hazards Addressed: Multi-Hazard (Climate Change, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Mutual aid agreements are necessary to be in place if a disaster occurs to provide integration and coordination of planning efforts for multiple jurisdictions. The intent of these agreements is to provide direction on how to respond to an emergency from the initial onset, through to extended response, and into the recovery process. Disasters know no boundaries and other emergency agencies are needed to help collaborate with emergency response.

Project Description: Guarantee mutual aid agreements stay in place such as California Master Mutual Aid Agreement, California Fire Assistance Agreement, Sacramento County Office of Emergency Services, etc.

In addition to the mutual aid agreement, local collaboration is essential. The Deputy Chief of Operations hosts Wildland Response and Units meetings with Sacramento Regional Fire/EMS Communications Center and Operational Chiefs in the surrounding agencies to collaborate regionally and make plans annually for wildland fire season. During these meetings, wildland practices and CAD vehicle assignments are reviewed and updated, as needed, prior to the wildland fire seasons.

In addition to reducing fire hazard risks and providing wildland burns training, Cosumnes Fire prepares for red flag events by collaborating with surrounding agencies, wildland preserve and local fish and wildlife. The Cosumnes Fire Department enhances additional staffing at peak times of the year, such as July 4th, and wildfire season to provide coverage when call volumes are expected to be high.

Other Alternatives: No action.

Existing Planning Mechanisms through which Action will be Implemented: Consumnes CSD Emergency Operations Plan

Responsible Office: Cosumnes Fire Department

Priority (H, M, L): Medium

Cost Estimate: Unknown due to the severity of the inclement weather

Potential Funding: Local and state budgets,

Benefits (avoided Losses): Establishing mutual aid agreements ensure additional resources are available for anticipated emergencies. Additional resources will assist in limiting impacts and reducing damages to property, the environment and to public health and safety.

Schedule: Ongoing

Action 6. Continue Vegetation Management Program

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background:

The Cosumnes Fire Department is committed to reducing the risk of fire and fire hazards in Elk Grove and Galt each fire season. Fire hazards exist when overgrown weeds, brush, or trimmings are adjacent to, or could potentially threaten structures such as dwellings, barns, storage buildings, or stored vehicles. This is accomplished through an aggressive annual vegetation management program. Vegetation Management is conducted March through November. The Vegetation Management Program Ordinance requires parcels of 2 acres or less to have weeds no taller than 2 inches. Parcels larger than 2 acres must have a 30-foot fire break around all structures, all guidelines are listed on https://www.yourcsd.com/306/Weed-Abatement. Fire hazard complaints can also be filed via an online complaint form, on the website listed above, or by contacting the Vegetation Management Hotline at (916) 405-7115. Cosumnes Fire Department also provides continuous education to the community with fire hazard concerns, preventative measures, and providing information on the dangers of illegal fireworks through social media campaigns and on our website.

Project Description: This project entails the ongoing implementation and enforcement of the Vegetation Management Program Ordinance. With the fire season being extended in recent years, more effort is required annually to enforce this ordinance, often requiring additional and dedicated staff.

Other Alternatives: No action.

Existing Planning Mechanisms through which Action will be Implemented: Vegetation Management Program Ordinance

Responsible Office: Cosumnes CSD

Priority (H, M, L): High

Cost Estimate: Estimated $25,000 annually for the program and about 141 properties annually, this does not include staffing/personnel costs

Potential Funding: Local budgets, Local, State and FEMA grant sources.

Benefits (avoided Losses): Reduced wildfire risk and vulnerability will reduce impacts to property, environment and public health and safety.

Schedule: Ongoing and Annual

LOS RIOS
COMMUNITY
COLLEGE
DISTRICT

Annex J Los Rios Community College District

J.1 Introduction

This Annex details the hazard mitigation planning elements specific to the Los Rios Community College District (LRCCD or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to LRCCD, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

J.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table J-1. Additional details on plan participation and District representatives are included in Appendix A.

Table J-1 LRCCD – Planning Team

Name	Position/Title	How Participated
Debbie Turner	Risk Management Supervisor	Attended meetings. Provided input on draft annex. Provided mitigation actions.
Julia Coleman	Risk Management Specialist	Attended meetings. Provided input on draft annex. Provided mitigation actions.
Nate Martin	Director, Sustainability	Attended meeting, Provided input on draft annex. Provided mitigation actions.
Vince Montoya	Dir. Facilities Maintenance	Provided input on mitigation actions, past occurrences, and hazard assessment.
Dan McKechnie	Dir. Facility, Planning & Construction	Provided input on mitigation actions, future master planning projects, and bond funding.
Larry Savidge	Emergency Manager/Chief of Police	Provided input on mitigation actions and emergency planning.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table J-2.

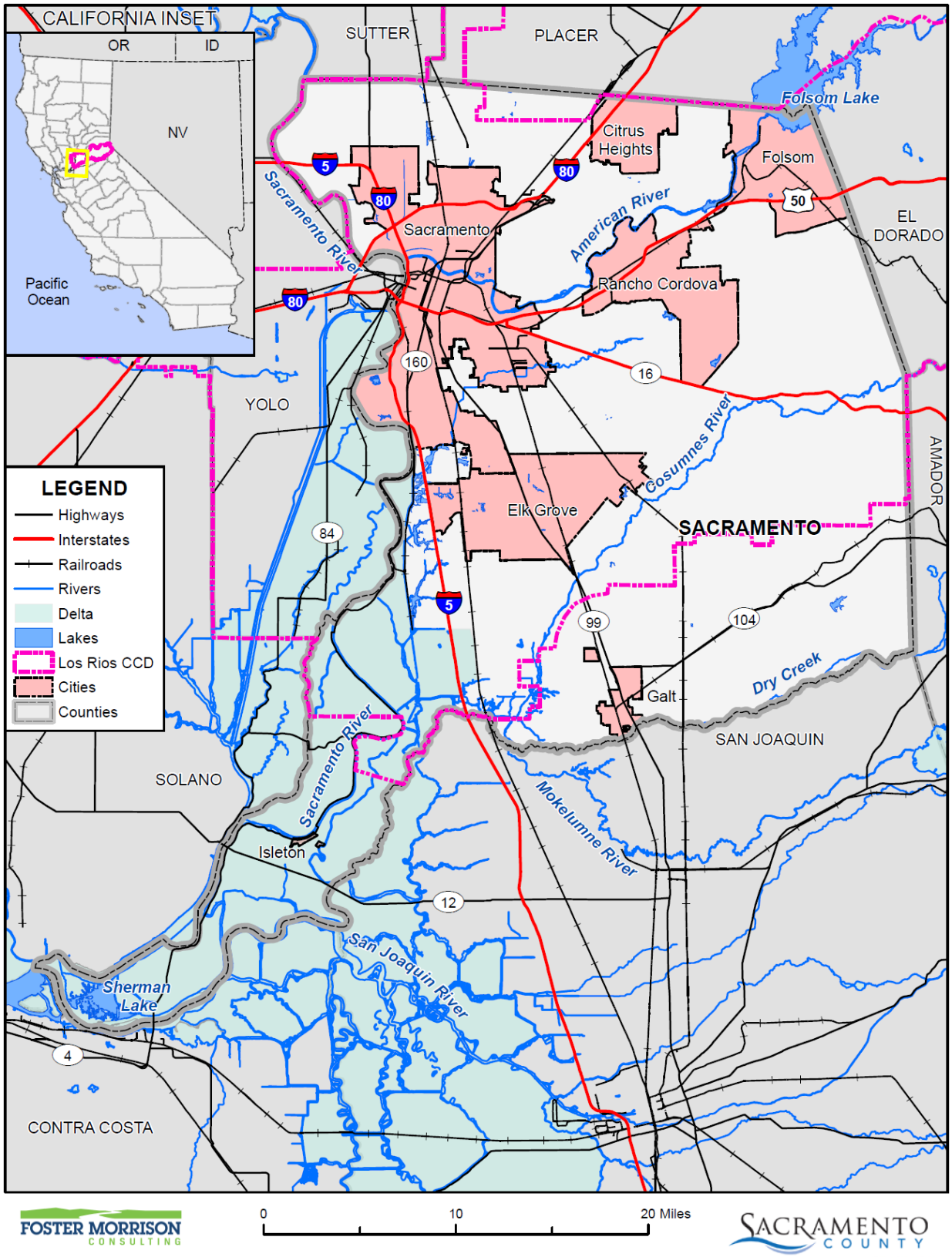
Table J-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Emergency Operations Plan	Consulted LHM Plan for updating emergency operations written plan and training needs.
Schedule Maintenance Special Repairs Plan	Consulted LHMP for hazard assessment and mitigation actions to obtain state funding for deferred maintenance repairs.

J.3 District Profile

The District profile for the LRCCD is detailed in the following sections. Figure J-1 displays a map and the location of the District within Sacramento County.

Figure J-1 LRCCD



Data Source: Los Rios Community College District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

J.3.1. Overview and Background

Los Rios Community College District is one of the nation's most respected learning institutions and the second-largest community college district in California. The College is a two-year public college district that serves the greater Sacramento region. Los Rios includes: American River, Cosumnes River, Folsom Lake and Sacramento City colleges; major education and outreach centers in Davis, Elk Grove, Natomas, Placerville, Rancho Cordova and West Sacramento; and specialized workforce and economic development programs for business, government and organizations throughout the region. The colleges offer AA/AS degrees, certificates and transfer education opportunities - students complete freshman and sophomore years and transfer to a four-year college or university - in more than 70 career fields.

The District's 2,400 square mile service area includes all of Sacramento County, most of El Dorado County and parts of Yolo, Placer and Solano counties. About 70,000 students are enrolled in the colleges and about 5000 employees to include full-time, part-time, and temporary.

- American River College – 153 acres with 122 buildings
- Natomas Center – 1 building
- Cosumnes River College – 180 acres with 90 buildings
- Elk Grove Center – 1 building
- Folsom Lake College – 151 acres with 21 buildings
- El Dorado Center – 3 buildings
- Rancho Cordova Center – 1 building
- Sacramento City College – 72 acres with 38 buildings
- Aeronautics (McClellan) - 2 buildings
- Davis Center – 2 buildings
- West Sacramento Center – 1 building

Other sites support vocational programs include Sacramento Regional Public Safety Center (1 building), Mather (1 building) for auto collision and bio-diesel program, and Pre-Apprenticeship training program (2 buildings).

Operational buildings include Facilities Management (1 building), District Office support (9 buildings) and Police Services and Workforce and Economic Development (1 building)

J.4 Hazard Identification

LRCCD identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table J-3).

Table J-3 LRCCD—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Limited	Unlikely	Negligible	Low	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Limited	Unlikely	Negligible	Low	High
Earthquake	Limited	Unlikely	Negligible	Low	Low
Earthquake Liquefaction	Limited	Unlikely	Negligible	Low	Low
Floods: 1%/0.2% annual chance	Limited	Unlikely	Critical	Low	Medium
Floods: Localized Stormwater	Limited	Occasional	Critical	Low	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Limited	Unlikely	Negligible	Low	Medium
Pandemic	Extensive	Unlikely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Limited	Unlikely	Negligible	Low	Medium
Severe Weather: Extreme Heat	Limited	Unlikely	Negligible	Low	High
Severe Weather: Heavy Rains and Storms	Limited	Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Limited	Likely	Limited	Low	Low
Subsidence	Limited	Unlikely	Negligible	Low	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Unlikely	Negligible	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

J.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

J.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section J.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table J-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

J.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the LRCCD's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table J-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. LRCCD's physical assets, valued at over $1.4 billion, consist of the buildings and infrastructure to support the District's operations.

Table J-4 LRCCD Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
American River College (ARC)	Main Campus	$394,091,646	Flooding, Severe Weather: heavy rain, wind and tornadoes, Wildfire, Pandemic
Cosumnes River College (CRC)	Main Campus	$320,857,854	Severe Weather: heavy rain, wind, and tornadoes, Pandemic
Davis Center	Center under Sacramento City College	$24,478,837	Severe Weather: heavy rain, wind, and tornadoes, Pandemic
District Office	Operational Support	$7,871,895	Flooding, Levee Failure, Severe Weather: heavy rain, wind and tornadoes, Pandemic
Elk Grove Center	Center under Cosumnes River College	$12,868,824	Severe Weather: heavy rain, wind, and tornadoes, Pandemic
El Dorado Center	Center under Folsom Lake College	$28,303,503	Severe Weather: heavy rain, wind & tornadoes, and wildfire, Pandemic
Ethan Way Center	Special services for business and industry	$5,094,488	Flooding, Levee failure, Severe Weather: heavy rain, wind & tornadoes, Pandemic
Facilities Management	Operational Support	$9,373,473	Severe Weather: heavy rain, wind and tornadoes, Pandemic
Folsom Lake College	Main Campus	$179,975,251	Severe Weather: heavy rain, wind and tornadoes, Pandemic
Mather Location (Leased)	Offsite program for American River College	$6,075,603	Severe Weather: heavy rain, wind and tornadoes, Pandemic
Natomas Center	Center under American River College	$9,646,908	Flooding, Severe Weather: heavy rain wind, and tornadoes, Pandemic
Rancho Cordova Center	Center under Folsom Lake College	13,057,066	Severe Weather: heavy rain, wind and tornadoes, Pandemic
Sac Regional Public Safety Training Center	Center under American River College	$10,242,536	Severe Weather: heavy rain, wind and tornadoes, Pandemic

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Sacramento City College (SCC)	Main Campus	$381,038,709	Flooding, Severe Weather: heavy rain, wind and tornadoes, Pandemic
Sacramento City College Hangar (Leased)	Offsite location for Sacramento City College	$3,152,561	Severe Weather: heavy rain, wind and tornadoes, Pandemic
Water Tower Complex	Operational Support	$4,211,569	Flooding, Levee Failure, Severe Weather: heavy rain, wind and tornadoes, Pandemic
West Sacramento Center	Center under Sacramento City College	$11,663,738	Severe Weather: heavy rain, wind and tornadoes, Pandemic
Total		**$1,422,004,461**	

Source: LRCCD

Natural Resources

LRCCD has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

LRCCD has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Development since 2016

No District facilities have been constructed since 2016 but improvements have been made at several campuses to include modernization projects and removing/rebuilding several buildings on existing campuses (American River College, Cosumnes River College and Sacramento City College). As such, a change in vulnerability is unlikely.

Future Development

Natomas Center adding a second building of instructional space, Folsom Lake College adding a science building for classes, labs, library and faculty offices, and at Sacramento City College replacing the existing science building with an updated facility.

The District has no control over future development in areas the District services. Future development in these areas parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

J.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table J-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally

grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

LRCCD added a generator to back up its computer servers several years ago and had it as a project in past LHMP. LRCCD also added a generator at District Office for backup.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

The El Dorado Center has been subject to PSPS events during high wind conditions because of its location in the foothills of El Dorado County.

The District has experienced multiple utility power outages lasting several days per event, at the Folsom Lake College, El Dorado Center campus, located in Placerville California. The Public Safety Power Shutoffs (PSPS) started in October 2019, and according to PG&E, they will continue into the foreseeable future.

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the District, County, and surrounding region is at risk, as pandemic is a regional, national, and international event. The speed of onset of pandemic is usually short, while the

duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table J-5.

Table J-5 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic.

- The 1918-1919 Influenza Pandemic (H1N1)
- The February 1957-1958 Influenza Pandemic (H2N2)
- The 1968 Influenza Pandemic (H3N2)

To date, the 21st century has seen two acknowledged pandemics.

- 2009 Swine Flu (H1N1)
- 2019/2020 COVID 19

Certain impacts that the District has been facing are the costs required to supply technology equipment to employees for them to be able to work from home, which includes the costs to increase District internet speed and VPN access for added security. Also, the costs associated with needing to provide students with Chromebooks, hotspots, and other technology equipment so they are equipped to continue their schooling offsite. Additionally, the District had to put into place a hiring freeze and our student enrollment has had a decrease, which ultimately causes a reduction and loss of revenue. Further, athletics have been currently halted which causes a reduction in revenue received from ticket sales and parking on event days. Since there are no in person classes, the District also loses revenue related to parking on campuses. Also, the District had to face the costs of cancellation for events that were already scheduled (e.g. commencement, appreciation days, travel, etc.).

All campus and office locations were closed for an extended period after the onset of the pandemic. After the extended period essential employees were allowed to be onsite following strict COVID-19 procedures and all other employees were working from home. Classes will continue to be online through the Spring Semester 2021 districtwide. As our facilities are facing closures, the facility rentals we extend to the community and local businesses have been cancelled. Vandalism has occurred to District facilities during the lockdowns (broken windows, door locks, graffiti, and vehicle theft/vandalism.).

Vulnerability to and Impacts from Pandemic

Pandemics have and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding the current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent the spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the District. Pandemic can have varying levels of impact to the citizens of the District and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently), and unemployment rose significantly. Supply chains for food and essentials can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

The most significant impacts to the District from the Pandemic generally have been economic in nature based on the District trying to accommodate virtual learning while experiencing a decrease in revenue sources such as those detailed above in Past Occurrences.

Assets at Risk

Pandemics do not affect District facilities, but can affect District personnel who operate District facilities.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of

storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Section 4.3.4 of the Base Plan. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

Historically, LRCCD has suffered approximately $167,000 in damages of which approximately $136,000 was recovered through disaster assistance programs. The events took place in 1994, 1995, 1997, 2003, 2004, 2008. The District noted two events that took place in 2017:

- **January 3-12, 2017** – Severe storms including high winds and gusts caused damage to multiple District locations (including American River College, Cosumnes River College, Folsom Lake College, Sacramento City College, El Dorado Center). Fallen tree limbs, roof leaks, and fence damages occurred. Damages can be seen in the images below.
- **January 18-23, 2017** – Severe storms including high winds and gusts caused damage to multiple District locations (including: District Office, Cosumnes River College, Sacramento City College). Large tree fell on Boardroom building creating building and water damage, other locations had fence damage, multiple fallen trees, and debris removal. LRCCD had to relocate regular scheduled Board meetings to alternate sites and lack of use of building for other activities. Damages can be seen in the images below.

Figure J-2 January 2017 Storm Damage – Tree Damage to Boardroom

Source: LRCCD

Figure J-3 January 2017 Storm Damage – Felled Tree

Source: LRCCD

Figure J-4 January 2017 Storm Damage – Fence Damage

Source: LRCCD

Figure J-5 January 2017 Storm Damage – Felled Tree

Source: LRCCD

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating

significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power outage and failure can be found in the discussion at the beginning of Section J.5.3, as well as in Section 4.3.3 of the Base Plan.

When there are heavy rains and strong winds, it usually affects multiple locations within LRCCD. For example, the January 2008 storms caused damages at 7 locations incurring a cost of $48,000 in damages. This included 16 items listed on the claim form. The state reimbursed LRCCD $38,600. Majority of the replacement cost were for items that were outside of the buildings, such as bent fence post, ripped sun covers, ripped banners, damage to storage containers, fallen trees, debris cleanup, and a broken window. The Facilities Management building had part of the roofing system blown off which created a leak inside the building and the damages were over $8,000. This was the first occurrence of damages to this building.

The main data center at the District Office supports the LRCCD's software systems, computers operations, and student services. This center has a 22-hour diesel generator that will provide power to the data center during a power outage.

The District police dispatch center at Ethan Way site is at risk of losing power. To mitigate this facility being affected by power outage, in 2008 a backup dispatch center was included in the new Operations building design at the Cosumnes River College campus.

Assets at Risk

All District assets (from Table J-4) are at risk from this hazard. Risk includes building loss of use, damage to property, equipment, furniture, computers, students' classes having to be moved, and loss of income for facility rentals.

J.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

J.6.1. Regulatory Mitigation Capabilities

Table J-6 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the LRCCD.

Table J-6 LRCCD Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y	Each campus has a master plan and mitigation actions are completed through capital improvement planning or maintenance and repair planning.
Capital Improvements Plan	Y	Hazards that are directly related to specific projects may be included within projects (individual).
Economic Development Plan	N	
Local Emergency Operations Plan	N	
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	N	
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	California Building Code 2013—LRCCD is under the jurisdiction of the Division of the State Architect and use the code they deem appropriate.
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	
Fire department ISO rating:	N	
Site plan review requirements	Y	LRCCD has the state architect review projects site plans with respect to ADA Accessibility and Landscaping (water use).
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program		
Other		

How can these capabilities be expanded and improved to reduce risk?
Continue staff training on update regulations and building codes, enforce building codes with individual campus projects.

Source: LRCCD

J.6.2. Administrative/Technical Mitigation Capabilities

Table J-7 identifies the District department(s) responsible for activities related to mitigation and loss prevention in LRCCD.

Table J-7 LRCCD's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	Y	To review hazards related to LRCCD
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Facilities Maintenance grounds department maintains drainage systems, roofing systems, and tree trimming to prevent damages to property and people.
Mutual aid agreements	N	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	Y	District police department works with multiple surrounding agencies to anticipate and respond to public safety issue, and natural disasters.
Community Planner	N	
Civil Engineer	N	
GIS Coordinator	N	
Other	Y	Risk Management Supervisor, Risk Management Specialist, Director, Sustainability, Dir. Facilities Maintenance, Dir. Facility, Planning & Construction, and Emergency Manager/Chief of Police are all trained on mitigation.
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	We use a mass notification system to address emergencies with employees and students.
Hazard data and information	N	
Grant writing	N	
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		

Continue to develop, update, and train on Emergency and Pandemic planning. Add more staffing to support maintenance programs.

Source: LRCCD

J.6.3. Fiscal Mitigation Capabilities

Table J-8 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table J-8 LRCCD's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Capital Improvement funds for mitigation projects if they are directly related to a specific Capital Improvement project. For example, while renovating the athletic fields the main storm drain is going to be improved to reduce the risk of localized flooding.
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	Bond funding has been used for past projects—for example seismic retro fitting of Hughes Stadium which was first build in 1928.
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	Y	
State funding programs	Y	The State provided special maintenance and special repair (SMSR) funding for schools. With this funding, we were able to complete roofing renovations district wide. This funding is not guaranteed to be part of the annual budget.
Other		
How can these capabilities be expanded and improved to reduce risk?		
Continue to allocate funds towards mitigation projects to reduce risks.		

Source: LRCCD

J.6.4. Mitigation Education, Outreach, and Partnerships

Table J-9 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table J-9 LRCCD's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	No	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes	Each campus holds Earth day events for resource conservation and most campuses have a sustainability club. District Office is working on campus natural resource usage dashboard for student and employees' projects.
Natural disaster or safety related school programs	Yes	Continue to train employees on National Incident Management System (NIMS) emergency preparation, and building evacuation training.
StormReady certification	No	
Firewise Communities certification	No	
Public-private partnership initiatives addressing disaster-related issues	No	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Increase training for students and employees on disaster preparedness and mitigation.		

Source: LRCCD

LRCCD Police Department conducts emergency operation drills at various locations throughout the school year. Depending on the type of drill it may involve outside agencies. In the past, outside agencies included local fire, police, Cal OES (California Office of Emergency Services), Center for Disease Control, Red Cross, and Sacramento County OES.

J.6.5. Other Mitigation Efforts

To sustain our services during and after a disaster, such as flooding and severe weather, there is a strong support to protect LRCCD against dating center failure including network and server infrastructure and access to the Internet. LRCCD is in the process of updating data centers at the District Office and Folsom Lake College. Currently the two data centers have generator backup power sources, and each has a 10Gbps connection to the Corporation for Education Network Initiatives California (CENIC) for Internet access. Each of the connections connect at a different location on the CENIC backbone. LRCCD is in the process of projects at each of the data centers of upgrading to Liebert Smartrow technology. LRCCD is also hopes to complete 4 additional 10Gbps circuits to create a 10Gbps Ring between the main campuses and District Office. LRCCD is also looking to install at least 1Gbps connection at the outreach centers and other district facilities. This is all in effort to improve connectivity for services including communications (phones, email, and others), and all Internet access.

LRCCD is also looking at architecture and deploying redundant WAN (Wide Area Network site to site) connectivity and on main campuses for the core and distribution LAN (Local Area Network with site building to building or floor to floor) networking. This will provide complete resiliency to failures of fiber and/or network electronics along either pathways, or data center, and failures at either of the CENIC connections, or the main data centers at LRCCD locations. The project continues with participation of CENIC, AT&T, SECC/Comcast and the LRCCD DO-IT Department. CENIC internet connections bandwidth was increased from 1Gbps each to 10Gbps (only one pathway is active at a time) and LRCCD will complete main campus WAN connectivity from single 1Gbps pathway to multiple 10Gbps pathways.

LRCCD upgraded the emergency mass notification system to alert students and employees for emergencies (such as disasters, shelter in place, campus closures, etc.) by sending text messages, email messages or calling a mobile phone. The system has improved features, ease of use, and aligns with technological advances for future options. It is now easier to post to social media sites, and digital signage.

The system can provide information to the majority of students and employees. The annual maintenance fees are funding by LRCCD.

LRCCD District police have trained over 550 employees in the SEMS/NIMS program. This training is open to all employees and students but is mandatory for all employees who are an Emergency Operations Command member. The emergency operation plan is being updated to be more streamline and training will be provided to all team members.

J.7 Mitigation Strategy

J.7.1. Mitigation Goals and Objectives

The LRCCD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

J.7.2. Mitigation Actions

The planning team for the LRCCD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Floods: Localized Stormwater
- Pandemic
- Severe Weather: Heavy Rains and Storms

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless

of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Pandemic Response Plan

Hazards Addressed: Pandemic

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: COVID-19 global pandemic and subsequent shutdown causing LRCCD college campuses to go 100% remote and conversion to online courses in March 2020, continuing through Fall semester 2021.

Project Description: Develop a Pandemic Response Plan districtwide to provide direction and outline decision making strategies to ensure the health and safety of our students and employees.

Other Alternatives: N/A

Existing Planning Mechanism(s) through which Action Will Be Implemented: Work with consultant to update and implement at each campus operations department.

Responsible Office/Partners: Health Services lead

Cost Estimate: $50,000

Benefits (Losses Avoided): Implement plan effectively to protect health and safety of students and employees. Maximize continuity of student classes and services.

Potential Funding: HEERF Funding or District General Funds

Timeline: 6 months

Project Priority: High

Action 2. Emergency Operations Plan Update

Hazards Addressed: Multi-Hazard (Floods: Localized Stormwater, Pandemic, Severe Weather: Heavy Rains and Storms)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: LRCCD has an outdated Emergency Operations Plan

Project Description: Hire consultant to update the Emergency Operations Plan. Update and revise districtwide to include all college locations to be in compliance with Federal governance, prepare guidance 101. Goal to provide clarity and consistency across the District.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Working with Police Services and Campus Operations to implement and schedule training.

Responsible Office/Partners: Los Rios Police Department led project

Cost Estimate: $50,000

Benefits (Losses Avoided): Be prepared for quick reaction time to open the Emergency Operation Center to react to any hazard to protect students and employees, and maintain business operations.

Potential Funding: General Funds

Timeline: 6 months

Project Priority: High

Action 3. COVID-19 Education/Information Program

Hazards Addressed: Pandemic Response

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Global pandemic keeping up with the changes by CDC, vaccination education, on-campus safety protocols, when to stay home, and staying healthy.

Project Description: Create an Education Program for students and employees for on-campus activities, to include safety protocols, vaccination education, response to symptoms, and protecting the community. Disseminate information effectively and efficiently to all district constituents (students, faculty, staff). This includes a COVID education campaign, marketing tools, social media production, website resources.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Working through staff development and campus health services

Responsible Office/Partners: Health Services and Public Information Office

Cost Estimate: $100,000

Benefits (Losses Avoided): Reduced risk from pandemic.

Potential Funding: HEERF (Higher Education Emergency Relief Fund)

Timeline: 6 months

Project Priority: High

Action 4. Installing a Microgrid Project, at the Folsom Lake College, El Dorado Center (EDC) in Placerville, CA

Hazards Addressed: Severe Weather: Floods, Wind and Tornado, Wildfire Mitigation, Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: EDC is the only Los Rios Community College site, which is subject to PG&E's Public Safety Power Shutoffs (PSPS), which occurred approximately five days in 2019 resulting in the campus being closed.

Note: Because EDC also provide electrical power to the adjacent community garden and observatory, power outages at our location have community implications as well.

Project Description: The Microgrid Project, in conjunction with the Solar Carport Project, would allow the campus to remain open during future PSPS events, which will continue for the foreseeable future. The Microgrid plan is to install a solar covered car port, battery storage system, and a propane powered generator all working together, such that when PG&E activates a PSPS event, EDC will remain open and operational for several days without being affected. This is referred to as islanding, and would allow EDC to be isolated from PG&E's PSPS. This Microgrid system will provide grid resiliency, lower utility cost over time, and reduce GHG emission, while increasing our renewable energy generation capacity, as well, as moving the campus closer to Zero Net Energy.

Other Alternatives: Solar project only, without battery storage and emergency generator. This option would not provide campus resilience.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Assess and implement plan to create electrical grid resiliency, GHG mitigation, and increase renewable energy generation.

Responsible Office/Partners: Los Rios Community College District-Facilities Maintenance

Cost Estimate: Currently, our portion of the unfunded cost is estimated at $600,000

Benefits (Losses Avoided): This Microgrid project will create resiliency, because of the ability to isolate from the electric utility grid during power outages (Island mode), thus keeping the campus operational during PSPS events. This project will also keep students in class, avoid possible state funding losses, and create resiliency for the campus and the surrounding community.

Potential Funding: The majority of the project will be funded through utility rates, the remaining funding for unexpected cost listed above is TBD.

Timeline: November 2021

Project Priority: High

Action 5. Backup Power for Police Dispatch

Hazards Addressed: All Hazards

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Lack of backup power for a critical service

Project Description: Install Uninterrupted Power Supply (UPS) portable units for Los Rios Police Dispatch computers, provide backup power in case of power outage for short term use.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Police department working with IT to find a solution for implementation.

Responsible Office/Partners: Information Technology (IT Dept)

Cost Estimate: $15,000

Benefits (Losses Avoided): Delay in response to emergency situations

Potential Funding: General funds

Timeline: 6 months

Project Priority: High

Action 6. Tree Mitigation – Districtwide

Hazards Addressed: Floods, Severe Weather: Heavy Rains and Storms, Severe Weather: Winds and Tornados, Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: History of large fallen trees uprooted during severe weather events, some that have caused building or property damage (roof, gutters, fencing, concrete work).

Project Description: Mitigate future damages to buildings and property when trees fall. Check and monitor the health of existing trees (age, disease, insect damage) and assess location, type, size of future trees prior to planting. Ongoing pruning of limbs, proper maintenance of all trees.

Other Alternatives: No action.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Facilities management to review, hire contractor, and add to maintenance schedule.

Responsible Office/Partners: Los Rios Community College District-Facilities Maintenance

Cost Estimate: $150,000

Benefits (**Losses Avoided**): Minimize potential damage districtwide

Potential Funding: General funds

Timeline: Ongoing

Project Priority: Medium

Annex K Reclamation District 800

K.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 800 (RD 800), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to IRD 800, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

K.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table K-1. Additional details on plan participation and District representatives are included in Appendix A.

Table K-1 RD 800 – Planning Team

Name	Position/Title	How Participated
Robert C. Wagner, P.E.	District Engineer	Reviewed draft documents
Patrick W. Ervin, P.E.	Engineer	Attended meetings, collected data, drafted text

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table K-2.

Table K-2 2016 LHMP Incorporation

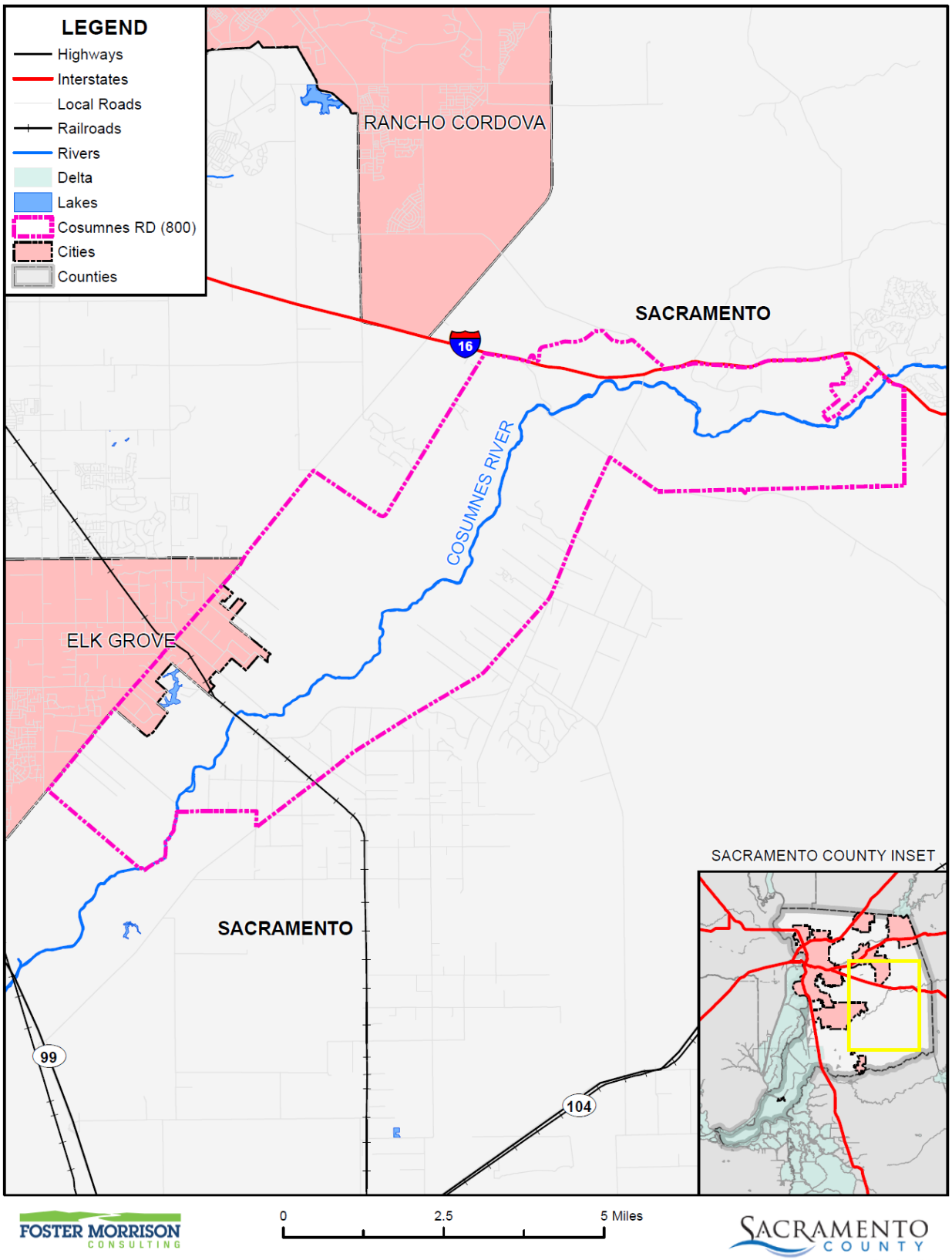
Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Erosion Repair Implemented	The District has repaired 4 places along the Cosumnes River that had significant erosion issues between levee stations 100+00 and 404+50.
National Resources Conservation Service (NRCS) Grant through the Emergency Watershed Protection Program.	The District plans to repair three erosion sites along the Cosumnes River during the summer of 2021. The sites were damaged during the 2017 floods. 75/25 Cost share with the NRCS.

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Levee Access Improvements	The District improved 3.3 miles of levee access, placing aggregate base on access roads, ramps and the levee crest for all weather access during storm events.

K.3 District Profile

The District profile for the RD 800 is detailed in the following sections. Figure K-1 displays a map and the location of the District within Sacramento County.

Figure K-1 RD 800



Data Source: Cosumnes Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

K.3.1. Overview and Background

Reclamation District No. 800 is an area within Sacramento County lying along the Cosumnes River and was originally created by action of the California State Legislature in 1907 (Statutes 1907, Ch 213). This original District, comprised of 2,136 acres, is located between Deer Creek and the Cosumnes River east of Elk Grove in Sacramento County. In January 1997, a flood of extraordinary size occurred on the Cosumnes River between Sloughhouse and Wilton requiring considerable construction work to levees along the river. However, no levee breaks occurred on those maintained by Reclamation District 800.

As a result of the 1997 flood on the Cosumnes River, it became apparent that a public agency was needed to maintain the levees and facilities along the river between Sloughhouse and Wilton areas, outside the boundaries of Reclamation District 800. At the request of landowners along the Cosumnes River whose lands were not included within Reclamation District 800, the Trustees of the District sought an amendment to the act under which the District was formed, in order to modify the boundaries and incorporate additional lands on the right bank of the Cosumnes River and to include, for the first time, lands on the left bank of the river down to the vicinity of Wilton.

To accommodate the above additions of land, SB 437 (Senator Patrick Johnston) was introduced and adopted by the Legislature and signed by the Governor as Chapter 191, Statutes of 1997. This action provided for the increase in District acreage from 2,136 to 25,435 acres. The total potential levee length is 34.05 miles with 17.65 miles along the right (or north) bank and 16.40 miles along the left (or south) bank.

Since the 1997 flood, with assistance from the County of Sacramento and funding by the U.S. Department of Agriculture, repairs were completed to levees along the Cosumnes River.

K.4 Hazard Identification

RD 800 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table K-3).

Table K-3 RD 800—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure					Medium
Drought & Water Shortage					High
Earthquake					Low
Earthquake Liquefaction					Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater					Medium
Landslides, Mudslides, and Debris Flow					Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic					Medium
Severe Weather: Extreme Cold and Freeze					Medium
Severe Weather: Extreme Heat					High
Severe Weather: Heavy Rains and Storms	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Occasional	Limited	Medium	Low
Subsidence					Medium
Volcano					Low
Wildfire					High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

K.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

K.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section K.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table K-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

K.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 800's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table K-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 800's physical assets, valued at over $100 million, consist of the buildings and infrastructure to support the District's operations.

Table K-4 RD 800 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
RD 800 levees	Levee	In excess of $100,000,000	Flood

Source: RD 800

Natural Resources

RD 800 has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

RD 800 has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and development within RD 800 has remained relatively unchanged since 2011. The District is composed of rural farmland with few economic drivers. As such, a change in vulnerability is unlikely.

Development since 2016

The RD has not seen an increase in the population protected by their levees since the 2016 plan. There is currently a project in the planning/permitting phase that will fix a large erosion area adjacent to Rooney Dam the Cosumnes River.

Since 2016 the District has improved approximately 3.3 miles of levee access by placing aggregate base rock. The placement of rock allows for all-weather access for patrolling and inspection during and after storm events.

Future Development

The District has no control over future development in areas the District services. Future development in these areas parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

During the 2017 presidentially declared disasters (4301 and 4308) the District sustained significant erosion damage in several locations along the Cosumnes River. The District has identified nine locations for slope stabilization projects to repair the erosion. Biological and cultural assessments have been completed and a Mitigated Negative Declaration has been adopted for all nine sites. The District received grant funding for

three of these sites from the Natural Resources Conservation Service (NRCS) under the Emergency Watershed Protection Program (EWPP). The NRCS sponsored sites are anticipated to be completed during summer 2021. The District will continue to repair the remaining six sites as funding becomes available. In 2017 the District raised assessments to aid in the repair of the levees.

In 2019, the District identified an additional erosion site at the end of Pecos Road near Rancho Murieta. A biological and cultural assessment is in progress and the site will be repaired when permits are received and funds are available.

K.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table K-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying

disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

There may have been PSPS in the area, but since the District doesn't own anything (buildings, pumps, etc.) there is really no effect.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the District noted that climate change is of concern, no specific impacts of climate change could be recalled. The District and HMPC members did, however, note that in Sacramento County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability to and Impacts from Climate Change

The 2014 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

Assets at Risk

Short duration storms with high precipitation intensities are particularly impactful to RD 800 because there are no dams upstream of the District. These storms cause a rapid rise in river stage within the District. Increased storm intensities related to climate change will likely cause the river to rise more quickly and reach flood stage more often.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a

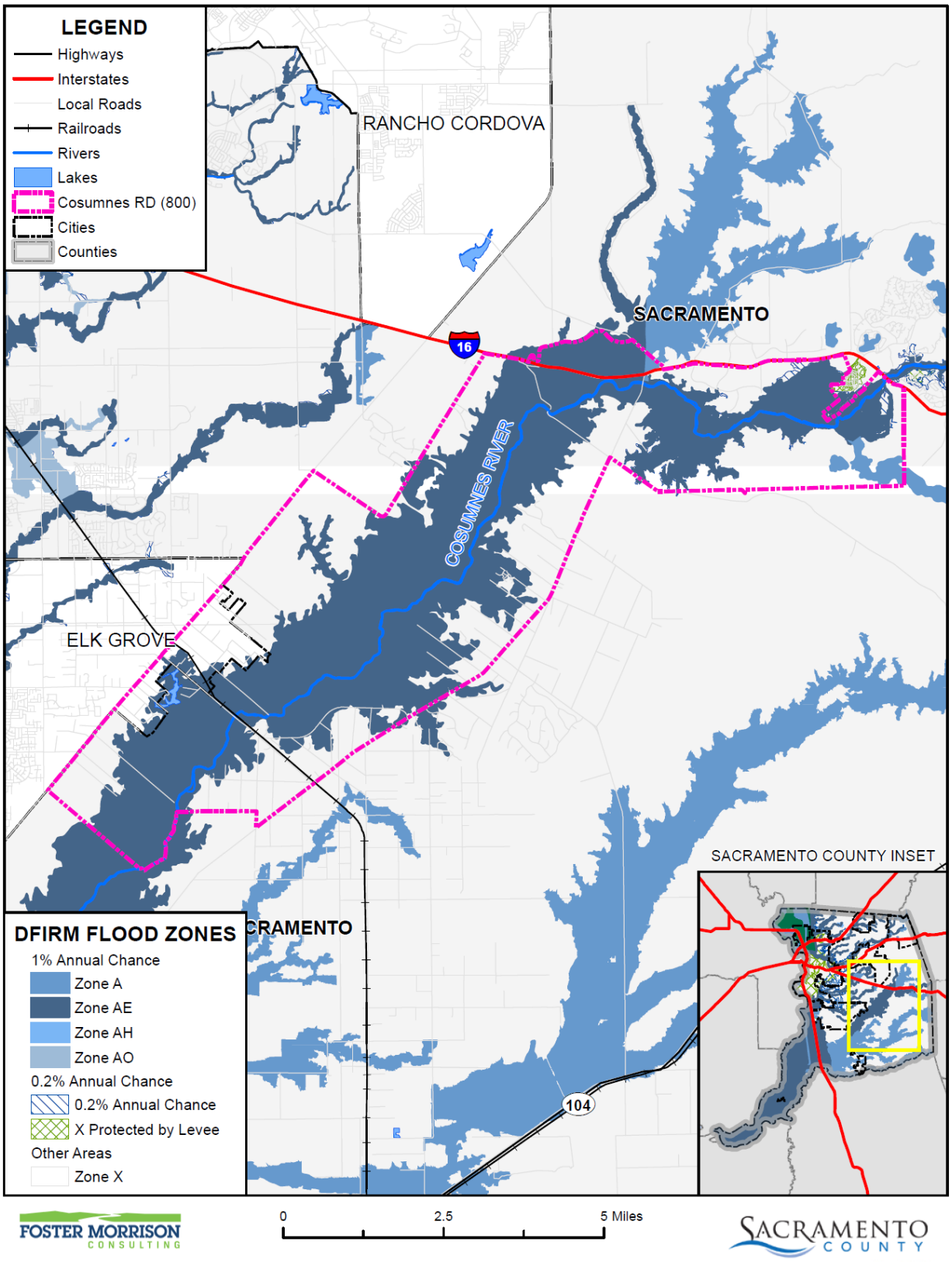
significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the RD 800 have been subject to historical flooding.

Location and Extent

The RD 800 has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure K-2.

Figure K-2 RD 800 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Cosumnes Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table K-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table K-5 RD 800– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	X
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	X
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table K-6. These events also likely affected the District to some degree.

Table K-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The District Planning Team noted that multiple levee failures occurred on the Cosumnes in 1997 which led to flooding.

In February 2017, the District was busy fighting multiple problem areas on the Cosumnes River as flows in the river reached nearly 50,000 cubic feet per second. RD 800 worked to sandbag multiple boils developing throughout the District while monitoring significant erosion occurring on both the north and south banks of the river (as shown on Figure K-3). One of the boils was so large we suspect that it caused a sinkhole nearly 15 deep on the levee crest. The river stage fluctuated rapidly with each passing storm system throughout February 2017. This fluctuation of water levels and the erosive nature of the in-situ sands, silts and gravels likely caused the majority of erosion. The National Resource Conservation Service has agreed to assist the District with three of the erosion sites at a 75/25 cost share. The estimated cost of the project is $985,977.

Figure K-3 RD 800 – Levee Boil

Source: River Valley Times

Figure K-4 RD 800 – High Water from 2017 Storms

Source: River Valley Times

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Flooding would occur as a result of levee failure or overtopping. Levee failure from either breaching or overtopping would result in the total loss of levee embankment material, as was the case in the 1997 flood event. Levee embankment failure within the current District boundary from the 1997 event resulted in multiple levee failure sites along the Cosumnes River. The resulting damage to agricultural lands was extensive, with the most damage occurring immediately adjacent to the levee breach causing severe erosion to agricultural lands, deposition of sands and debris and the complete destruction of adjacent vineyards and irrigation systems.

Assets at Risk

District levees are at risk from this hazard.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Extremely High

Hazard Profile and Problem Description

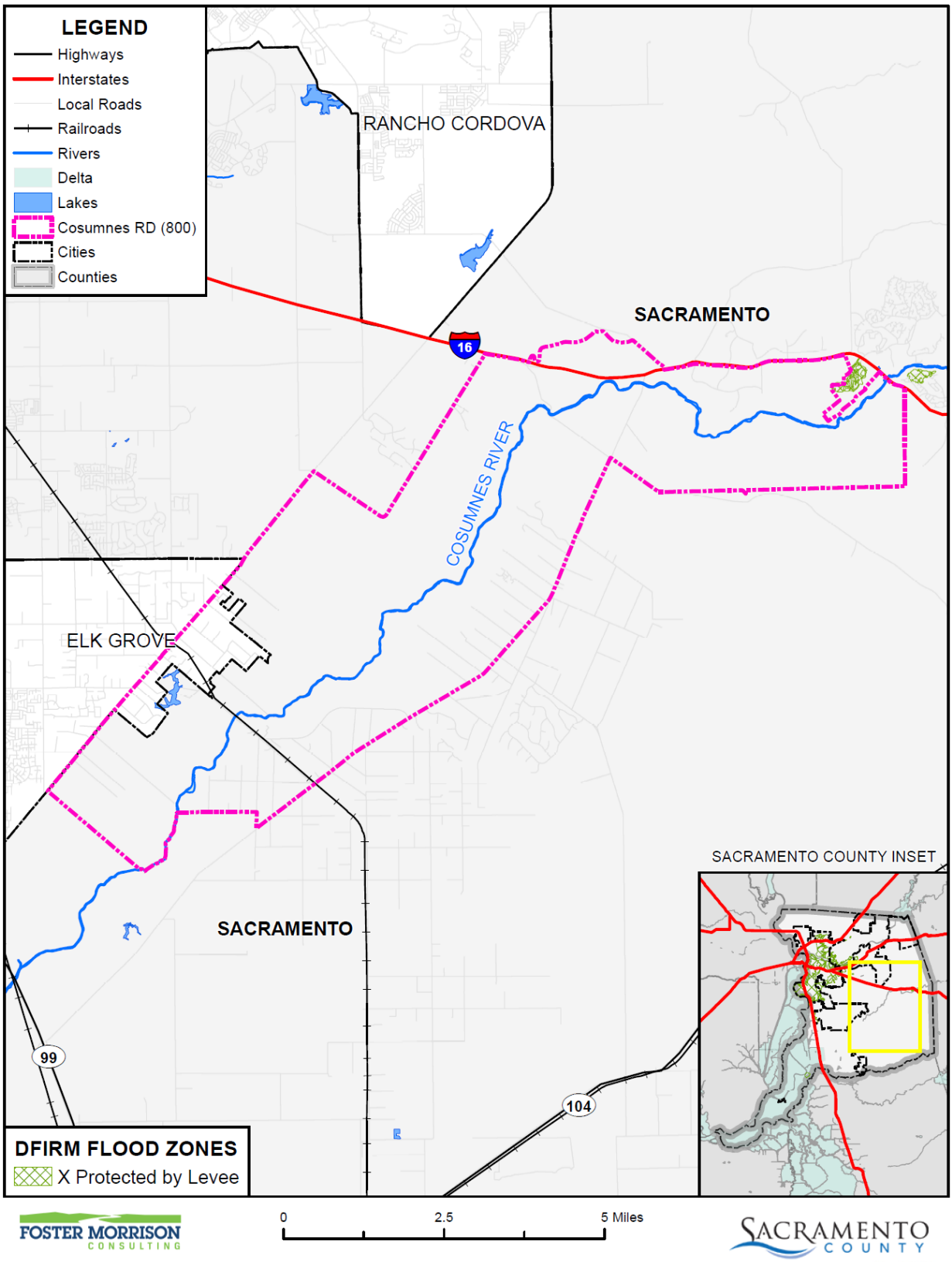
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure K-5.

Figure K-5 RD 800 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Cosumnes Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District noted the following past levee issues:

Levee embankment failure within the current District boundary from the 1997 event resulted in multiple levee failure sites along the Cosumnes River. The resulting damage to agricultural lands was extensive, with the most damage occurring immediately adjacent to the levee breach causing severe erosion to agricultural lands, deposition of sands and debris and the complete destruction of adjacent vineyards and irrigation systems.

In January 2017, RD 800 fought a boil on the Cosumnes River levee near the Wilton Road Bridge. Additionally, the water levels were dangerously high in the Sloughhouse area on the Cosumnes River levee that RD 800 also maintains.

In February 2017, the District was busy fighting multiple problem areas most notably on the Cosumnes River levee north of the Wilton Road Bridge and along Jackson Road where the river overtopped its bank and inundated vineyards and a walnut orchard. In Sloughhouse, RD 800 sandbagged a developing boil that occurred on a private levee which RD 800 maintains that protects the Rancho Murieta Community.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be significant. Facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Potential for severe damage to the Wilton Road crossing over the Cosumnes River would require detouring of extensive daily high volume traffic of Wilton Road. Closure of the road would severely delay public safety agency emergency response. Truck and vehicular traffic impacts would have severe economic impacts to the local economy.

Assets at Risk

District levees are at risk from this hazard.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

The District Planning team noted that 1997 storms caused high flows in the Cosumnes which cause levee failures and flooding.

In 2017, there were a series of three storms that occurred in the District. The storms caused high water and flooding as well as downed trees, localized flooding and the Cosumnes River rose to levels not seen since 1997. More information can be found in the Levee Failure section above.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power outage and failure can be found in the discussion at the beginning of Section K.5.3, as well as in Section 4.3.3 of the Base Plan.

The secondary effects of heavy rain and storms that are of concern to RD 800. Heavy rains can cause flooding, levee failure, and stream bank erosion. Flooding, levee failure, and stream bank erosion can cost RD 800 millions in damages.

Assets at Risk

District levees are at risk from this hazard.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County or District for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

In 2017, there were a series of three storms that occurred in the District. The storms caused high water and flooding as well as downed trees, localized flooding and the Cosumnes River rose to levels not seen since 1997.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power outage and failure can be found at the beginning of Section K.5.3 above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Increased PSPS events
- Occasional building damage, primarily to roofs

Assets at Risk

District levees are at risk from this hazard.

K.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections:

regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

K.6.1. Regulatory Mitigation Capabilities

Table K-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 800.

Table K-7 RD 800 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y	District has a 5 year plan that is being updated in 2021. It is expected to be completed in December. It addresses hazards.
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	N	
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	Encroachment permit regulations
Flood insurance rate maps	N	

Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	Y	Erosion control measures on levee and canal slopes as necessary
Other		
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. Additional funding to support levee maintenance and other activities. The District recently raised assessments so that more funds are available for levee maintenance.		

Source: RD 800

K.6.2. Administrative/Technical Mitigation Capabilities

Table K-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 800.

Table K-8 RD 800's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	N	
Mutual aid agreements	N	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	N	
Community Planner	N	
Civil Engineer	Y	
GIS Coordinator	N	
Other	Y	District Engineer and Engineer are trained on mitigation.
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	N	
Hazard data and information	N	

Grant writing	N
Hazus analysis	N
Other	
How can these capabilities be expanded and improved to reduce risk?	
Additional funding is required for levee maintenance. The District recently raised assessments so that more funds are available for levee maintenance.	

Source: RD 800

K.6.3. Fiscal Mitigation Capabilities

Table K-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table K-9 RD 800's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Storm water utility fee		
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	N	
Community Development Block Grant	Y	
Other federal funding programs	Y	
State funding programs	Y	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Additional funding is needed to expand. The District will look for Cal OES, FEMA, and CA DWR funding opportunities.		

Source: RD 800

K.6.4. Mitigation Education, Outreach, and Partnerships

Table K-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table K-10 RD 800's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	N	
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The District may work with other entities in the future to provide education on how hazards affect RD 800 and the people protected by the District.		

Source: RD 800

K.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

Levee maintenance practices designed to protect District levee system includes annual vegetation management and rodent control. Due to environmental protection limitations, District disaster reduction practices are limited.

Since 2016 the District has done the following:

- Raised assessments to provide more funding for levee maintenance and repairs.
- Improved 3.3 miles of levee access by placing aggregate base rock on the levee crest, access roads and ramps. The base rock allows for patrolling the levee in all weather conditions.
- Obtained NRCS grant funding to repair three of nine erosion sites on the Cosumnes River resulting from the 2017 floods. Construction is scheduled for summer 2021.
- Completed biological and cultural assessment reports and completed the CEQA process for the remaining six erosion sites. The District plans to repair these sites as funding becomes available.
- In 2019 the District identified an additional erosion site at the end of Pecos Road near Rancho Murieta. The District is in the process of performing biological and cultural assessments of the site.

K.7 Mitigation Strategy

K.7.1. Mitigation Goals and Objectives

The RD 800 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

K.7.2. Mitigation Actions

The planning team for the RD 800 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Floods: 1%/0.2% annual chance
- Levee Failure
- Severe Weather: Heavy Rains and Storms
- Severe Weather: Wind and Tornado

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Reclamation District 800 Emergency Levee Repair Project

Hazards Addressed: Climate Change, Levee Failure, Flood, Heavy Rain and Storms, Winds and Tornadoes

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Critical erosion on the waterside of the Cosumnes River levee that suffered severe erosion during the 2017 storms. The erosion at these sites is so severe, levee integrity has been compromised and further erosion could lead to a breach during a major storm event.

Project Description: Reclamation District No. 800 Cosumnes (RD 800), proposes to repair three critical erosion repairs on the waterside of the Cosumnes River levee that suffered severe erosion during the 2017 storms. The erosion at these sites is so severe, levee integrity has been compromised and further erosion could lead to a breach during a major storm event. These sites are named "Fig Road Downstream" "Cosumnes Road Downstream", and "Freeman Road" after the roads that provide access to each site.

Freeman Road consists of approximately 450 linear feet of construction on the waterside levee slope south bank of the river. The waterside slope will be grubbed, stripped and prepared for material placement. Imported embankment fill material will be placed and compacted at a 1.5 to 1 slope to restore the levee to its previous condition. Rock slope protection will be placed on the entirety of the waterside slope to protect the repair from future erosion. A two-foot deep by two-foot wide toe trench will be utilized to stabilize the rock. A layer of geosynthetic fabric will be placed between the embankment and the rock slope protection to provide additional rock stabilization.

Cosumnes Road Downstream consists of approximately 270 linear feet of construction on the waterside levee slope south bank of the river. The waterside slope will be grubbed, stripped and prepared for material placement. Imported embankment fill material will be placed and compacted at a 1.5 to 1 slope to restore the levee to its previous condition. Rock slope protection will be placed on the entirety of the waterside slope to protect the repair from future erosion. A two-foot deep by two-foot wide toe trench will be utilized to stabilize the rock. A layer of geosynthetic fabric will be placed between the embankment and the rock slope protection to provide additional rock stabilization.

At the Fig Road Downstream site, approximately 200 feet of levee crest will be excavated to a depth of approximately five feet. The crest will be replaced and recompacted using the excavated material. Additionally, approximately 450 of waterside levee slope will be grubbed, stripped and prepared for material placement. Imported embankment fill material will be placed and compacted at a 2 to 1 slope to restore the levee to its previous condition. Rock slope protection will be placed on the entirety of the waterside slope to protect the repair from future erosion. A two-foot deep by two-foot wide toe trench will be utilized to stabilize the rock. A layer of geosynthetic fabric will be placed between the embankment and the rock slope protection to provide additional rock stabilization.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: N/A

Responsible Agency/ Department/Partners: Reclamation District 800

Cost Estimate: Approximately $1,000,000

Benefits (Losses Avoided): Reduces the likelihood of levee failure.

Potential Funding: Reclamation District 800 / Natural Resources Conservation Service

Timeline: 1 Year

Project Priority (H, M, L): H

Annex L Reclamation District 1000

L.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 1000 (RD 1000), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 1000, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

L.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table L-1. Additional details on plan participation and District representatives are included in Appendix A.

Table L-1 RD 1000 – Planning Team

Name	Position/Title	How Participated
Kevin King	General Manager	Participated in LHMP update process; reviewed and edited District's information included in LHMP; reviewed and edited District Emergency Action Plan; will participate in regional flood emergency exercise
Gabe Holleman	Operations Manger	Reviewed and edited District's information included in LHMP; reviewed and edited District Emergency Action Plan; will participate in regional flood control emergency exercise
Paul Devereux	Project Manager	Attended meetings. Participated in LHMP update process; drafted District's information included in LHMP; edited District Emergency Action Plan

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table L-2.

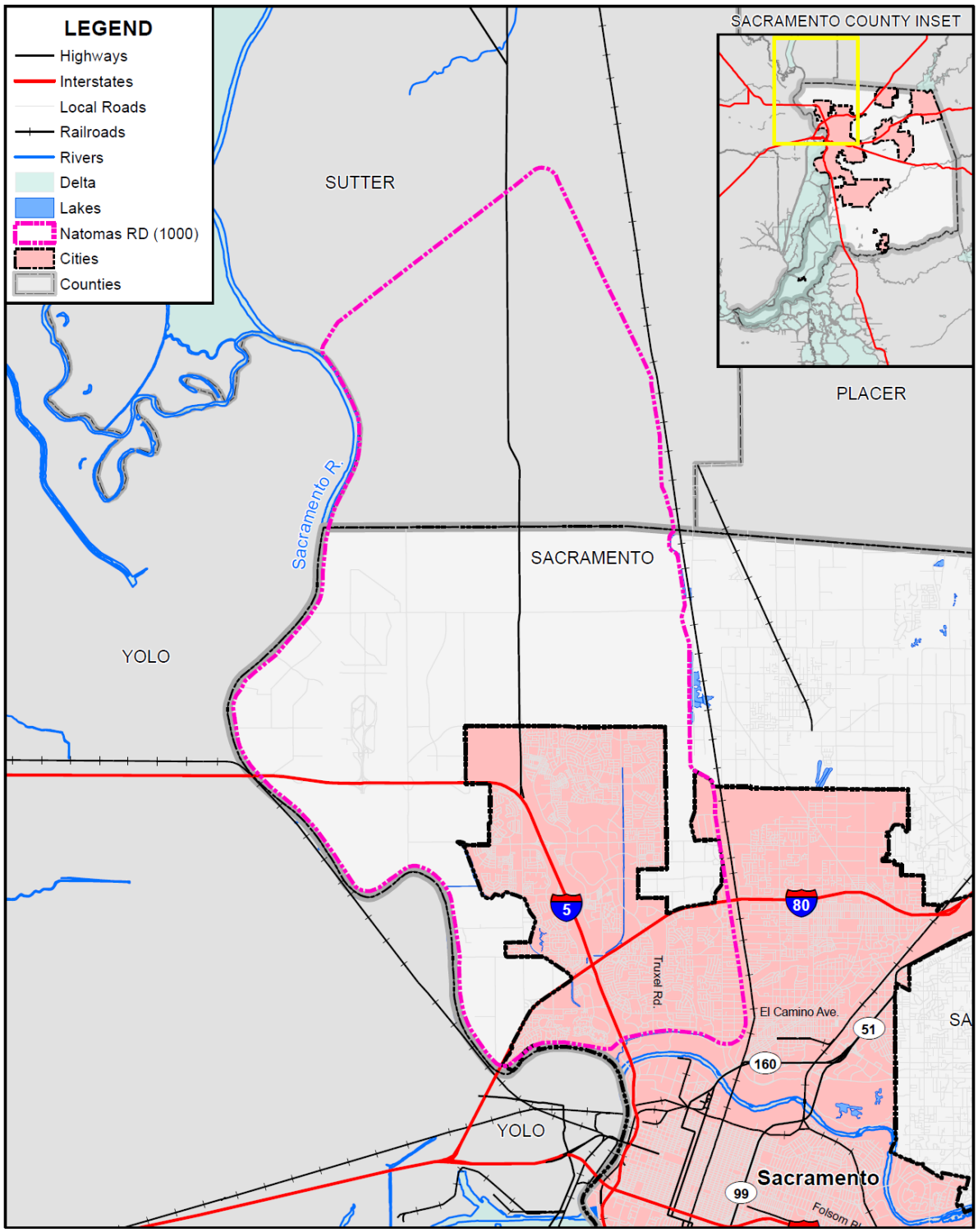
Table L-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Emergency Action Plan	Identifies potential flood risks and District's plan to monitor and respond in an emergency including communications, pre-disaster deployment; flood fight materials storage; emergency response contracts all in compliance with NIMS and SEMS protocols. The District's LHMP Annex was utilized in addressing flood risks.
Capital Improvement Plan	Identifies improvements to District facilities to improve flood safety; assist with monitoring and responding in a flood emergency; and improve system reliability thereby reducing the overall flood risk. Mitigation actions from the 2016 LHMP Annex were included in the CIP which was updated in 2020.
Security Risk Assessment	Identified critical District infrastructure and recommended measures to improve security and ensure District can perform essential functions during an emergency. Key information from the 2016 LHMP Annex were incorporated into this assessment.
Strategic Plan	Identifies District mission to reduce flood risk; preparations for floods and emergency response; outreach to community including information during flood emergency; coordination with other regional agencies including City and County of Sacramento. Key information from the 2016 LHMP Annex were incorporated into this updated Strategic Plan.

L.3 District Profile

The District profile for the RD 1000 is detailed in the following sections. Figure L-1 displays a map and the location of the District within Sacramento County.

Figure L-1 RD 1000



Data Source: Natomas Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

L.3.1. Overview and Background

Reclamation District No. 1000 (RD 1000) has been providing flood protection, drainage and public safety to residents, businesses, schools, and agriculture since it was formed in 1911 as a California special district by the California State legislature (Act). The District's mission is to protect the lives and property in the Natomas basin from flooding and provide drainage for urban and agricultural runoff. RD 1000 maintain 42 miles of levees surrounding Natomas, over 30 miles of large drainage canals and seven pump stations that collect and pump the storm water and agricultural runoff back into the adjacent river system. The District is governed by a seven-member Board of Trustees elected by the property owners within the Natomas basin. The District operates under the direction of the District's General Manager who reports directly to the Board of Trustees. The District's Operations Manager supervises the daily activities of the field crew and reports to the General Manager.

Reclamation District No. 1000 was created by an act of the State Legislature on April 8, 1911 (Act). The purpose was to allow for the reclamation of what was then known as the American Basin for agricultural purposes. Prior to RD 1000, the American Basin historically flooded from the Sacramento and American Rivers overflowing their banks due to winter rains and runoff from the foothills. Much of the land was owned by the Natomas Company of California and with the formation of RD 1000 was reclaimed for agriculture, due to the rich fertile floodplain soil, which dominated the early years in Natomas. The Act gave the District authority and responsibility for flood control and drainage in what has become the Natomas Basin.

Reclamation of Natomas began in 1913 with construction of the perimeter levee system which was completed in 1915 at a cost of approximately $2 million financed by the sale of bonds. Following completion of the levees, an interior drainage system consisting of canals, ditches and drains was constructed to collect both stormwater runoff from precipitation that falls within the leveed area as well as agricultural runoff from irrigated farmland. The original system conveyed all the runoff to a large pumping plant constructed in 1915 at the terminus of Second Bannon Slough (Plant 1A) at the south end of the District. This plant still exists and is used today and it is located directly across the Garden Highway from the District Office. A second pumping plant (Plant 2) was added at Pritchard Lake in 1920 along the Sacramento River north of Elverta Road, and a third plant (Plant 3) was added in 1939 also located on the Sacramento River just north of San Juan Road. Eventually four more pump plants were added at various locations in the District to accommodate more development and relieve pressure on the original plants.

The drainage system stayed in this configuration for a number of years. In the 1950's and 1960's urbanization of the Natomas Basin began, predominantly because of its close proximity to downtown Sacramento and the construction of the interstate highway system. The first area to develop was the Gardenland area in the southern extremity of the basin tucked up against the American River and Natomas East Main Drain Canal. In the 1960's Sacramento Metropolitan Airport (now Sacramento International Airport) was developed. A new pumping plant paid for by the County was constructed to handle the increased runoff from the newly constructed airport. Through the decades more development occurred starting with the South Natomas Community, Metro Air Park (industrial area adjacent to the airport) and North Natomas Community. More development has been approved and/or is in planning for areas within the City of Sacramento, Sacramento County and Sutter County in the north half of Natomas.

The levees around Natomas were designed to handle the historical "flood of record" which was the 1907 and 1909 floods on the Sacramento River. Another large flood event occurred in 1937 which the system safely passed with only minor problems. Again, in 1955 an even larger flood occurred in the California Central Valley around Christmas and the Natomas levees held with some minor sloughing along the Sacramento River near the Sacramento/Sutter County line. Levees upstream on the Sacramento River failed leading to additional improvements to the flood control system by the Army Corps of Engineers including raising the Natomas Cross Canal and Pleasant Grove Creek Canal levees as much as two to three feet within RD 1000 in anticipation of future, even larger flood events. In addition, by 1955 Folsom Dam was operational which provided additional flood storage capacity along the American River improving flood safety on the District's southern flank.

The system remained generally in the same condition as originally constructed until February 1986 when the flood of record occurred along the Sacramento and American Rivers caused by a series of large Pacific storms carrying significant amounts of sub-tropical moisture. These storms coined as the "Pineapple Express" because of its origins near the Hawaiian Islands are now referred to as "atmospheric rivers". The flood levels on the Sacramento River, though not overtopping, caused significant seepage along the Garden Highway levee which nearly resulted in a catastrophic levee failure. Early flood emergency response by the District followed by a major flood fight by the Army Corps of Engineers prevented a levee failure. As a result of the near failure, the levees system surrounding Natomas was de-certified and any further development halted.

A system of repairs was initiated in the early 1990's on both the Sacramento River and Natomas East Main Drain Canal (NEMDC) Work along the Sacramento River was done by the Corps of Engineers (Sacramento Urban Project) to address the levee seepage. Subsequently, the Sacramento Area Flood Control Agency or SAFCA implemented levee raising and other strengthening measures along the NEMDC as part of the North Area Local Project.

As a result of these projects, the levees were "certified" to provide 100 year FEMA level of protection in 1997 and urban development began again with North Natomas in the City of Sacramento, bringing thousands of new residents, businesses and supporting infrastructure. Industrial and commercial development also expanded in the vicinity of the airport to support its growing needs. And the airport itself has undergone and continues to undergo significant expansion to support the growing passenger demands. In each case, the District worked with the appropriate land use agency to ensure the impacts of the development and increased runoff are mitigated and do not overburden the existing drainage system. In most cases, large detention storage basins have been incorporated into new development to temporarily store the increased urban runoff and allow it to be pumped back into the RD 1000 drainage system at a rate similar to the pre-development condition. These detention basins are augmented by improvements to the existing pumping plants increasing their capacity to assist in handling the increased urban runoff.

In January 1997, a flood similar to the 1986 flood in precipitation amount and resultant river levels occurred throughout Norther California including the RD 1000 system. Unlike 1986, the improved RD 1000 levee system passed the flood event with minimal issues justifying the levee infrastructure investment. However, a number of other levees in Northern California failed during the flood event, which was later attributed to levee underseepage which had not previously been understood or considered to be a significant risk. Following the 1997 flood event, the RD 1000 levees were analyzed and found to have similar foundation

conditions to those levees that had failed indicating its levees were at risk of failure due to underseepage. Following the analysis which demonstrated the levees did not meet the underseepage factor of safety criteria, the Natomas levee system was again de-certified in 2003 shutting down further urbanization

Efforts to address this newly defined levee risk and the potential for further urbanization of the Natomas basin are described later in this annex.

L.4 Hazard Identification

RD 1000 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table L-3).

Table L-3 RD 1000—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure					Medium
Drought & Water Shortage					High
Earthquake					Low
Earthquake Liquefaction					Low
Floods: 1%/0.2% annual chance	Extensive	Unlikely	Catastrophic	Medium	Medium
Floods: Localized Stormwater	Limited	Occasional	Limited	Low	Medium
Landslides, Mudslides, and Debris Flow					Medium
Levee Failure	Extensive	Unlikely	Catastrophic	High	Medium
Pandemic					Medium
Severe Weather: Extreme Cold and Freeze					Medium
Severe Weather: Extreme Heat					High
Severe Weather: Heavy Rains and Storms					Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Medium	Low
Subsidence					Medium
Volcano					Low
Wildfire					High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

L.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

L.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section L.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table L-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

L.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 1000's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table L-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 1000's physical assets, valued at over $2.1 billion, consist of the buildings and infrastructure to support the District's operations.

Table L-4 RD 1000 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
RD 1000 Plant 1A and 1B	Essential	$25,000,000	Flood
RD 1000 Plant 2	Essential	$5,000,000	Flood
RD 1000 Plant 3	Essential	$10,000,000	Flood
RD 1000 Plant 4	Essential	$7,000,000	Flood
RD 1000 Plant 5	Essential	$4,000,000	Flood
RD 1000 Plant 6	Essential	$7,000,000	Flood
RD 1000 Plant 8	Essential	$15,000,000	Flood
District Drains/Canals	Essential	$50,000,000*	Flood
RD 1000 Federal Levee system	Essential	$2,000,000,000*	Flood
RD 1000 Corporation Yard	Essential	$10,000,000**	Flood/Levee Failure
RD 1000 Office	Essential	$500,000	Flood/Levee Failure
Pleasant Grove Area Levees	Essential	$2,000,000	Flood/Levee Failure
Total		**$2,135,500,000**	

Source: RD 1000

* Estimated costs to repair damaged canals/drains after major flood and levee failure floods Natomas Basin—not the full replacement value

**Cost includes RD 1000 equipment stored at Corp Yard

In addition to assets owned by RD 1000, the District noted the following assets that are protected by RD 1000 levees, but are owned by others:

- Sacramento International Airport
- City of Sacramento River Pump Stations (3) and Interior Drainage Pump Stations
- Schools (2 high schools, middle and elementary schools)
- Significant Commercial and Industrial Developments
- Data and Information Storage Centers
- Fire Stations
- Police Stations
- Senior Housing
- Interstate 5 and 80/ Highway 99
- Day Care Centers
- Hazardous Material Sites

Natural Resources

RD 1000 has a variety of natural resources of value to the District and to the public. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Within the District, the Natomas Basin Conservancy operates and maintains a number of wildlife preserve areas under the Natomas Basin Habitat Conservation Plan. The purpose of the preserves is to provide

habitat for endangered and other species to mitigate for the impact of development within the Sutter County and City of Sacramento jurisdiction of the Natomas Basin.

Historic and Cultural Resources

RD 1000 has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

There are a number of undisclosed Native American culturally sensitive sites which are generally buried below the ground and therefore would not be directly impacted by a flood event. However, there could be impacts to these sites during the infrastructure repair and recovery following a major flood especially one resulting in a levee failure.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan. The following is specific to the Natomas Basin portion of Sacramento County.

As described above, urban development was halted in the District when the levees were decertified in 2003. A comprehensive project for the District's perimeter levee system was studied and developed by SAFCA, State of California and the Army Corps of Engineers. The proposed levee improvements will provide 200-year flood protection to the Natomas Basin, consistent with the newly adopted State flood control standards for urban areas (Urban Level of Protection or ULOP Criteria).

Work was initiated by SAFCA and the State of California in 2006 to mitigate the flood risk. With the construction that was completed (approximately 50% of the levee improvements) and the Federal authorization of the Natomas Levee Project in 2014, the area was remapped into an A99 FEMA flood plain designation recognizing the progress made towards eventually removing Natomas from a FEMA designated Special Flood Hazard Area. Under the A99 floodplain designation, development is again allowed within the Natomas Basin.

Development since 2016

With the lifting of the building moratorium, a number of projects have been approved since 2016 and large scale residential, commercial and industrial projects are under construction in the Natomas Basin even though the levee improvements have not been completed. As such, development since 2016 has likely increased the vulnerability to those in the District. The District facilities are built with these issues in mind, so it has likely not increased the vulnerability to the District itself. It should be noted, the previous work on the perimeter levee system by SAFCA from 2007 to 2017 addressed the highest risk areas to the existing levee system. Refer to the City and County for specific projects approved since 2016.

Since 2016, RD 1000 has not added any significant facilities/infrastructure except those being constructed by the Corps of Engineers under their Natomas Levee Project described below in Section C.6.5. A few minor improvements including Supervisory Control and Data Acquisition (SCADA) improvements at

several pumping plants to allow remote monitoring of water levels and pump operations; a small building addition at the Corp Yard office and purchase of new equipment have been done since 2016. The cost of these improvements and the equipment are included in the replacement cost estimates in Table C-4. All these improvements are within identifiable hazard areas protected by levees.

Future Development

RD 1000 has no land use authority. However, a number of major development projects have initiated the entitlement process and new development is expected within the RD 1000 jurisdiction in the City of Sacramento, County of Sacramento and Sutter County over the next 30 years.

More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

Future Improvements to RD 1000 Facilities

Future improvements to RD 1000 infrastructure and facilities are primarily tied to the Natomas Levee Project construction by the Corps of Engineers described below in Section C.6.5. The Corps project includes a new Pumping Plant No. 4 on the Natomas Cross Canal; a new Pumping Plant No. 5 on the Sacramento River north of Elkhorn Blvd; major improvements to Pumping Plant Nos 1A near the District office and at Plant No. 3 along the Sacramento River north of Power Line Road; and finally some minor alterations to the outfall conduits at Pumping Plant Nos. 6 and 8.

In addition to the Natomas Levee Project; RD 1000 recently updated its Capital Improvement Program and is currently assessing its long term financing to implement the identified capital improvements. If funding can be secured, it is anticipated capital improvements will be made to the existing RD 1000 infrastructure including major pumping plant improvements, asset management planning, improved SCADA monitoring, and emergency backup generator capability.

These improvements will address the hazard risks identified including mitigating localized flood impacts, security issues, reduced impacts from 1%/0.5% floods and reduce levee failure risks.

L.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table L-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on

past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

RD 1000 is vulnerable to power outages/power failures which occur during the flood season resulting in a loss of power to our critical facilities including the pump stations. These pump stations remove the water collected in the drainage system from urban, agricultural and airport property within Natomas. The levee system prevents drainage by gravity requiring all stormwater runoff to be discharged out of the basin by pumps. When the pumps cannot operate due to power outage, the levels in the drains and canals rise and eventually will escape the system at the low points causing localized flooding.

Generally, the risk due to power outages are low because of the interconnectivity of the drainage system allowing water to be pumped out from multiple plants; also, the plants are served by two electrical suppliers, SMUD in Sacramento County and PG&E in Sutter County. In addition to the risk being low, the vulnerability is also low as the damages are typically limited to flooded fallow agricultural fields or streets and other low points in the urban areas and not damaging homes or other structures provided the outage is of short duration. However, should the duration of the outage be for an extended period and occur during

a major storm, the risk will increase and could affect potential evacuation routes if Natomas must be evacuated due to levee safety concerns.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

RD 1000 has lost power at one or more of its pumping plans almost on an annual basis. The likelihood of losing power at all plants is small; however there have been 2 instances in the last 20 years where this event did occur albeit for a short time. In most cases, power is restored to one or more pump plants within a few hours or less. However, there have been some locations within PG&E service area where power was lost for several weeks due to the remote locations of the plants in Sutter County.

PSPS occur during the wildfire season and not the flood season and has been limited to PG&E service areas; therefore RD 1000 is generally unaffected by them. RD 1000 does limited pumping during the summer when rice fields are drained. We are not aware of any PSPS affecting RD 1000 and likely will not impact us in the future.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing. RD 1000 would be affected by climate change resulting in more precipitation and less snow resulting in increased river levels during large storm events and more precipitation which must be pumped out of the Natomas Basin.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the District noted that climate change is of concern, no specific impacts of climate change could be recalled. The District and HMPC members did, however, note that in Sacramento County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability to and Impacts from Climate Change

The 2014 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

Currently the District is monitoring climate change impacts, but has not implemented any modifications to our operations. The District plan based on the long range climate forecast predictions and operate based on individual storm forecasts.

Assets at Risk

The District noted that its facilities could be at risk from climate change.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred within the 1% annual chance floodplains and in other localized areas.

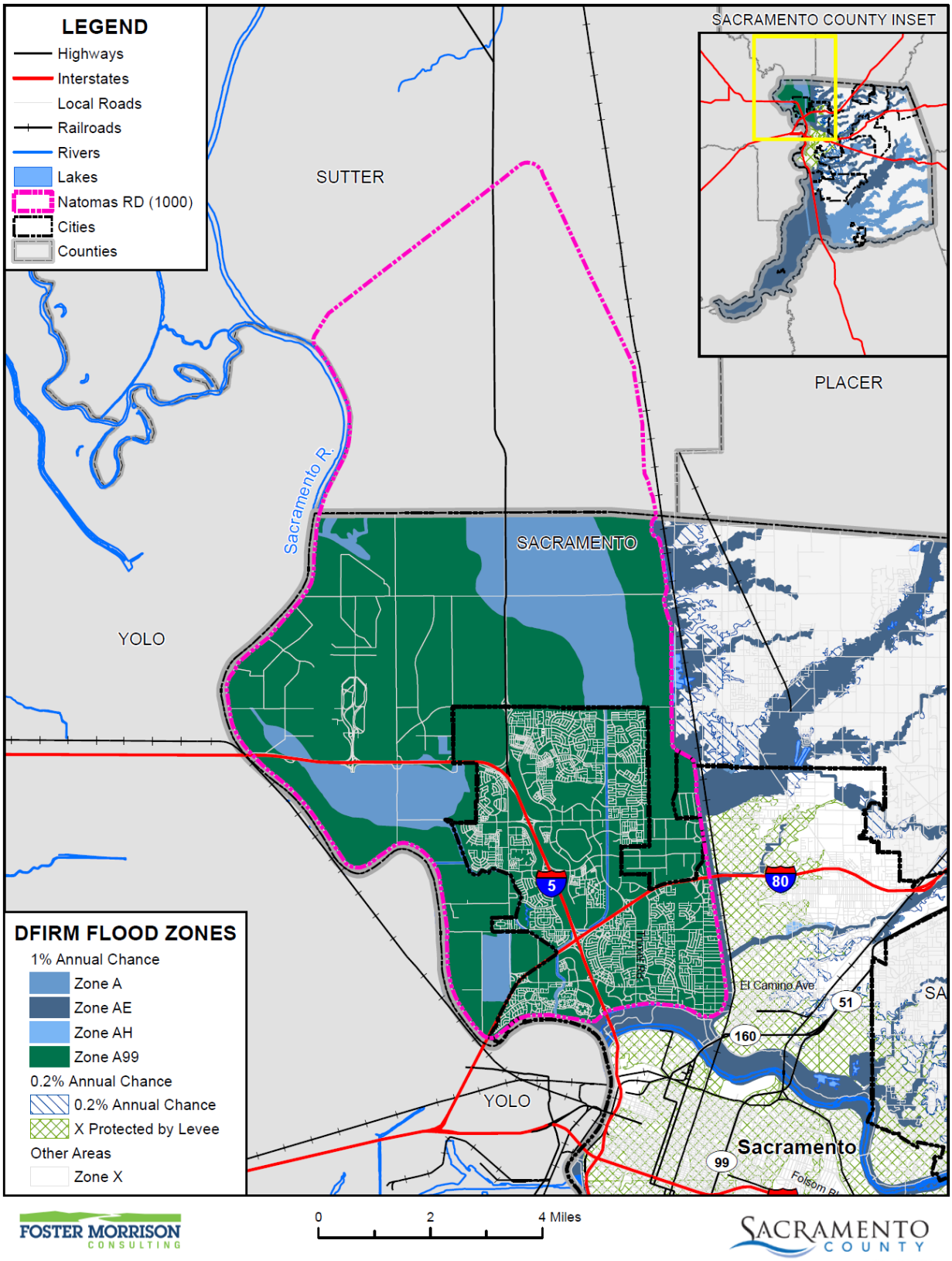
As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the RD 1000 have been subject to historical flooding.

The 1% and 0.5% annual chance of floods can impact the perimeter levee system, Pleasant Grove area levees, as well as the interior drainage system operated by RD 1000 that are not within the special flood hazard areas. These large events will cause the District's facilities to operate at or above their design capacity and in many instances will result in damages to our system, while not resulting in failure. These impacts may also occur at more frequent flood events including the 10% annual chance event or lower.

Location and Extent

The RD 1000 has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure L-2. However, the risk extends to the entire RD 1000 boundary and all our facilities as described above in the impact description.

Figure L-2 RD 1000 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 04/16/2016, Natomas Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table L-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table L-5 RD 1000 – DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	X
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District. However, as noted above the District has impacts of these flood events outside the mapped flood hazard areas, and flood events on the perimeter levee system can extend for several weeks.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table L-6. These events also did affect the District and in many cases RD 1000 filed disaster assistance claims with both FEMA and California OES due to impacts and damages sustained. This includes the three disaster declarations from the 2017 flood events. The District filed claims and has received reimbursements for our damages due to these events. Attached are the PA Worksheets documenting the damages from the 2017 disaster declarations.

Table L-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Along the perimeter Federal levee system and the Pleasant Grove area levees, these large flood events can result in the following potential impacts:

- erosion of both the landside and waterside levee slopes and waterside berms.
- Seepage both through levee and under levee causing landside boils requiring emergency actions including building sandbag rings, filling landside canals, installing sheetpiles, removing pumping plants
- Downed trees blocking access and causing large root ball voids in the levee
- Damages to levee maintenance roads due to excessive patrols to monitor the levees during high water events
- Damages to pump plant outfall structures

Within the interior drainage system these large flood events can result in the following impacts:

- Erosion of the canal, drain and ditch banks
- Sedimentation of the canals, drains and ditches blocking flows
- Damages to drainage culverts, headwalls, gate structures, access structures, or other drainage facilities
- Damages to pumping plants including trash rakes, pumps, and electrical equipment

Assets at Risk

As noted above, the assets at risk for these large flood events including the perimeter Federal levee system, Pleasant Grove area levees, District's seven pump stations, and the interior drainage system including the canals, drains and ditches. Not all these facilities will likely be damaged during the 1% or 0.5% (or more frequent) flood events. More significant damages to all the District facilities would only occur if the flood resulted in a levee failure which is described in more detail below under the Levee Failure Hazard.

Generally, all the RD 1000 facilities are at risk from this flood hazard depending on the specific nature of the flood event but the damages would likely be limited to specific features at specific locations.

Levee Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a river, stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water which increases the erosion potential. Levees can be natural or man-made. In the case of RD 1000, all the levees are man-made.

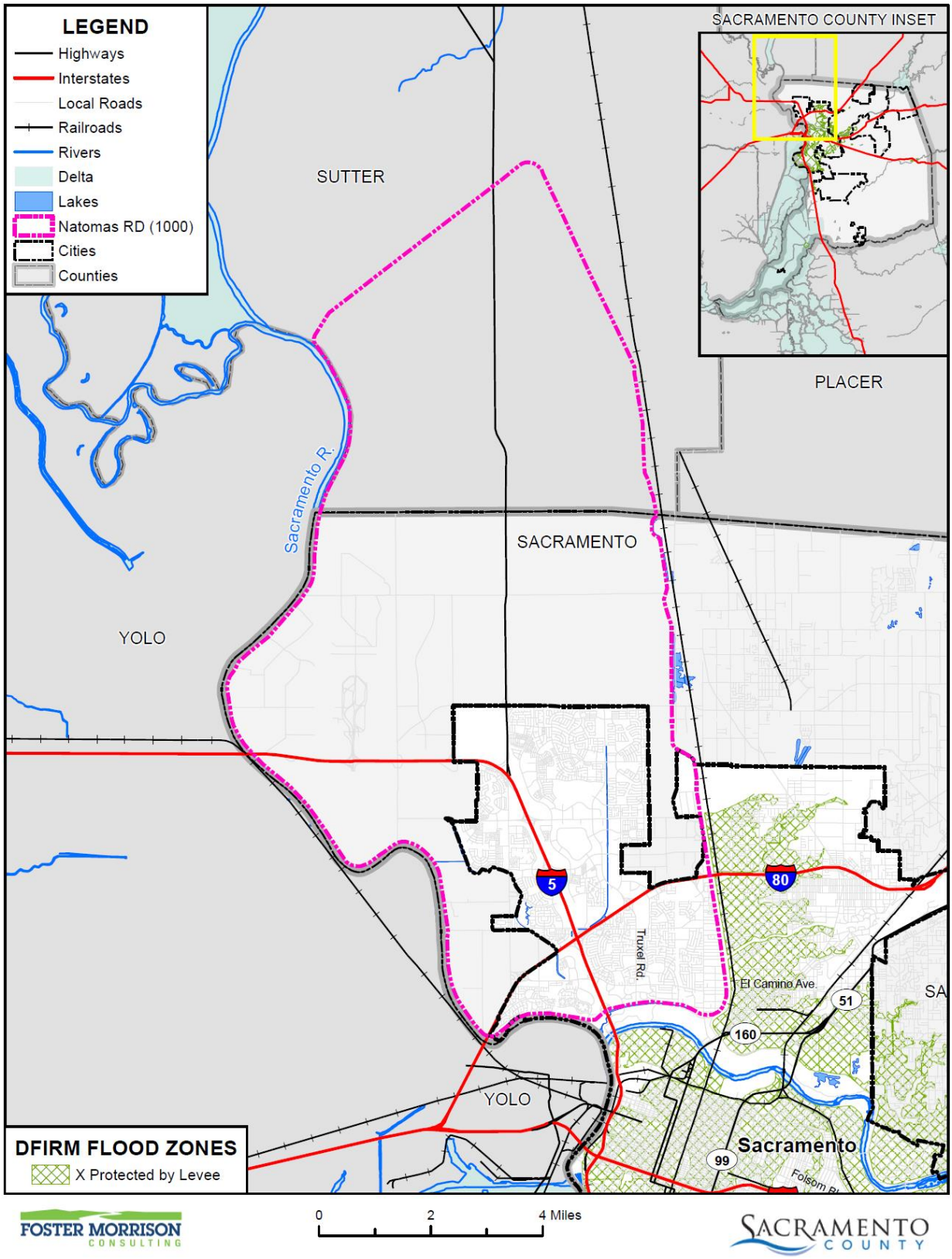
Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events that exceed the design capacity or upstream dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping; levee slope stability issues, seepage through the levee due to highly permeable material or seepage paths caused by burrowing rodents, vegetation roots, pipe penetrations; seepage under the levee foundation moving materials and creating voids in the foundation eventually leading to levee collapse and overtopping; erosion of the waterside slope or berm, and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. It can occur at any location along the levee system. Expected flood depths from a levee failure within the Natomas Basin t vary based

on existing ground elevation and location of the levee failure and will vary from less than 5 feet to over 20 feet. Should a levee failure occur it is anticipated 90% of the District will be flooded as closing a levee is nearly impossible during flood stages. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The City of Sacramento have designated rescue zones and evacuation zones based on the distance from the levee failure. The duration of levee failure risk times can be days to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees including RD 1000. Levees in the District are shown on Figure L-3.

Figure L-3 RD 1000 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Natomas Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Past Occurrences

There have been no federal or state disaster declarations from levee failure in RD 1000. The District Planning Team noted the following past occurrences of near levee failures as detailed above the Flood 1%/0.2% Annual Chance section above: 1955, 1986, 1997, and 2006. It should be noted the levees west of the Sacramento Airport along the Sacramento River would have failed in 1986 had not the District and eventually the Corps of Engineers conducted an emergency flood fight to stabilize the levee. Likewise the Sacramento River north of Elverta Road was in jeopardy of failing and RD 1000 deployed emergency measures to again stabilize the levee. While catastrophic levee failures were avoided during these record flood events, additional levee improvements continued to accommodate future flood conditions in the Natomas basin. The 2017 emergency declarations included the Pleasant Grove Area levees that were in danger of overtopping and failing. The District conducted a flood fight and has subsequently repaired the damages with FEMA disaster assistance. The area protected is primarily agricultural property with a few ag-residences.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall which combined with flood releases from upstream reservoirs raise the river levels to flood stage. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be significant. Facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Should a perimeter levee fail in RD 1000 along the Sacramento River, American River, Pleasant Grove Creek Canal, or Natomas Cross Canal, the entire Natomas Basin would likely be inundated due to volume of water within those rivers and canals. Only a small segment of the Natomas East Main Drain Canal levee south of Sankey Road might limit the basin flooding due to the smaller volume of water available to breach the levee.

Vandalism

If a potential levee failure can be identified in advance, an evacuation could be done to limit potential loss of life, though it would not diminish the resulting property damage. A catastrophic levee failure with not warning would likely result in loss of life in Natomas. This is why a robust levee patrol and monitoring system is essential to identify levee problems early and allow for emergency response and evacuations.

District facilities, in particular the pump stations are targets for security breaches and vandalism. The electrical equipment and copper wiring are a target for thieves and vandals. If damaged or stolen, the pumping plant could be inoperable until repairs can be made. If this occurs during flood season and prior

to a major storm event, the plant could be down for an extended period resulting in increased flood risks such as localized flooding as previously described.

Recently, a new security and vandalism hazard has emerged in the form of homeless encampments on the levees and within the floodway. In some instances, the levee has been damaged or degraded to accommodate tents and other living quarters. In addition, displaced persons move up the levees as flood waters rise blocking access for levee patrols and potentially delaying critical flood emergency responses to insure no people are at risk while the large equipment deploys flood fight materials such as large rocks.

The security issues related to the pumping plants can occur at any of the seven RD 1000 plants. The security issues related to homeless and displaced persons is primarily within the urban areas of the District and are concentrated on the American River on the southern perimeter and Natomas East Main Drain Canal along the southeastern perimeter.

Prior to installation of the high security fencing at Plant 8, the District had several security breaches resulting in vandalism and wire theft. Because of the location of the most recent wire theft, several pumps were inoperable for an extended period before the new wires could be placed. Since the fencing was replaced, there have been security breaches but no major vandalism or wire theft.

Pumping Plant No. 1 was impacted by vandalism at the adjacent SMUD substation serving the plant resulting in the loss of a transformer. The transformer was not a standard one used by SMUD and had to be special ordered resulting in the plant being inoperable for an extended period.

There have been a number of other acts of security breaches and vandalism at District facilities in the past including the Corp Yard and District office resulting in tool and equipment theft and other operational impacts.

Since 2016, the homeless encampments have escalated along with the damages to the levees. In 2019, a large excavation was made in the American River levee segment requiring the District to request assistance from City law enforcement to remove the encampment so levee repairs could be made prior to flood season. These excavations in the levee are concealed from levee patrollers by tents, furniture and other temporary living facilities

As noted, security breaches and vandalism at any of the RD 1000 pump stations could result in loss of use of the facility for an extended period of time until repairs can be made. If the breach occurs prior to a large storm event, there could be localized flooding. While not causing extensive damage, the localized flooding could impact potential evacuation routes if it coincides with a levee failure or other emergency requiring evacuations.

Within the levee system, damages caused by homeless/displaced persons could impact levee stability depending on the extent of the damage and the fact it is not visible to the maintenance personnel to mitigate prior to a flood event. Of equal concern is the impact of the floodway inhabitants on the levee patrol and emergency operations. During high water, floodway inhabitants move to the high ground along the adjacent levees, oftentimes blocking the patrol roads, obscuring levee conditions, slowing the patrol efforts or delaying flood fight activities. Levee patrols are critical during high water to monitor the levee system for

seepage, erosion, or other signs of levee distress. It is critical that emergency measures be implemented quickly to ensure minor problems do not escalate and lead to critical levee problems and/or levee failure.

Assets at Risk

The District has seven pump stations in the interior basin used to pump the stormwater and agricultural runoff from the basin into the adjacent riverine system. A catastrophic levee failure could eventually damage all eight of the pump stations and require their reconstruction. Table L-4 shows the estimated replacement cost for each of the pump stations. In addition, the District has a corporation yard and a main office in Natomas. The main office is located on top of the existing Sacramento River levee and would likely not be physically damaged by a catastrophic flood event though it would not be functional due to loss of utilities including power as a result of the flood. The corporation yard would be damaged due to a flood event and could result in a loss of the District's equipment fleet unless it can be relocated to high ground before flood waters affect the corporation yard. This would be dependent on the location of a levee breach in relation to the yard. In addition to RD 1000 assets, the Natomas Basin includes significant public and private development and infrastructure including schools, churches, government buildings, major interstate highways, commercial, industrial and single family residences. In addition, Sacramento International Airport is also located within Natomas and their estimates are that it could be shut down for several months to a year or more to repair damages and make the airport functional again. Closure of the airport along with the infrastructure noted above would have a significant impact on the economy of the Sacramento region.

With the levee improvements that have been completed to date and the anticipated improvements described below about to be completed by the Corps of Engineers over the next 5s year; the risk of a levee failure will be significantly reduced and not likely to occur. However, as noted previously, there always will be a levee failure risk due to unknowns and future potentially large flood events due to climate change or other climatological conditions.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power outage and failure can be found at the beginning of Section L.5.3 above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Increased PSPS events
- Occasional building damage, primarily to roofs

Assets at Risk

In the District, during periods of high water, the levees can be impacted by high winds causing erosion to the water side of the levee.

L.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

L.6.1. Regulatory Mitigation Capabilities

Table L-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 1000.

Table L-7 RD 1000 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2015	District adopted a 2015-2020 Strategic Plan which identifies hazard mitigation needs and opportunities
Capital Improvements Plan	Y 2020	Yes Plan was updated in 2020 and includes hazard mitigation projects
Economic Development Plan	Y 2021	District adopted Comprehensive Financial Plan identifying future funding needs and funding sources for O&M and Capital Improvement. Plan includes mitigation actions
Local Emergency Operations Plan	Y 2017	Yes Identifies Flood Hazards and operational response
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y 2018	Asset Management Plan
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	NNA	Version/Year:

Building Code Effectiveness Grading Schedule (BCEGS) Score	NNA	Score:
Fire department ISO rating:	NA	Rating:
Site plan review requirements	Y	Proposed projects which impact levees or drainage facilities require permits or approvals from RD 1000t and include plan review and sign off. Encroachments on levees or within flood ways require State Encroachment Permit under Title 23 of the CA Water Code. Code is adequate to protect flood control infrastructure
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	NNA	Refer to City or County
Subdivision ordinance	NNA	Refer to City or County
Floodplain ordinance	NNA	Refer to City or County
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	Title 23 California Water Code for encroachment permits on levees and floodways
Flood insurance rate maps	N	Refer to City and County
Elevation Certificates	N	Refer to City and County
Acquisition of land for open space and public recreation uses	Y	District works with City and County for open space and public recreation opportunities within drainage and flood control corridors; requests land use plans provide appropriate setbacks from development for emergency flood operations and allow for future levee improvements due to climate change or other considerations.
Erosion or sediment control program	Y	Erosion control measures on levee and canal slopes as necessary; District incorporates SWPP measures on its maintenance and capital projects.
Other	Y	District has adopted a Development Impact Fee
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. District can partner with local land use agencies during development reviews to ensure adequate areas are available for operations and maintenance and future improvements to reduce flood risk hazard; could be combined with open space/recreation needs and would address potential climate change impacts. District could work with local land use agencies to incorporate levee safety zones as part of their zoning or general plans to provide buffers for O&M and future flood risk reduction improvements		

Source: RD 1000

L.6.2. Administrative/Technical Mitigation Capabilities

Table L-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 1000.

Table L-8 RD 1000's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	District's O&M activities directly reduce flood risks as described above including vegetation management; levee maintenance; pump station operations; and 24-hour monitoring during flood events. District created Operations Manager position in 2020 to better manage its operations and maintenance activities including development of a comprehensive annual maintenance, asset management plan all to improve overall operations and reduce the flood risk hazard
Mutual aid agreements	Y	District has mutual aid agreements with City and County of Sacramento. In addition it operates under the SEMS/NIMS emergency operations system to request assistance from the Operational Area coordinator at Sacramento County and the State and, if necessary, from the federal government through the Army Corps of Engineers during a flood emergency.
Other	Y	District Board of Trustees develops policies for the District and approves plans, including hazard mitigation activities. General Manager implements policies and plans adopted by the Board.
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	NA	
Floodplain Administrator	NA	
Emergency Manager	Y	RD 1000 District Manager and Operations Manager—Trained in FEMA/OES SEMS/NIMS. Manager coordinates with City, County, and State staff as necessary
Community Planner	N	
Civil Engineer	Y	RD 1000 Project Manager/Consultant
GIS Coordinator	Y	RD 1000 General Manager and Operations Manager District has initiated a GIS data base of facilities; looking to develop and implement a more robust GIS system in next 5 years to include right of way, O&M activities, encroachment permits, utility crossings, and identified hazards or past performance issues.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	RD 1000 website provides the public with general flood related information including District O&M or Capital Improvement activities as well as what to do in an emergency. It provides links to other websites for more detailed information. During an emergency the District refers the public to the City and County for information including evacuation notices and directions.

Hazard data and information	Y	RD 1000 anticipates implementing a more robust GIS system to include specific hazard data and information including past performance issues and locations of levee penetrations or other utility locations to monitor during a flood. Also, the SCADA system allows for real time information on pump operations and canal levels for emergency managers.
Grant writing	Y	RD 1000 consultants have grant writing and management capabilities; District may look to retain services of a grant writer if funding for flood risk reduction become available
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Continued training in emergency management will benefit staff and improvement emergency response and coordination with other agencies. Developing a GIS data base will improve real time information and emergency response by identifying hazard areas or locations with past performance problems. A more robust SCADA system will allow for more detailed information on real time canal levels and pump operations to facilitate emergency response and alerts to other local agencies such as the City and County.		

Source: RD 1000

L.6.3. Fiscal Mitigation Capabilities

Table L-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table L-9 RD 1000's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	District currently using Capital Reserves to fund projects; recently adopted Financial Manage Plan looking at alternative funding options for CIP which includes hazard mitigation projects and improved emergency operations.
Authority to levy taxes for specific purposes	Y	Proposed increases in annual assessments must comply with Proposition 218 which requires a public vote. Some funds for ongoing O&M have been included in Capital Assessment District funding for Natomas Levee project.
Fees for water, sewer, gas, or electric services	NA	
Impact fees for new development	Y	District requires impact fee and mitigation for new development
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	District has authority but currently has no GO Bonds outstanding
Incur debt through private activities	N	

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Community Development Block Grant	NNA	
Other federal funding programs	Y	Emergency funding through Corps of Engineer's PL 84-99 authority; FEMA disaster assistance funding and grants for declared emergency events; federal appropriations for flood mitigation projects through the Army Corps of Engineers Currently being used for Natomas Levee Project; could be used for future identified federal flood risk reduction projects in Natomas. Bureau of Reclamation water efficiency grant funding was used to implement phase 1 SCADA improvements to monitor water levels and pump operations to improve flood operations and notify of power outages
State funding programs	Y	Fund were received from Department of Water Resource flood maintenance grant program past 3 years used to purchase equipment and implement flood risk reduction projects. Funds may be available in future if State legislature appropriates funding. Other future State sponsored grant programs. Cost sharing on federal flood risk reduction projects currently being used for Natomas Levee Project; could also be used for future flood risk reduction projects in Natomas
Other		
How can these capabilities be expanded and improved to reduce risk?		
The District will need to seek an increase in its annual assessment to cover both O&M and capital improvement costs in the next five years. With a voter approved increase, capital improvements including hazard mitigation projects can be implemented as well as maintaining a robust O&M plan for the levees and flood patrols and emergency response capabilities. RD 1000 will need to coordinate with SAFCA and the State on federal Bank Protection projects to address erosion on the Sacramento River levee.		

Source: RD 1000

L.6.4. Mitigation Education, Outreach, and Partnerships

Table L-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table L-10 RD 1000's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.		
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	District has a community outreach program which includes annual meetings with community and neighborhood groups providing educational material on our public safety role and mission. District has a proactive website, Facebook page and Twitter account that we use to provide information to the public both generally and during an emergency.
Natural disaster or safety related school programs		District has reached out to school district to partner on a flood safety program—hope to achieve in near future.
StormReady certification	NA	
Firewise Communities certification	NA	
Public-private partnership initiatives addressing disaster-related issues		
Other	Y	District has received the Certificate of Transparency from California Special District's Association for the past five years.
How can these capabilities be expanded and improved to reduce risk?		
Educating the public on our District's public safety role and mission will increase the awareness of flood risks in Natomas, the importance of our work, and the need to stay informed during an emergency. District could improve its outreach with a public relations consultant to assist with messaging and reaching vulnerable populations. Public education will assist in securing funding for future work and improved public safety.		

Source: RD 1000

L.6.5. Other Mitigation Efforts

Levee Failure and 1%/0.2% chance flood event

As previously described, efforts are currently underway to address both these potential risks with the goal of providing Natomas at least 200 year level of flood protection (a 0.5% risk of flooding in any given year) and looking for opportunities to improve the system even beyond this level; particularly as urbanization of the basin continues. RD 1000 is collaborating with the Corps of Engineers, State Central Valley Flood Protection Board and Sacramento Area Flood Control Agency on these improvements. The work is being done on the 42 mile perimeter federal levee system protecting Natomas and includes new adjacent levees, expanded levees, seepage cutoff walls, seepage berms, pumping plant modifications, retaining walls, landside patrol/maintenance access roads, utility relocations and other improvements.

Work on the project commenced in 2006 by SAFCA which completed approximately 50% of the levee work shown on the attached map in blue. The remaining work, show in red, is being done by the Corps of Engineers based on the 2014 Congressional authorization. Following is the status of the remaining work by Reach.

- Reach A—Contract to be awarded in 2021 with construction commencing in 2022 for three years
- Reach B—Currently under construction expected to be completed by 2023.
- Reach C—All work was completed by SAFCA
- Reach D—Levee work completed by SAFCA; minor levee work remaining was completed by the Corps in 2020; replacement of Pumping Plant 4 under construction to be completed by 2022
- Reach E—Under design with construction scheduled for 2023 and 2024
- Reaches F and G—Under design as a single project with construction scheduled for 2024 and 2025
- Reach H—Levee work under construction to be completed in 2021
- Reach I—Levee work was completed in 2019; remaining work includes levee slope flattening and construction of a patrol/maintenance road at the landside toe to be constructed in 2022 or 2023

The District's goal is to complete all the work by 2025.

Other previous Flood Hazard Mitigation Projects

- Implementation of the initial phase of a SCADA system to monitor canal levels and pump station operations alerting field staff of any power outages or flow restrictions.
- Bank erosion protection projects implemented with the Corps of Engineers and State CVFPB to address identified high risk areas for erosion potential which could impact levee stability

Operational Flood Mitigation

RD 1000 conducts the following operations to mitigate flood hazards

- Annual pre-flood season levee inspections to identify deficiencies or maintenance needs prior to the flood season
- Annual pre-flood season inspection and testing of pumping plants to identify deficiencies or maintenance needs.
- During high water events, RD 1000 field staff monitors the levees and pump stations on a 24/7 basis looking for seepage, boils, erosion or other signs of levee distress. In addition, crews monitor the pump station operations and remove debris from the trash racks to maintain flows.
- Participate in flood exercises with the City and County when conducted
- Field staff participate in annual flood fight training and exercises conducted by California Department of Water Resources
- Maintain an inventory of flood fight materials including large rock, sandbags, aggregate base material, sand, tools and equipment
- Resurface and/or replenish AB on levee patrol roads prior to flood season.
- Treat vegetation in canals and drains prior to flood season to improve flows.

Power Outage/Power Failure Hazard Mitigation

RD 1000 has one backup generator installed at its Plant 1A and Plant 1B location across from the District office at the southern end of the District. The generator is diesel powered and capable of operating all six

pumps at 1B and a portion of Plant 1A pumps but must be re-fueled several times a day. Several other plants are equipped for portable generators to be connected, but the District currently does not possess any.

Security Hazard Mitigation

RD 1000 has replaced existing fencing at Plant 8 and Plant 1 with improved security fencing to reduce the risk of vandalism or theft at the pumping plants. In addition, new plants being replaced or constructed are specified to include the new security fencing.

RD 1000 has a security alarm at both the office and Corp Yard to alert staff and law enforcement of intrusions. In addition, the District partners with Natomas Basin Conservancy and Natomas Water Company on security patrols during non-working hours.

RD 1000 has worked with other partners in the Natomas Basin including the Sacramento Area Flood Control Agency, Natomas Central Mutual Water Company, Natomas Basin Conservancy, Sacramento County Airports and the City of Sacramento on projects of mutual benefit that address public safety and the District's flood control mission.

L.7 Mitigation Strategy

L.7.1. Mitigation Goals and Objectives

The RD 1000 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

L.7.2. Mitigation Actions

The planning team for the RD 1000 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Floods: 1%/0.2% annual chance
- Levee Failure
- Severe Weather: High Winds and Tornadoes

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each

jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Asset Management Plan Update

Hazards Addressed: 1%/0.5% Flood Event; Levee Failure; Localized Flooding, High Winds and Tornadoes

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: RD 1000 has a significant number of flood control and drainage assets including pumping stations, canals, levees, drainage ditches and culverts which have not all be categorized or their current conditions assessed. There are several GIS and other historical documents which describe them but have not been fully inventoried nor their current conditions assessed. RD 1000 needs to identify all its assets, assess their conditions and develop a plan for their operation, maintenance and replacement at the end of their useful life so they continue to provide the flood risk reduction and drainage services they were intended to provide. The assessment would include evaluation for security In addition, RD 1000 needs to develop a funding mechanism to meet its current and future operational needs, capital replacement, and capital improvements to meet its flood safety responsibilities.

Project Description: RD 1000 will update its current asset management plan to identify its current and future funding needs for operations, maintenance, capital improvement, security, and capital replacement of its flood control and drainage facilities. This will require an outside consultant to develop a GIS data base, field survey to identify and assess conditions including security, development of costs for O&M and capital replacement. This asset management plan will be used to identify current and future funding needs including mechanisms for funding.

Other Alternatives: The alternative is to continue with current practice which addresses problems as they are identified or when assets fail.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The asset management plan will be funded through current budgeting and funding mechanisms with approval by the Board of Trustees.

Responsible Agency/ Department/Partners: The asset management plan will be done by an outside consultant under the direction of the General Manager and the Operations Manager

Cost Estimate: The estimate to update the asset management plan as described above is $1.6 million

Benefits (Losses Avoided): Benefits are the timely replacement of assets before they fail. If assets fail during an emergency or flood event, property damage will occur as previously described for the flood events described above

Potential Funding: The most likely funding will be the RD 1000 general fund through the annual budgeting process. We are currently looking at future funding mechanisms to meet the District's current and future funding needs including development of this asset management plan.

Timeline: If a funding mechanism is identified and successfully implemented, an asset management plan could be developed withing 2 to 3 years. If RD 1000 relies on its current funding, the plan would have to be implemented in phases over a longer period.

Project Priority (H, M, L): This is a high priority project since much of the planning and funding are dependent on identifying the assets and their funding needs.

Action 2. Corporation Yard Improvements

Hazards Addressed: 1%/0.5% Flood Event; Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: RD 1000's current Corporation Yard (yard) is small and does not provide for an efficient operation, especially during a flood fight when time delays can be critical. The District stores much of its flood fight materials including large rock, sandbags, visquine and aggregate base at its Corporation Yard. Equipment, including dump trucks need to be loaded for deployment to a flood fight to prevent a levee failure. Under the current layout, trucks need to wait and cannot be loaded in an efficient manner resulting in delays delivering to the levee site. RD 1000 recently acquired additional area adjacent to its yard as part of the SAFCA levee project improvements.

Project Description: RD 1000 has developed a masterplan for the layout of its yard, which provides for an efficient method to load trucks with flood fight materials without delays, store additional flood materials, and provide locations where equipment can be protected from the elements extending their life. Implementing the masterplan requires additional access road construction, extending perimeter fencing, extending the security alarm system, and developing equipment storage and maintenance facilities. This masterplan has not been implemented due to funding constraints.

Other Alternatives: Alternatives would be to continue with the current system which is inefficient for flood fighting resulting in delays and increasing the risk of levee failure. Another alternative would be to develop a new Corporation Yard at other locations which would be more costly.

Existing Planning Mechanism(s) through which Action Will Be Implemented:

RD 1000 would use a combination of its existing field work force supplemented by specialty contractors (for pavement, fences or building construction) to implement the yard masterplan. The work would be scheduled into the District's current maintenance plan as time allows.

Responsible Agency/ Department/Partners: As noted above, the work will be done by a combination of RD 1000 field work force and outside contractors hired by the District under the direction of the Operations Manager

Cost Estimate: The estimated cost to implement the Corporation Yard Masterplan is $200,000

Benefits (Losses Avoided): The benefits of implementing the Corporation Yard Masterplan are a more efficient operations and maintenance plan, especially during the initial stages of a flood fight when delays can result in a levee failure with catastrophic property damage and potential for loss of life.

Potential Funding: The most likely funding will be the RD 1000 general fund through the annual budgeting process. We are currently looking at future funding mechanisms to meet the District's current and future funding needs including implementation of the Corporation Yard Masterplan

Timeline: RD 1000 implemented some of the proposed yard masterplan over the past several years. However, limited funding and other flood control and drainage priorities have prevented completion of the proposed improvements. With current constraints, the improvements would be delayed for up to 4 years.

Project Priority (H, M, L): The Corporation Yard Masterplan implementation is a Medium priority for RD 1000 unless funding becomes available.

Action 3. Waterside Levee Inspection Capability

Hazards Addressed: Levee Failure, High Winds and Tornadoes

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background:

Active erosion on the waterside of the levees in the Sacramento River creates a potential levee failure mode for the adjacent levees. If the levee fails, it would result in catastrophic flooding within Natomas including loss of life. RD 1000 would benefit from a pro-active program to inspect and monitor the erosion activity to intervene before the erosion poses a threat to the levee.

Project Description: Develop a baseline for current erosion activity and develop a system to conduct periodic inspections to monitor. Engage a professional engineer to assist the District in developing criteria for when erosion could impact the adjacent levee and develop a mitigation strategy to address the threat.

Other Alternatives: A no action alternative would be to rely on the State and Corps of Engineers for their inspections and assessment of the waterside berm.

Existing Planning Mechanism(s) through which Action Will Be Implemented:

Development of a waterside erosion plan would be done by an outside consultant under the direction of the General Manager and Operations Manager with approval by the Board of Trustees.

Responsible Agency/ Department/Partners: RD 1000 would be the responsible agency working in partnership with the California Central Valley Flood Protection Board and Corps of Engineers.

Cost Estimate: The estimated cost to develop the waterside erosion plan would be approximately $100,000. The annual expenses to conduct the surveys and evaluate the information would be $25,000.

Implementing a bank protection project should it be determined necessary would range from $1.0 to $10.0 million depending on the size of the site and necessary repairs.

Benefits (Losses Avoided): Implementation of a bank erosion program could prevent a future catastrophic levee failure which would result in significant flood damages and loss of life.

Potential Funding: Potential funding includes RD 1000 General Fund, a funding mechanism identified for the 2020 Capital Improvement Plan Update or FEMA/State flood mitigation grant funds Implementation of bank protection projects would require funding from the State and Corps of Engineers under the Sacramento River Bank Protection Authority.

Timeline: Once funding is identified, a bank erosion prevention program could be established in about 2 years with an on-going annual commitment.

Project Priority (H, M, L): Given the current program by the State and Corps, this would be a Medium priority for RD 1000

Action 4. Pleasant Grove Area Levee Improvements

Hazards Addressed: 1%/0.5% Flood; Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: RD 1000 operates and maintains a system of levees east of the Natomas Basin in the Pleasant Grove area. These levees are not part of the Federal Sacramento River Flood Control Project system and thus not eligible for PL84-99 or other federal funds. These levees are lower than the federal levees to the west and have overtopped and failed in 1986, 1997 and they almost failed in 2017. RD 1000 did a flood fight to protect these levees in 2017 and received FEMA disaster assistance funds for the work performed. If the levees can be raised to uniform height, the risk of failure would be reduced. When the levees fail, they cause property damage and structure damage, though the area is primarily agricultural with only a few ag-res properties

Project Description: The project would be to raise the existing Pleasant Grove Area levees to provide a uniform freeboard above the design flood elevation. The top of the levees would be raised from zero to a maximum of approximately one foot above their current elevation. Most of the work could be done on the crown of the existing levee, though some areas may require landside fill to provide an adequate levee crown.

Other Alternatives: Alternatives would be to do nothing and continue flood fighting during high water events. Short flood walls could also be used to provide the freeboard, but these would impact levee maintenance and be more expensive than embankment fill.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Since these levees are not part of the federal project, the work would have to be implemented by RD 1000 including CEQA and permitting as part of its Capital Improvement Plan

Responsible Agency/ Department/Partners: RD 1000 would be the responsible agency

Cost Estimate: The estimated costs for design, environmental, permitting and construction is $1.0 million

Benefits (Losses Avoided): The project benefits would be reduced property damage due to future flooding, avoided costs to repair damage to levees as experienced in 1986, 1997 and 2017. It is anticipated there were damages during prior flood events, but RD 1000 does not have any detailed records of the damages or repairs.

Potential Funding: Potential funding includes the RD 1000 general fund through the annual budget process; potential grants for rural levee improvements through the State or as part of the funding mechanism for the 2020 Capital Improvement Plan Update.

Timeline: If funding is identified, the project could be implemented within 2 years. If no funding is identified the project would likely not be implemented.

Project Priority (H, M, L): The Pleasant Grove Area levee improvements is a Medium priority for RD 1000

Action 5. Plant 1 Emergency Generator Natural Gas Conversion and Mobile Generators for Plants 2, ,3 and 5

Hazards Addressed: 1%/0.5% Flood Event; Localized Flooding; Security

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: RD 1000 currently has diesel powered generator at its Plant 1 facility which can be used to power Pumping Plant Nos 1A and 1B during a power outage. However, the generator requires the diesel tank be filled every 8 hours to fully function on a continues basis. During a flood emergency access to a tanker truck several times a day may not be reasonable due to road flooding, traffic issues from the power outage and other emergency demands. The proposal would be to convert//replace the diesel generator with a natural gas generator with continuous supply from an existing gas main near the facility. Plant No. 1 is one of the key facilities and most used during a flood event. In addition, RD 1000 currently has not backup generators for Plants 2, 3 and 5 to allow for pumping during a power outage.

Project Description: Replace or convert the existing diesel powered generator at Pumping Plant No. 1 to a natural gas powered generator for use during a power outage. Purchase portable generators that could be deployed to Plants 2, 3 and 5 as necessary during a power outage and retrofit the plants to accept the generator connections.

Other Alternatives: The only alternative would be to continue using the diesel powered generator and rely on having sufficient diesel supply during the power outage or construct a larger or second diesel tank. Though feasible, this would require additional diesel be stored at the site which may not be used before the fuel becomes unusable and must be replaced. The use of natural gas would be less expensive for long term operations since the gas is kept by the supplier once the initial capital costs are invested. For plants 2,3 and 5 the alternative would be to not have generators and be unable to pump during a power outage at these facilities. We could attempt to lease/rent generators during an emergency, but they may not be available.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The project would be implemented by RD 1000 as part of its Capital Improvement Plan and as approved in the annual budget by the Board of Trustees.

Responsible Agency/ Department/Partners: RD 1000 would be the responsible agency

Cost Estimate: The estimated cost for the diesel to natural gas conversion of the Plant 1 generator is $500,000 The cost for purchase and implementation of portable generators for Plants 2, 3 and 5 is $600,000

Benefits (Losses Avoided): The benefits of a generator to power the pumping plant during a power outage were described above and would include flood risk reduction and prevention of property damage and potential road closures during flood events which could impact evacuation if accompanied by levee stability issues.

Potential Funding: Potential funding includes RD 1000 General Fund, a funding mechanism identified for the 2020 Capital Improvement Plan Update or FEMA/State flood mitigation grant funds.

Timeline: Once funding is identified, the project could be implemented within 2 years.

Project Priority (H, M, L):

The generator conversion from diesel to natural gas at Plant 1 and purchase of portable generators for Plants 2, 3 and 5 are a High priority for RD 1000

Action 6. Plant 8 Improvements

Hazards Addressed: 1%/0.5% Flood Event; Localized Flooding; Security

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Pumping Plant No. 8 is the most used plant in the RD 1000 system due to its high capacity and flexibility in operations due to numerous pumps at this facility of varying output capabilities. The plant, however, is located on a parcel that is not easily accessible and small creating logistic issues for operations and maintenance. The outfall pipes are located across a four lane arterial street and not accessible from the plant. In addition, the plant is serviced by low voltage from the supplier (SMUD) which has led to electrical issues during flood operations.

Project Description: The proposed project is to reconstruct the plant to improve its operation, replace the discharge pipes, and replace the power with medium voltage which is more reliable and reduces electrical issues during flood events.

Other Alternatives: Other alternatives would be to downsize the project to only replace the power supply as a phased approach. However, all facilities have a fixed useful life, and eventually the pumping plant will have to be replaced.

Existing Planning Mechanism(s) through which Action Will Be Implemented: The project would be implemented as part of its overall Capital Improvement Plan as identified in the 2020 update as an RD 1000 project

Responsible Agency/ Department/Partners: RD 1000 would be the responsible agency

Cost Estimate: The total project cost estimate is approximately $27.0 million ($21.4 million for pump plant reconstruction and $5.6 for discharge and outfall replacement).

Benefits (Losses Avoided): As described above, the benefits for this project are the flood risk reduction and prevention of property damage during a flood event if the pump plant were to fail. As noted, Plant 8 is the most used pumping plant in the RD 1000 system. Though the costs for replacement are high, the facility will eventually have to be replaced when it exceeds its useful life.

Potential Funding: Given the high cost, the likely funding would be associated with a proposed funding mechanism to implement the 2020 Capital Improvement Plan Update

Timeline: Given the high cost, this project could only be funded through a debt issuance or after a number of years where the Capital Reserves are built up. If funding source was identified, the project could be implemented in about 5 years.

Project Priority (H, M, L): Because it is a critical facility for RD 1000 the replacement of Pumping Plant 8 is a High priority.

Action 7. Expanded SCADA System

Hazards Addressed: Localized Flooding; 1%/0.5% flood; Security

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: RD 1000 prepared a SCADA Master Plan (Plan) to be able to monitor drain levels and pump operations remotely to allow for effective and efficient flood operations. SCADA allows RD 1000 staff to identify potential problems such as power outages or high canal levels and respond in a timely manner. The District partially implemented SCADA improvements in 2018-2019 including monitoring at Pumping Plant Nos. 1,2,3, and 8. We have also requested SCADA be included in Plants 4 and 8 when they reconstructed by the Corps of Engineers under their Natomas Levee Project.

Project Description: The project proposes to expand the SCADA to include all RD 1000 pumping plants and be placed at key locations within the drainage system to assist with decisions on which pumps to operate. The Plan also includes adding security measures such as cameras to notify staff if there is a security breach at one of our facilities so law enforcement can be dispatched. Loss of power at pumping plants due to security breaches can lead to property damage from localized flooding

Other Alternatives: There are no other alternatives other than continue the current operations with the limited SCADA improvements.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Implementation of the SCADA Plan would be done through a contractor under the direction of the General Manager and Operations Manager.

Responsible Agency/ Department/Partners: RD 1000 would be the responsible agency. Other partners could include the Natomas Mutual Water Company, Natomas Basin Conservancy, City of Sacramento, Sacramento County and Sutter County all who have an interest in canal levels and pumping operations in Natomas.

Cost Estimate: The estimated cost to implement the remaining elements of the SCADA Masterplan (including canal levels) is $1.5 million

Benefits (Losses Avoided): Implementation of the SCADA improvements would allow for more effective and efficient operations during flood events. Quick problem identification allows for actions to mitigate the flood risk and prevent potential flood damages due to high water levels or power outages.

Potential Funding: Potential funding includes RD 1000 General Fund, a funding mechanism identified for the 2020 Capital Improvement Plan Update or FEMA flood mitigation grant funds.

Timeline: Once a funding source is identified, the SCADA Masterplan improvements could be implemented in 2 to 4 years.

Project Priority (H, M, L): Completion of the SCADA Masterplan improvements is a High priority for RD 1000.

Action 8. Update Emergency Operations Plan and Staffing

Hazards Addressed: 1%/0.5% Flood Event; Levee Failure; Security; Localized Flooding

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: RD 1000 has an adopted Emergency Action Plan (EAP). With the recent and on-going improvements to the levee system as part of the Natomas Levee Improvement Project, it would be appropriate to review and update the plan based on the improvements which have been made to the system. The EAP will include identifying locations where emergency flood fight materials are stored for deployment during a flood emergency. In addition, the current emergency action plan requires additional staffing during a flood emergency to conduct the adopted levee patrol requirements. Also, should there be a need to conduct a flood fight, additional personnel will be required to continue the levee patrols while other staff are assisting with the flood fight.

Project Description: Update the current emergency action plan to incorporate the recent Natomas Project Levee Improvements constructed by the Corps of Engineers and SAFCA. Review current mutual aid agreements and amend as necessary to ensure appropriate staffing levels to meet the Emergency Action Plan requirements. Based on these agreements, RD 1000 may need to pursue contracts with private consultants to provide necessary staffing during a flood emergency. In addition, the EAP will identify

strategic locations where flood fight materials can be stored for deployment during a flood event. This will require purchasing or leasing property for the storage.

Other Alternatives: The only alternative would be to not update the emergency action plan and continue with existing agreements for staffing. During an emergency, resources may not be available from our mutual aid partners due to their own emergency response needs.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Updating the Emergency Action Plan would be done by an outside consultant working with the RD 1000 staff under the direction of the General Manager.

Responsible Agency/ Department/Partners: RD 1000 would be the responsible agency to update the Emergency Action Plan. It will coordinate with the California Central Valley Flood Protection Board and Sacramento County Office of Emergency Services

Cost Estimate: The estimated cost to update the Emergency Action Plan and develop a staffing plan and agreements would be approximately $100,000. The purchase and establishment of stockpile sites would cost approximately $750,000

Benefits (Losses Avoided): Having a functional Emergency Action Plan based on current conditions is essential to responding in a flood emergency and preventing flooding or a potentially catastrophic levee failure. It is essential for RD 1000 to have the necessary resources to respond during a flood emergency to monitor the system and respond if problems are found. Having flood fight materials strategically located will reduce response time and potentially prevent a levee failure.

Potential Funding: Potential funding includes RD 1000 General Fund, a funding mechanism identified for the 2020 Capital Improvement Plan Update, State flood control assistance grants or FEMA flood mitigation grant funds

Timeline: The current Natomas Levee Project is expected to be completed by 2025. However, the proposed improvements are generally known allowing for the Emergency Action Plan update to be initiated. Once a funding source is identified, the update can be completed in approximately 1 year.

Project Priority (H, M, L): Emergency Action Plan Update and resource evaluation are a High priority for RD 1000

SACRAMENTO COUNTY
WATER AGENCY

Annex M Sacramento County Water Agency

M.1 Introduction

This Annex details the hazard mitigation planning elements specific to the Sacramento County Water Agency (SCWA or District), a new participating jurisdiction to the 2021 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to SCWA, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

M.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table M-1. Additional details on plan participation and District representatives are included in Appendix A.

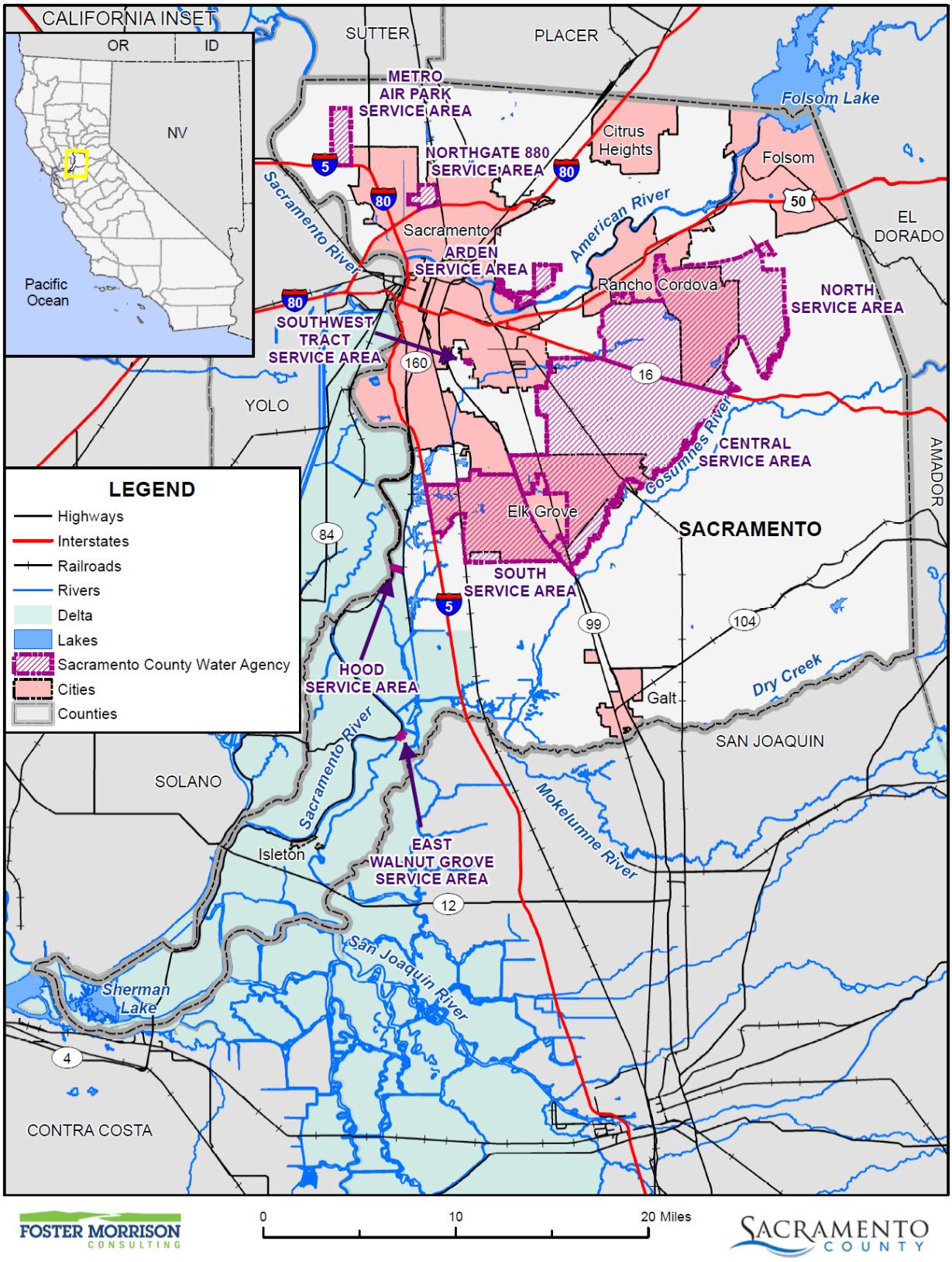
Table M-1 SCWA – Planning Team

Name	Position/Title	How Participated
Forrest Williams	Senior Engineer	Review documents, attend meetings
Carlos Smith	Associate. Engineer	Identify hazards and assets, draft text, attend meetings

M.3 District Profile

The District profile for the SCWA is detailed in the following sections. Figure M-1 displays a map and the location of the District within Sacramento County.

Figure M-1 SCWA



Data Source: Sacramento County Water Agency, Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

M.3.1. Overview and Background

The Sacramento County Water Agency (SCWA) is dedicated to providing safe and reliable drinking water to over 55,000 homes and businesses in the following areas in Sacramento County:

- Laguna Vineyard (South Sacramento County)
- Mather-Sunrise
- Arden Park-Sierra Oaks
- Hood
- Northgate
- Southwest Tract
- Metro Air Park

Sacramento County Water Agency was formed in 1952 by a special legislative act of the State of California. The Sacramento County Board of Supervisors was designated to act as the ex-officio governing body or Board of Directors for SCWA. The Water Agency Act empowers the Board of Directors to create geographic zones with specific projects and benefits. Currently SCWA has the following zones:

- Zone 40 was created by the Water Agency Board of Directors on May 14, 1985 pursuant to Resolution No. 663 to fund the planning, design, and construction of major water supply facilities that benefit the Zone. Zone 40 revenue is provided from water development fees collected at the time of development and from Special User Fees included in bi-monthly water customer utility charges.
- Zone 13 was created by the Water Agency Board of Directors on May 5, 1987 to fund comprehensive long-range planning and engineering studies of flood control, water resources development, water supply management and water conservation beneficial to the Zone. Zone 13 includes all of Sacramento County excepting the cities of Sacramento, Folsom, Galt and Isleton, and its activities are funded by an annual per-parcel assessment on all real property within the Zone.
- Zone 41 was created by the Water Agency Board of Directors on June 13, 2000 pursuant to Resolution WA-2397, and constituted a reorganization of the Sacramento County Water Maintenance District. Zone 41 funds the operation and maintenance of a public drinking water system that includes water production, treatment, storage and distribution facilities, pursuant to permits issued by the California Department of Health Services. Revenue to fund Zone 41 activities is provided by utility charges, connection permit fees, construction water permits, and grants-all of which fund Water Supply Capital Facilities Design and Water Supply Facilities Operations and Administration. Zone 41 also provides wholesale water supply to the Elk Grove Water Service pursuant to the First Amended And Restated Master Water Agreement Between Sacramento County Water Agency And Florin Resources Conservation District/Elk Grove Water Service, June 28, 2002.
- Zone 50 was created by the Water Agency Board of Directors on June 1, 2004 pursuant to Resolution WA-2542. Zone 50 encompasses the Metro Air Park Special Planning Area, a commercial and industrial development adjacent to the Sacramento International Airport. Zone 50 funds certain capital facilities required to provide water supply to the Zone, as described in the Zone 50 Water Supply Master Plan adopted on October 25, 2005; Zone 50 revenue is provided from water development fees. Water for the Zone is purchased from the City of Sacramento pursuant to an October 12, 2004 Wholesale And/or Wheeling Water Service Agreement.

M.4 Hazard Identification

SCWA identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table M-2).

Table M-2 SCWA—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Low	–
Dam Failure	Limited	Unlikely	Catastrophic	High	Low
Drought & Water Shortage	Extensive	Likely	Critical	High	High
Earthquake	Extensive	Occasional	Limited	Medium	Low
Earthquake Liquefaction	Limited	Unlikely	Limited	Low	Low
Floods: 1%/0.2% annual chance	Limited	Occasional	Catastrophic	Medium	Medium
Floods: Localized Stormwater	Limited	Occasional	Limited	Low	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Limited	Low	Medium
Levee Failure	Limited	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Critical	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Occasional	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Low	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Low	Low
Subsidence	Limited	Unlikely	Limited	Low	Medium
Volcano	Extensive	Unlikely	Limited	Low	Low
Wildfire	Limited	Likely	Limited	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

M.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

M.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section M.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table M-2) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

M.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the SCWA's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table M-3 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. SCWA's physical assets, valued at over $565 million, consist of the buildings and infrastructure to support the District's operations.

Table M-3 SCWA Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
FRWA Surface Water Intake Plant	Essential	$54,948,984	Flood, Earthquake, Severe Weather
FRWA Raw Water Pipeline	Essential	$8,336,275	Earthquake
Vineyard Surface Water Treatment Plant	Essential	$244,140,313	Earthquake, Wildfire, Severe Weather
Water Treatment Plants	Essential	$80,518,712	Flood (Levee/Dam/100Yr/500Yr), Earthquake, Wildfire, Severe Weather
Water Wells	Essential	$28,767,926	Flood (Levee/Dam/100Yr/500Yr), Severe Weather, Wildfire
Storage Tank & Booster Stations	Essential	$10,815,231	Flood (Levee/Dam/100Yr/500Yr), Earthquake, Severe Weather Wildfire
SCADA System	Essential	$1,136,504	Flood (Levee/Dam), Severe Weather, Wildfire
Water Transmission Mains	Essential (165 miles)	98,190,500	Earthquake
Water Distributions Mains	Essential (715 miles)	$38,975,447	Earthquake
Total		**$565,82,892**	

Source: SCWA

Natural Resources

SCWA has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

SCWA has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Future Development

The District has limited control (water availability) over future development in areas the District services. Future development in these areas parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

The District noted that new facilities are constructed based on development demands. The 2016 Zone 40 Water System Infrastructure Plan identified new growth areas and the planned water facilities to support the new growth.

M.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table M-2 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

The District noted no significant impacts to date. All major water production, treatment, and delivery facilities have fixed emergency standby generators. Most well sites have on site generations or portable emergency generators available. Most facilities have at least a minimum or 24-hours of continuous back up power before fuel or servicing becomes an issue.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan. The District has not been affected by PSPS events to date.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

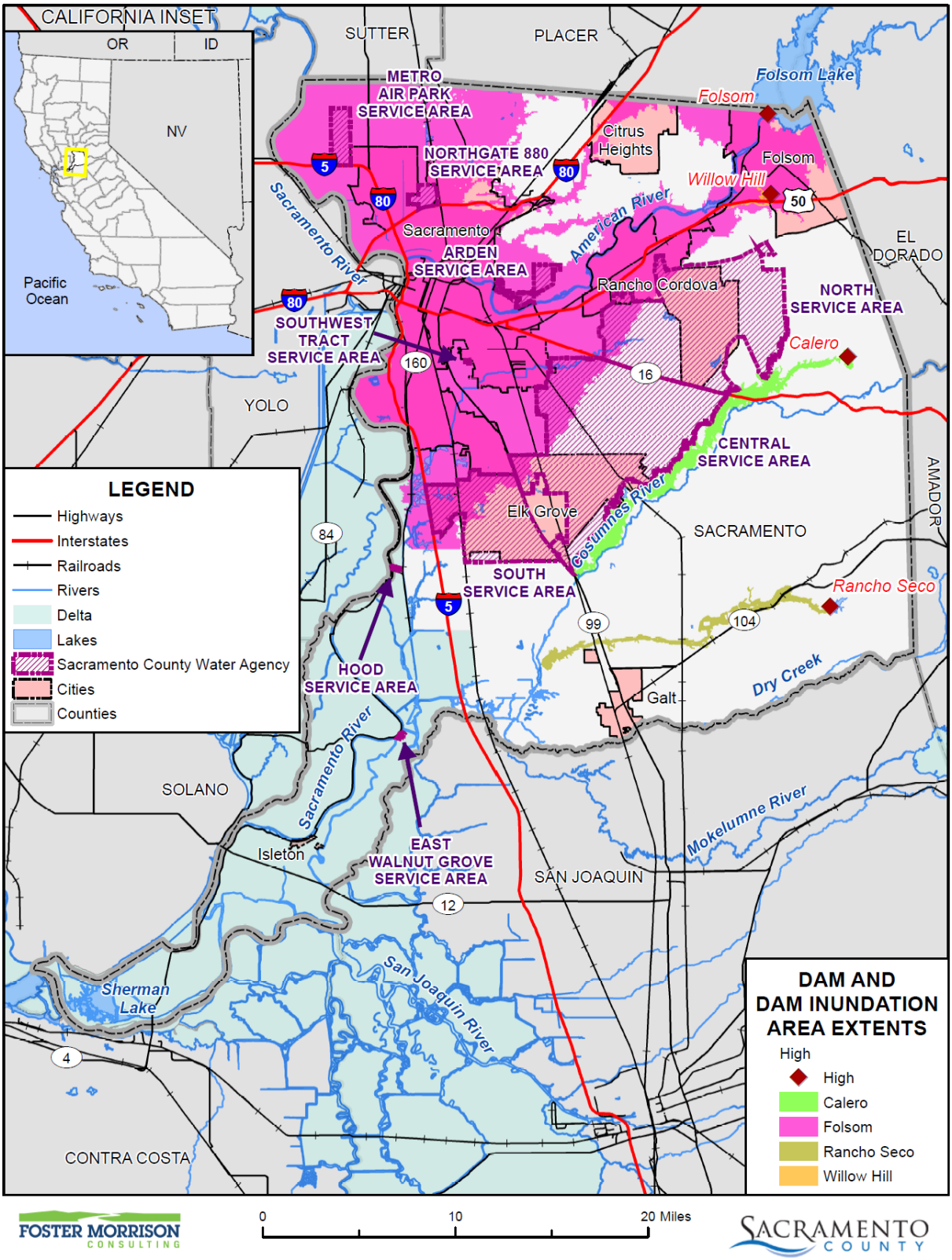
Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

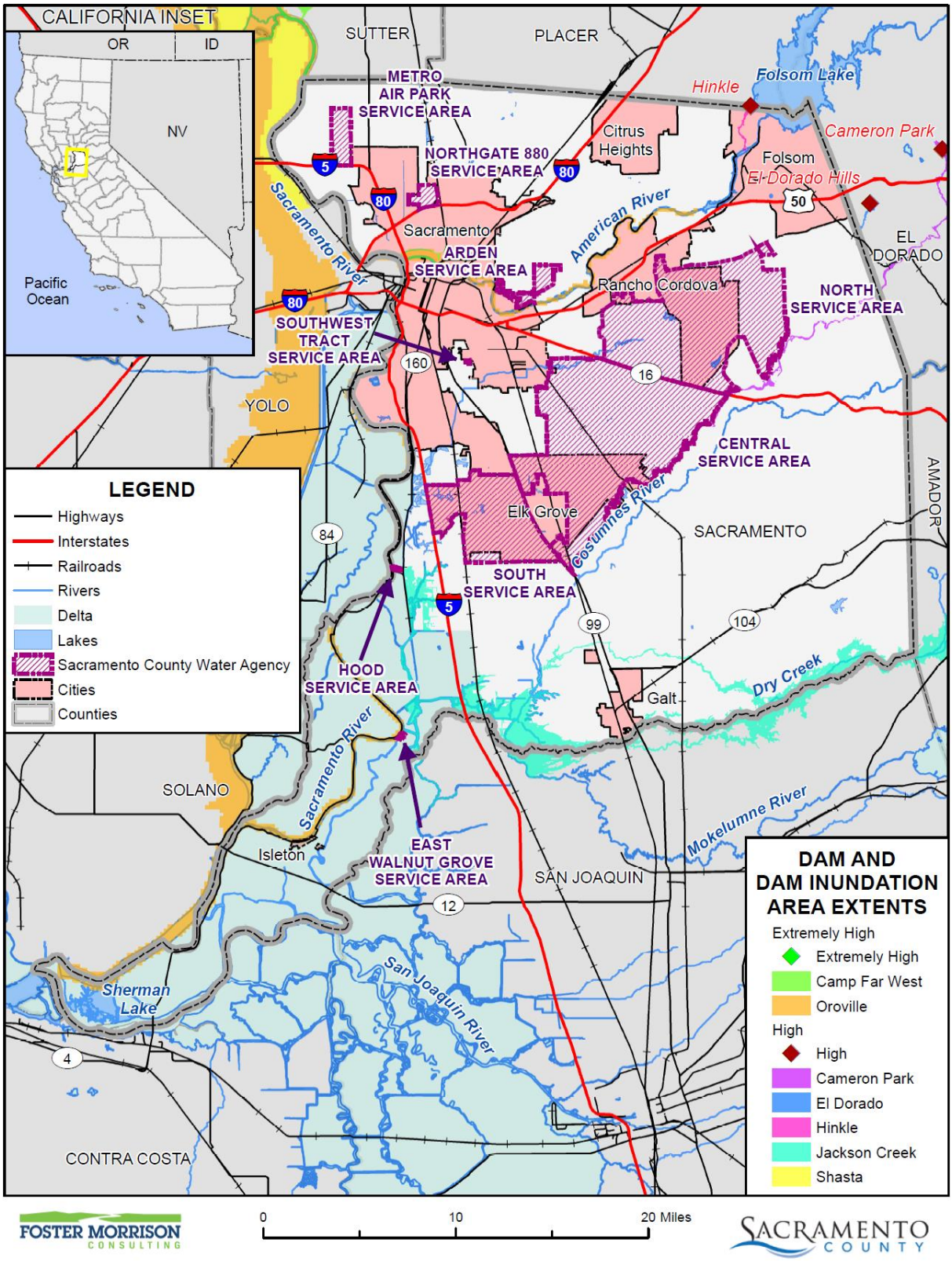
Dams inside the County that can affect the District can be seen on Figure M-2. Dams outside the County that can affect the District can be seen on Figure M-3. The Folsom Dam 235,000 cfs release is shown on Figure M-4. While Figure M-2 and Figure M-3 illustrate dam inundation areas from an actual dam failure, Figure M-3, the Folsom 235,000 cfs scenario reflects the likely inundation area associated with a possible "super" release of water from Folsom. This updated Folsom scenario reflects the Folsom dam improvements which make a dam failure unlikely, with any resulting downstream inundation from Folsom associated with an intentional release of water from the dam. It is anticipated that the worst case scenario would be a 235,000 cfs release, which is comparable to a 200-year flood. The area labeled Folsom 235,000 CFS Release Riverine Inundation is the American River corridor and the backwater of the Natomas East Main Drainage Channel (aka Steelhead Creek) to the flood control pump station.

Figure M-2 SCWA – Dam Inundation Areas from Dams Inside the County



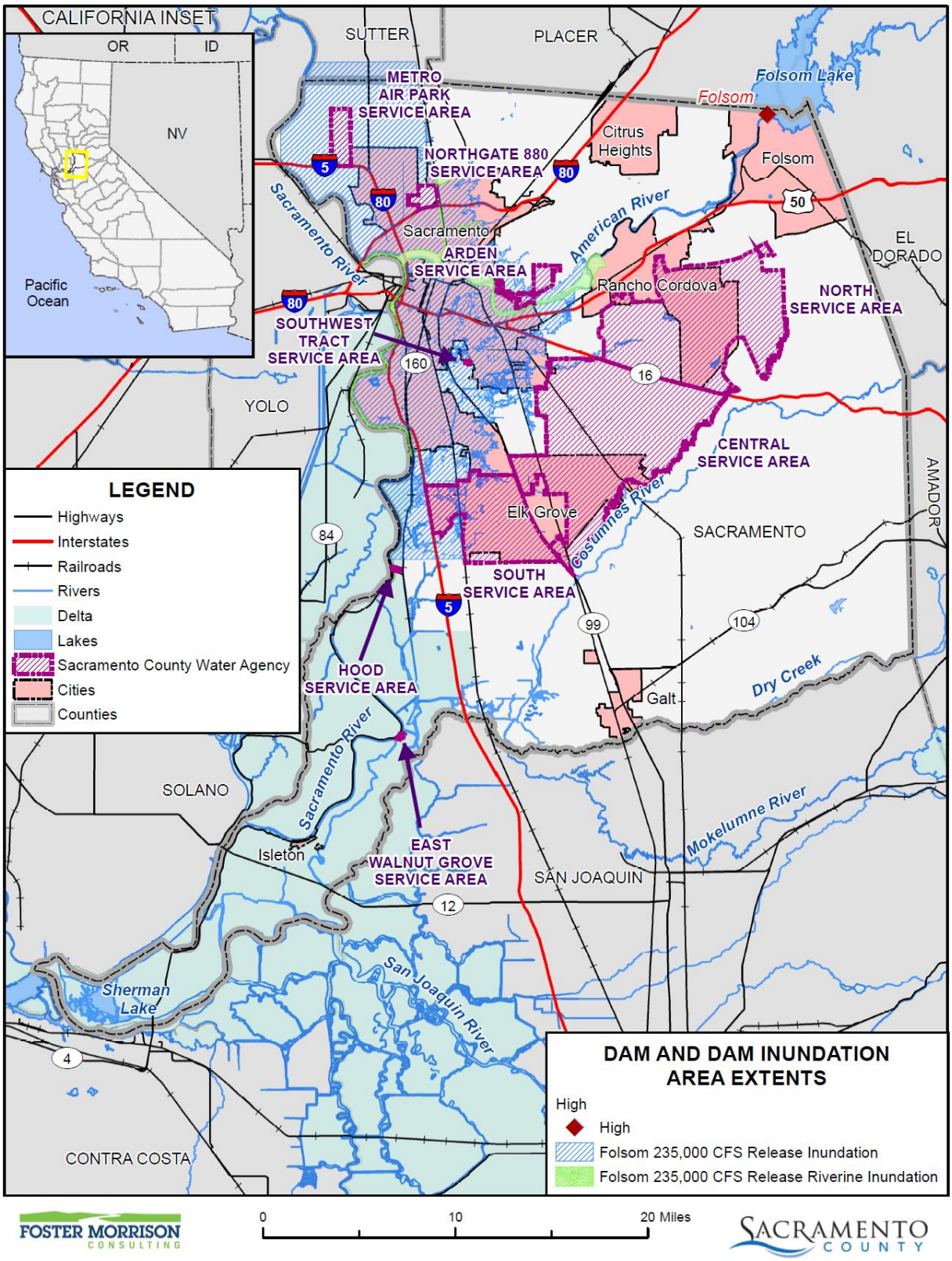
Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Figure M-3 SCWA – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County Water Agency, Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Figure M-4 SCWA – Folsom Dam 235,000 cfs Scenario



Data Source: County-provided dam inundation data (CA_DWR_200YEAR_FLOODPLAIN.zip 2020), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

All water facilities serving the Metro Air Park and Northgate industrial service areas would be inundated and forced to shut down operations until floodwaters recede – catastrophic impacts. Equipment replacements most likely needed.

Three (3) direct feed water wells in the Arden Park Vista service area would be inundated and forced to shut down operations until floodwaters recede. Equipment replacements most likely needed. Loss of the 3 wells sites would be critical to the operation of the west end of water system, however, provide all of the other water system wells sites are operational sufficient water supply is expected at reduced water pressures. Emergency inter-ties with adjacent water purveyors exist.

Zone 40 North Service Area – Mather main base water facilities are located on the edge of the flood inundation boundary. Insufficient information at this time to determine the extent of flood damage and impacts to the operations of the water facilities. Other nearby water facilities would be operational.

Zone 40 South Service Area - all facilities west of the UPRR tracks would be inundated and forced to shut down operations until floodwaters recede. Insufficient information at this time to determine the extent of flood damage and repairs needed to the water facilities. The Dwight Rd WTP and several well sites are also within the flood inundation boundary. Damage to these facilities is also expected. Other nearby water facilities would be operational to supply water to the area but at reduced water pressures.

The District also would be impacted by the loss of access to remote water facilities

Assets at Risk

The District noted the following assets at risk

- Arden Park Vista Service Area: 3 Direct Feed Wells.
- Zone 40 South Service Area: All water facilities west of the UPRR tracks, Dwight Rd WTP, several well sites.
- Zone 40 North Service Area: All water facilities on Mather main base area.
- Northgate Service Area: All water facilities (direct feed wells).
- Metro Air Park: All water facilities

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the District, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the District and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There has been two state and one federal disaster declaration due to drought since 1950. This can be seen in Table M-4.

Table M-4 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the District are the same as those for the County and includes 5 multi-year droughts over an 85-year period. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

The District noted no specific physical damages but impacts (reduced use) to the operations of surface water facilities and reliance on more use of groundwater resources or water transfers. Water restrictions leads to reduced revenue for the District.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the District, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult.

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. With a reduction in water, water supply issues based on water rights becomes more evident. Climate change may create additional impacts to drought and water shortage in the County and the District.

During periods of drought, vegetation can dry out which increases fire risk. Drought that occurs during periods of extreme heat and high winds can cause Public Safety Power Shutoff (PSPS) events to be declared in the County. More information on power outage and failure can be found in the discussion at the beginning of Section M.5.3, as well as in Section 4.3.3 of the Base Plan.

Declared water shortage/drought events trigger the implantation of the Sacramento County Water Agency Water Shortage Contingency Plan (ver 4-19-21) – water restrictions.

Assets at Risk

The FRWA intake and pipeline facilities and Vineyard surface water treatment plant rely solely on the availability of Sacramento river water. Reduced surface water allocations minimize the use of these major facilities.

Earthquake

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The District is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the District fall within a low to moderate shake risk, with most of the moderate risk in the Delta area of the County.

Past Occurrences

There have be no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquakes or that affected the District in any meaningful way.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured buildings can be very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. There are none of these buildings owned by the District.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The SCWA is within the less hazardous Zone 3.

Impacts from earthquake in the District will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

There is a limited impact on operations. A majority of the water system facilities are built after year 2000 and designed and construction to the latest seismic standards. Water production/treatment/storage facilities are open space facilities with most process equipment and tanks exposed, not housed in buildings. Most sites are unmanned. There is potential widespread / long-term loss of electrical power may affect the ability to operate all necessary water facilities with back up emergency generators. Access to remote facilities could be hampered.

Assets at Risk

The District noted the following assets at risk:

- Elevated water storage tanks in the North Service Area (Mather) need seismic retrofitting improvements. At risk of failure during a major earthquake event.
- Water transmission mains and distribution mains – potential pipe joint separation resulting in water leakage

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

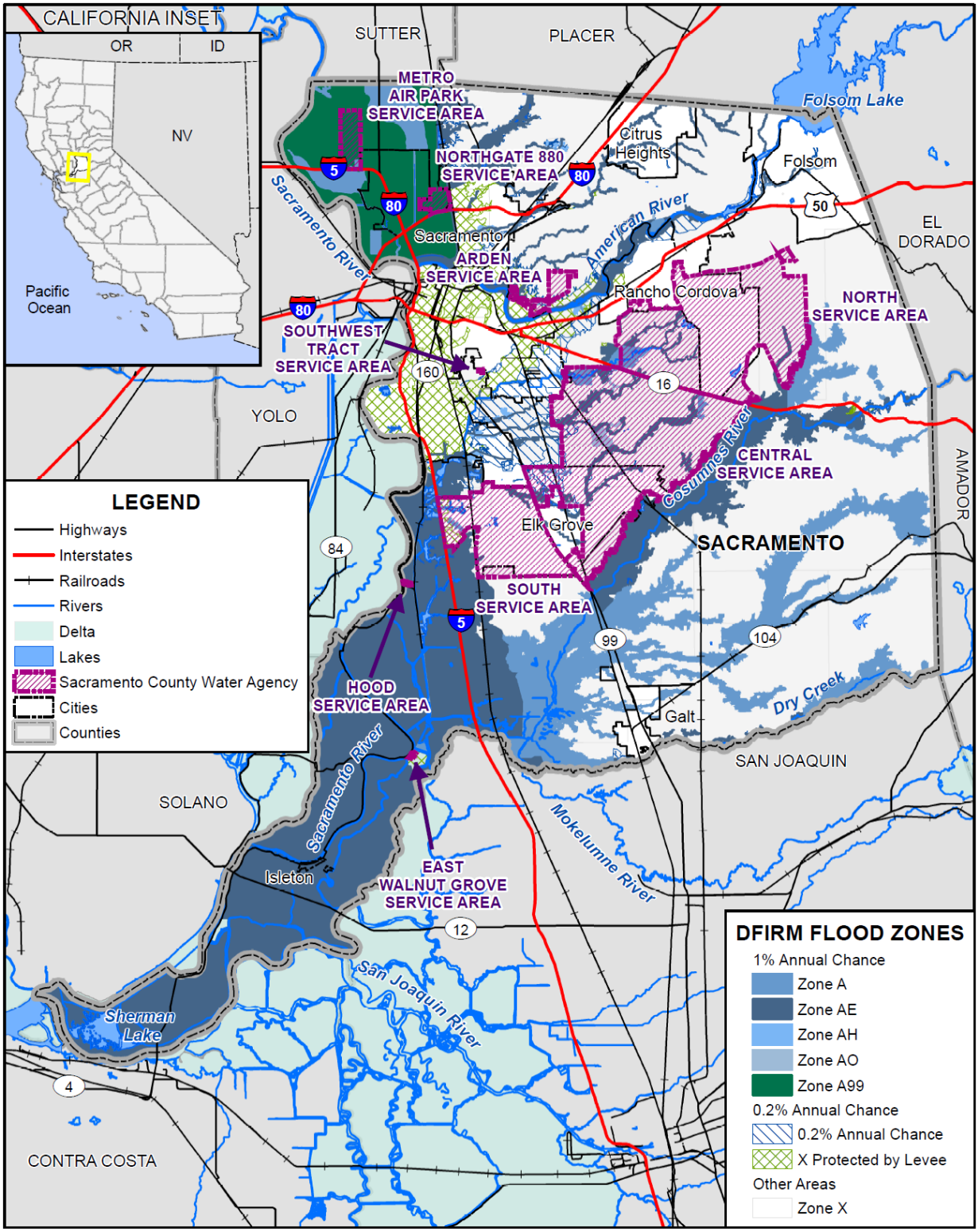
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the SCWA have been subject to historical flooding.

Location and Extent

The SCWA has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure M-5.

Figure M-5 SCWA – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County Water Agency, Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Table M-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table M-5 SCWA– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	X
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	X
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table M-6. These events also likely affected the District to some degree.

Table M-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Regional and local flooding may affect access to certain water facilities.

Assets at Risk

The District noted the following assets at risk:

- Arden Park Vista Service Area (Zone X – Levee / 500yr): 3 direct feed well sites.
- Northgate Service Area (Zone A99): All (6) direct feed well sites.
- Metro Air Park Service Area (Zone A99): Water storage and booster station
- Laguna-Vineyard Service Area (Zone X – Levee): 2 raw water well sites / water treatment plant
- Laguna-Vineyard Service Area (Zone AE/500Yr): Water storage tank and booster station/ well sites
- Hood Service Area (Zone AE): All (3) direct feed well sites
- East Walnut Grove Service Area (Zone X – Levee): All well sites / tank and booster station

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

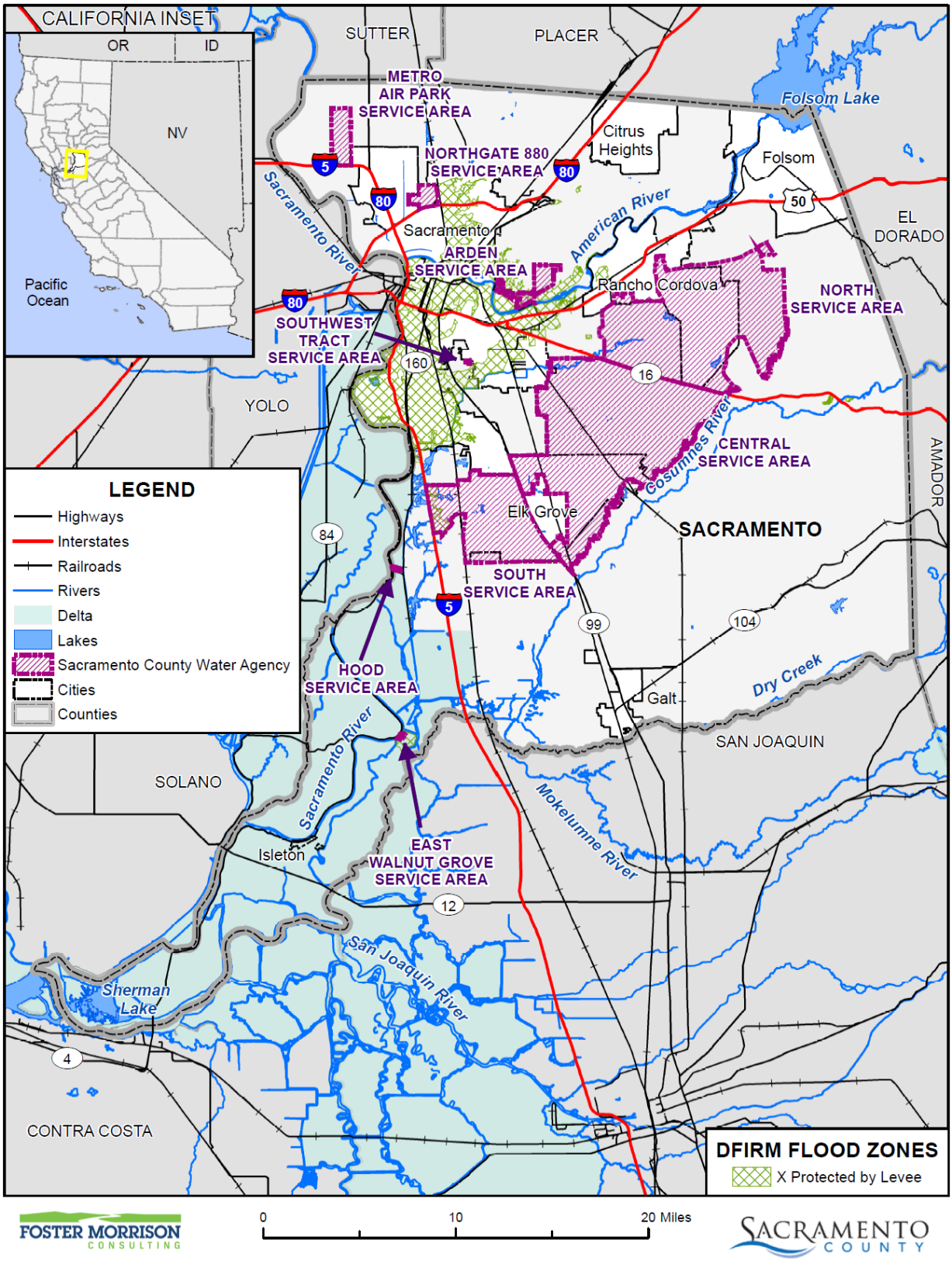
Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees.

Location of areas protected by areas are shown on Figure M-6.

Figure M-6 SCWA – DFIRM X Protected by Levee Areas



Data Source: FEMA NFHL 07/19/2018, Sacramento County Water Agency, Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

The District note that access to remote water facilities may be hampered.

Assets at Risk

The District noted the following assets at risk:

- All water facilities serving the Metro Air Park and Northgate industrial service areas are at risk of potential flood inundation due to levee failure (Zone A99) requiring shut down of all operations until floodwaters recede. Equipment replacements most likely needed.
- Three (3) direct feed water wells in the Arden Park Vista service area are at risk of potential flood inundation due to levee failure (Zone X / Protected by Levee) and force shut down of well operations until floodwaters recede. Equipment replacements most likely needed. Loss of the 3 wells sites would be critical to the operation of the west end of water system, however, provide all of the other water system wells sites are operational sufficient water supply is expected at reduced water pressures. Emergency inter-ties with adjacent water purveyors exist.
- Zone 40 South Service Area – Two (2) raw water wells near I-5 are at risk of potential flood inundation due to levee failure (Zone X / Protected by Levee) and may force shut down of well operations until floodwaters recede.

M.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships.

M.6.1. Regulatory Mitigation Capabilities

Table M-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the SCWA.

Table M-7 SCWA Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	N/A	
Capital Improvements Plan	N/A	
Economic Development Plan	N/A	
Local Emergency Operations Plan	N/A	
Continuity of Operations Plan	N/A	
Transportation Plan	N/A	
Stormwater Management Plan/Program	N/A	
Engineering Studies for Streams	N/A	
Community Wildfire Protection Plan	N/A	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	SCWA 2020 Urban Water Management Plan. SCWA Water Shortage Contingency Plan SCWA Emergency Response Plans SCWA Risk and Resilience Assessments SCWA Zone 40 Water Supply Master Plan SCWA Zone 40 Water System Infrastructure Plan
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N/A	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N/A	Score:
Fire department ISO rating:	N/A	Rating:
Site plan review requirements	N/A	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N/A	
Subdivision ordinance	N/A	
Floodplain ordinance	N/A	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N/A	
Flood insurance rate maps	N/A	
Elevation Certificates	N/A	

Acquisition of land for open space and public recreation uses	N/A	
Erosion or sediment control program	N/A	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The District will look to expand upon existing plans to reduce hazard risks in the future.		

Source: SCWA

M.6.2. Administrative/Technical Mitigation Capabilities

Table M-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in SCWA.

Table M-8 SCWA's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Preventative maintenance program and annual inspections
Mutual aid agreements	Y	Multiple agreements with multiple entities. Coordination is effective.
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N/A	
Floodplain Administrator	N/A	
Emergency Manager	N	
Community Planner	N/A	
Civil Engineer	Y	Adequate and trained on mitigation. Coordination is effective.
GIS Coordinator	Y	Adequate and trained on mitigation. Coordination is effective.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	SCADA System/Alarm Systems/CCTV Systems
Hazard data and information	Y	
Grant writing	N	
Hazus analysis	N	
Other		

How can these capabilities be expanded and improved to reduce risk?
Need technical resources and staff for grant applications. This would increase the Districts capabilities.

Source: SCWA

M.6.3. Fiscal Mitigation Capabilities

Table M-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table M-9 SCWA's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	Y	Water service use fees fund O&M projects
Impact fees for new development	Y	Zone 40 development fees fund CIP projects
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	Y	Applied for federal grants
State funding programs	Y	Applied for state grants
Other		
How can these capabilities be expanded and improved to reduce risk?		
Seek all available grant-funding opportunities to cost share on CIP and rehabilitation projects. This includes federal, state, and local grants.		

Source: SCWA

M.6.4. Mitigation Education, Outreach, and Partnerships

Table M-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table M-10 SCWA's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N/A	

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Water conservation program – Water Wise
Natural disaster or safety related school programs	N/A	
StormReady certification	N/A	
Firewise Communities certification	N/A	
Public-private partnership initiatives addressing disaster-related issues	N/A	
Other	N/A	
How can these capabilities be expanded and improved to reduce risk?		
SCWA outreaches to service area customers only. This could be improved by web site improvements, additional brochure mailings, and in person site visits. Improve water conservation enforcements – additional staff.		

Source: SCWA

M.7 Mitigation Strategy

M.7.1. Mitigation Goals and Objectives

The SCWA adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

M.7.2. Mitigation Actions

The planning team for the SCWA identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Floods: 1%/0.2% annual chance
- Levee Failure

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and

projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Action 1. Flood Hazard Mitigation

Hazards Addressed: Flooding – Dam failure / Levee failure / 100yr & 500 yr flood events.

Goals Addressed: 1, 3, & 4

Issue/Background: SCWA operates certain water production/distribution facilities (water wells, storage tank & booster stations, and water treatment plants) subjected to potential major flood damage caused by dam or levee failures, and 100-year / 500-year flood events. To date no flooding events have damaged any of these water facilities.

Project Description: To reduce the risk and increase the resiliency of critical water supply infrastructure from major flood damage or complete loss, SCWA is evaluating the following mitigation actions/projects:

1. Construct floodwalls/berms around entire facilities or critical equipment/buildings.
2. Elevate critical equipment, buildings, and hazardous materials/chemicals/fuels above flood elevation.
3. Install tie-downs on tanks and buildings.
4. Flood-proof emergency generator and control buildings.
5. Ensure spare parts and replacement equipment are readily available.

Other Alternatives: Support and participate in county, regional, state and federal flood mitigation projects that will reduce flooding in water service areas affected by the above flood hazard

Existing Planning Mechanisms through which Action will be Implemented:
SCWA Operations and Maintenance engineering planning

Responsible Office: SCWA Operations and Maintenance Engineering

Cost Estimate: TBD

Potential Funding: FEMA, Cal OES, RWA, and Bureau of Reclamation grants.

Benefits (avoided Losses): Avoid significant equipment damage and shutdowns of water production facilities due to floodwater inundations. Maintain continuous operation of water systems to supply clean reliable drinking water and fire protection flow.

Schedule: Ongoing.

Priority (H, M, L): Low

Action 2. Improve Water Supply Portfolio

Hazards Addressed: Drought & Water shortage

Goals Addressed: 1, 2, 3, 4

Issue/Background: Improve water supply reliability and prevent or minimize water supply shortages triggered by water supply operational changes and catastrophic events.

Project Description: Maintain sufficient annual water supplies for domestic, commercial, industrial consumption uses and provide fire protection. Water conservation enforcement actions. Public outreach. Manage conjunctive use of water system. Construct CIP projects that improve water storage capacity and water distribution. Conduct water audits. Seek additional water rights / contracts.

Other Alternatives: No action.

Existing Planning Mechanisms through which Action will be Implemented: Annual Water Supply and Demand Assessments (WSDA). Emergency Response Plan (ERP). Mutual aid agreements with adjacent water purveyors.

Responsible Office: SCWA Operations and Maintenance Engineering

Cost Estimate: TBD

Potential Funding: FEMA grants, Bureau of Reclamation, RWA funding.

Benefits (avoided Losses): Increased protection of District facilities from drought and water shortage issues. Ability of the District to provide water for both consumption and fire suppression.

Schedule: Ongoing

Priority (H, M, L): Medium

Action 3. Seismic Upgrades and Inspections

Hazards Addressed: Earthquake

Goals Addressed: 1, 3, & 4

Issue/Background: SCWA owns and operates two aged, elevated water storage tanks previous owned by the U.S. Air Force that do not meet current seismic standards. Recent seismic assessments determined insufficient foundation mass and strength capacity, insufficient foundation anchorage, and tension only braced frame braces.

Potential above and below ground pipeline joint separation caused by seismic activity leading to water leaks and forced shutdowns.

Project Description: Design and prepare contract documents to correct elevated storage tank seismic deficiencies. Publicly bid for construction of seismic upgrades to meet current seismic standards. Conduct pipeline leak detection surveys following major seismic events.

Other Alternatives: Reduce the volume of stored water in tanks or remove them from service and lose system storage capacity. Build new ground level storage tanks at a greater expense.

Existing Planning Mechanisms through which Action will be Implemented: SCWA Zone 41 budget and project planning/scheduling.

Responsible Office: SCWA Operations and Maintenance Engineering

Cost Estimate:

- Mather housing elevated water tank: $2,066,817 (Preliminary)
- Mather main base elevated water tank: $ 1,435,084 (Preliminary)
- Pipeline leak detection surveys: TBD

Potential Funding: SCWA Zone 41. Seek FEMA, Bureau of Reclamation, and RWA grants

Benefits (avoided Losses): Maintain the ability to store and distribute water for drinking and fire protection. Reduce water loss in pipelines and water contamination.

Schedule: Elevated storage tanks: Complete within the next three to five years. Pipeline leak detection surveys: As needed

Priority (H, M, L): Medium

Annex N Sacramento Metropolitan Fire District

N.1 Introduction

This Annex details the hazard mitigation planning elements specific to Sacramento Metro Fire District (SMFD or District), a previously participating jurisdiction to the 2021 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to SMFD, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

N.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table N-1. Additional details on plan participation and District representatives are included in Appendix A.

Table N-1 SMFD – Planning Team

Name	Position/Title	How Participated
Ty Bailey	Exec. Director	Project Coordination. Attended meetings. Provided input on hazard identification.
Lisa Barsdale	Fire Marshal	Risk Analysis. Assisted with annex edits and mitigation actions. Attended meetings.
Jeff Frye	Chief Development Officer	Planning & Development. Assisted with annex edits and mitigation actions.
Erin Castleberry	Administrative Specialist	Planning & Development. Assisted with annex edits and mitigation actions.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table N-2.

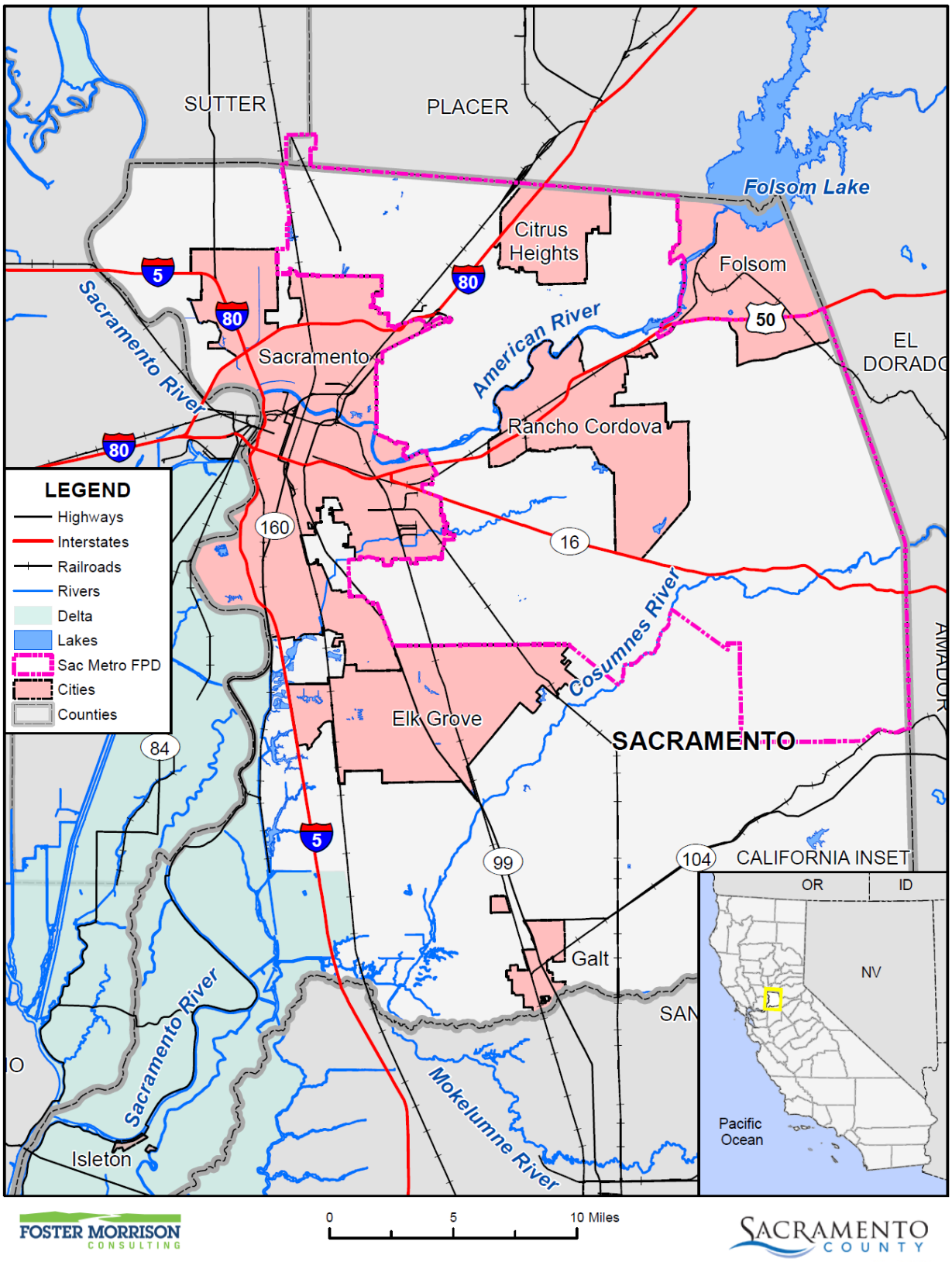
Table N-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Community Risk Reduction Plan	LHMP was used to inform sections of this Plan.

N.3 District Profile

The District profile for the SMFD is detailed in the following sections. Figure N-1 displays a map and the location of the District within Sacramento County.

Figure N-1 SMFD



Data Source: Sacramento Metro Fire Protection District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

N.3.1. Overview and Background

The Sacramento Metropolitan Fire District, "Metro Fire," serves a population of over 738,000 in a 358 square mile service area. Metro Fire is the 7th largest fire agency in the State of California.

Metro Fire is a combination of 16 smaller fire departments that, over the years, merged to create this California Special District. The last merger was in December 2000 when American River Fire Department and Sacramento County Fire Protection District merged to form the Sacramento Metropolitan Fire District, pursuant to Government Code Section 56839. As a special district, Metro Fire is governed by a Board of Directors; each member is elected by the voters within a geographical area, or division, of Metro Fire's operational area.

On any given day, there are 155 on-duty personnel to serve the District's communities. Routine and emergency operations are managed with five (5) Battalion Chiefs with oversight through an Assistant Chief assigned a 24-hour shift. Metro Fire is comprised of three branches – Operations, Administration, and Support Services.

Operations includes Fire & Rescue, Emergency Medical, Training & Safety, Special Operations, Homeland Security, Fire Investigation, and Health & Wellness Divisions. The Administration Branch consists of Economic Development, Finance, Human Resources, and Information Technology Division. Support Services oversees Facilities, Fleet Maintenance, Logistics Division and Community Risk Reduction Division.

The coordinated efforts of all three branches provide the efficiencies necessary to provide all-hazard emergency response and community risk reduction services within the jurisdiction. This in conjunction with the collaborative relationships with County, City and allied partners aid to ensure the highest level of service is provided and maintained for the residents, businesses and visitors.

N.4 Hazard Identification

SMFD identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table N-3).

Table N-3 SMFD—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Significant	Highly Likely	Limited	Medium	–
Dam Failure	Limited	Unlikely	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Critical	High	High
Earthquake	Extensive	Occasional	Catastrophic	Medium	Low
Earthquake Liquefaction	Limited	Occasional	Limited	Medium	Low
Floods: 1%/0.2% annual chance	Limited	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Extensive	Highly Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Occasional	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Critical	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Medium	Low
Subsidence	Limited	Unlikely	Limited	Low	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Extensive	Highly Likely	Catastrophic	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

N.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

N.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section N.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table N-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

N.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the SMFD's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> *Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table N-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. SMFD's physical assets, valued at over $153 million, consist of the buildings and infrastructure to support the District's operations.

Table N-4 SMFD Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Station 21	Essential	5,441,361	Earthquake
Station 22	Essential	1,014,640	Earthquake
Station 23	Essential	1,361,669	Earthquake
Station 24	Essential	1,615,274	Earthquake
Station 25	Essential	1,879,527	Earthquake
Station 26	Essential	2,521,810	Earthquake
Station 27	Essential	999,352	Earthquake
Station 28	Essential	801,362	Earthquake
Station 29	Essential	6,147,942	Earthquake
Station 31	Essential	1,315,817	Earthquake
Station 32	Essential	6,253,853	Earthquake
Station 41	Essential	1,487,942	Earthquake
Station 42	Essential	851,879	Earthquake
Station 50	Essential	9,023,606	Earthquake, Dam Failure
Station 51	Essential	2,633,071	Earthquake, Flood, Dam Failure
Station 52	Training	1,002,297	Earthquake, Flood, Dam Failure
Station 53	Essential	982,137	Earthquake, Flood, Dam Failure
Station 54	Essential	943,672	Earthquake, Flood, Dam Failure
Station 55	Essential	1,554,895	Earthquake, Wildfire
Station 58	Essential	996,861	Earthquake, Wildfire
Station 59	Essential	1,687,979	Earthquake, Wildfire
Station 61	Essential	1,973,109	Earthquake, Flood, Dam Failure
Station 62	Essential	2,024,654	Earthquake, Dam Failure
Station 63	Essential	904,049	Earthquake, Dam Failure
Station 64	Essential	349,588	Earthquake, Dam Failure
Station 65	Essential	2,458,004	Earthquake, Flood, Dam Failure
Station 66	Essential	2,520,734	Earthquake, Dam Failure
Station 68	Essential	6,460,650	Earthquake, Dam Failure
Station 101	Essential	4,267,007	Earthquake
Station 102	Essential	801,514	Earthquake
Station 103	Essential	837,945	Earthquake
Station 105	Essential	1,960,039	Earthquake, Flood, Dam Failure
Station 106	Essential	2,758,026	Earthquake, Dam Failure
Station 108	Essential	939,409	Earthquake
Station 109	Essential	3,340,863	Earthquake
Station 110	Essential	3,293,177	Earthquake, Dam Failure

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Station 111	Essential	6,352.585	Earthquake, Dam Failure
Station 112	Essential	779,918	Earthquake
Station 114	Essential	County Owned	Earthquake
Station 115	Essential	County Owned	Earthquake
Station 116	Essential	1,214,663	Earthquake, Dam Failure
Station 117	Essential	576,391	Earthquake, Dam Failure
Headquarters	Essential	30,645,922	Earthquake, Dam Failure
Logistics	Essential	6,066,361	Earthquake, Dam Failure
Fleet	Essential	13,112,495	Earthquake
Hurley	Leased	5,987,786	Earthquake
Gold Canal	Leased	3,263,704	Earthquake, Dam Failure
Total		**$60,867,322**	

Source: SMFD

Natural Resources

SMFD has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

SMFD has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Development since 2016

No new facilities were built since 2016. As such, vulnerability of the District is assumed to have not changed since 2016.

Future Development

Station 68 is currently under construction. We will also likely add a station in between 50 and 55 as well. This future development will serve to reduce hazard risk, and these building will be built to code and in locations so as to reduce risk to the structure. As such, a lowering of in vulnerability is likely.

The District has no control over future development in areas the District services. Future development in these areas parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

N.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table N-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally

grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

Metro Fire's Emergency Operations Plan (EOP) addresses power outages in Incident Annex 9 – Utility and Power Failure Response. The purpose of this Incident Annex is to provide resources and support to affiliated agencies for emergent needs in Metro Fire's jurisdiction in the event of a major electrical power or natural gas supply failure. The Incident Annex provides guidelines for planning and reducing the impacts associated with large utility failures and ensuring that emergency services are not interrupted. The Incident Annex includes information on standard operating procedures for emergency routes, movement of responders, victims and supplies associated with response and recovery efforts following a major disaster. Also included is information on major response services critical to the welfare of the citizens living and conducting business within Metro Fire's boundaries. The Incident Annex is responsible for coordinating with all affiliated agencies to manage the auxiliary needs before (preparedness), during (response), and after (recovery and mitigation) the event.

This Incident Annex was last updated in 2016 and does not specifically address PSPS planned power outages, which began in 2019. Metro Fire attests that future updates to Incident Annex 9 will specifically address PSPS planned outages in its scope.

Metro Fire has 26 facilities with emergency back-ups generators, however 6 of them are in poor condition. There are 19 facilities without any form of emergency back-up power.

Climate Change

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and

rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the District noted that climate change is of concern, no specific impacts of climate change could be recalled. The District and HMPC members did, however, note that in Sacramento County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability to and Impacts from Climate Change

The California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

The District noted that climate change could increase outdoor fires in general not necessarily just wildfires. Also, if snowpack melt increases its logical to assume rescue calls along the rivers could also increase. For EMS, medical calls for dehydration/exposure could increase.

Assets at Risk

The District noted that its facilities will most likely not be at risk from climate change.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–High

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

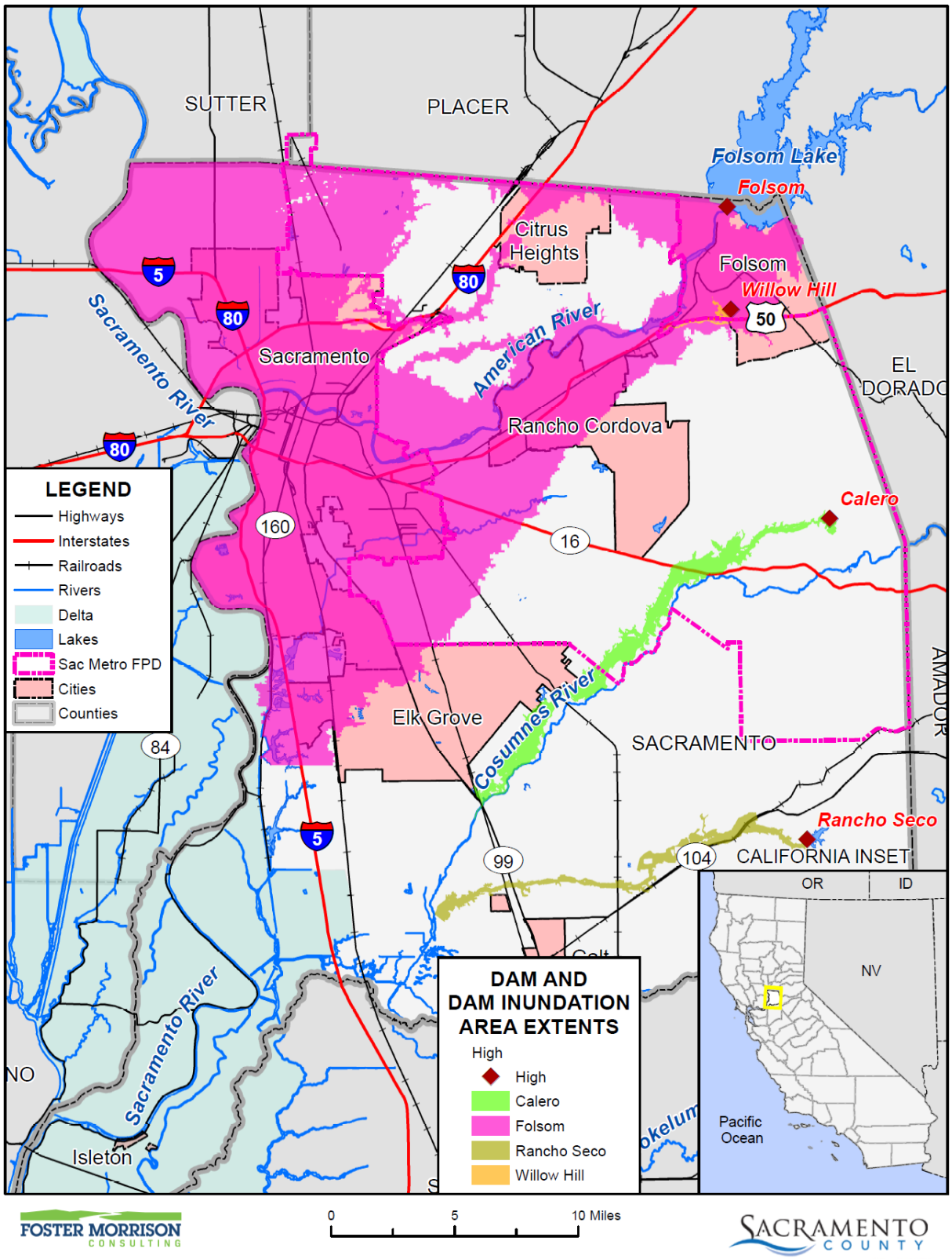
Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

Based on dam inundation data obtained from CA DWR and Cal OES the was discussed in Section 4.3.7 of the Base Plan, dams inside the County that can affect the District can be seen on Figure N-2. Dams outside the County that can affect the District can be seen on Figure N-3. The Folsom Dam 235,000 cfs scenario discussed in Section 4.3.7 of the Base Plan is shown in Figure N-3. While Figure N-2 and Figure N-3 illustrate dam inundation areas from an actual dam failure, Figure N-3, the Folsom 235,000 cfs scenario reflects the likely inundation area associated with a possible "super" release of water from Folsom. This updated Folsom scenario reflects the Folsom dam improvements which make a dam failure unlikely, with any resulting downstream inundation from Folsom associated with an intentional release of water from the dam. It is anticipated that the worst case scenario would be a 235,000 cfs release, which is comparable to a 200-year flood. The area labeled Folsom 235,000 CFS Release Riverine Inundation is the American

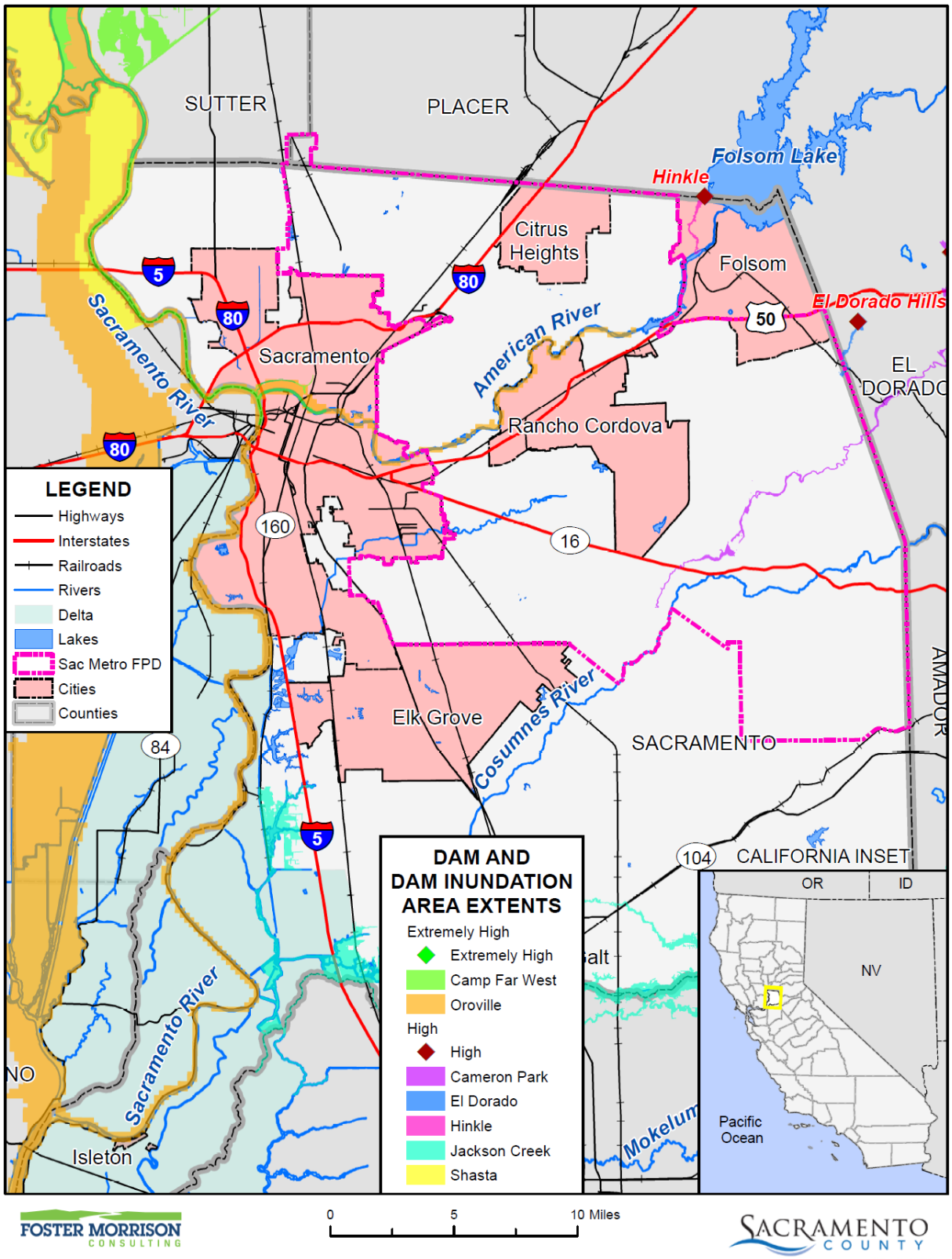
River corridor and the backwater of the Natomas East Main Drainage Channel (aka Steelhead Creek) to the flood control pump station.

Figure N-2 SMFD – Dam Inundation Areas from Dams Inside the County



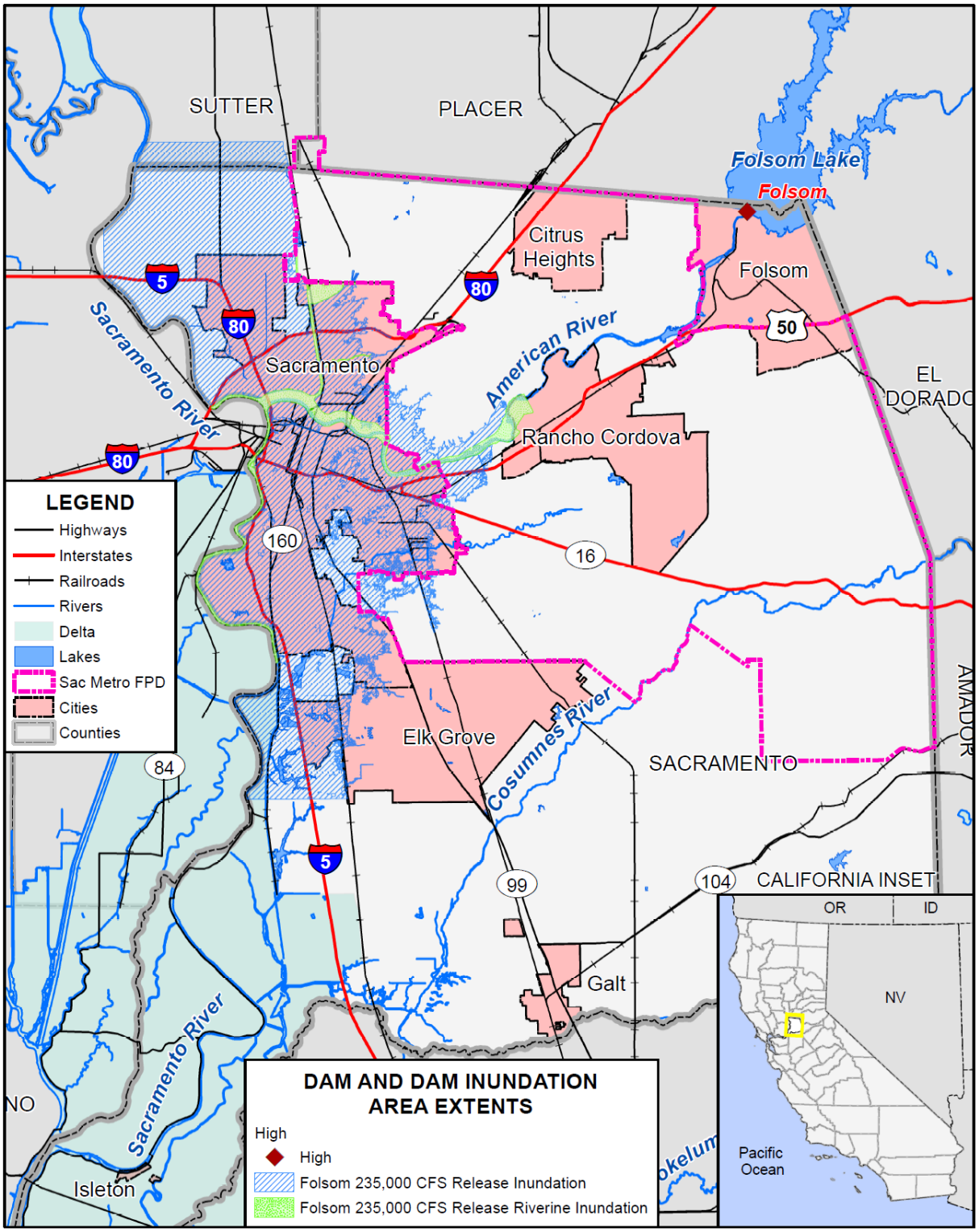
Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 2/2021.

Figure N-3 SMFD – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento Metro Fire Protection District, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Figure N-4 SMFD – Dam Inundation Areas from Folsom Dam 235,000 cfs Scenario



Data Source: County-provided dam inundation data (CA_DWR_200YEAR_FLOODPLAIN.zip 2020), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 02/2021.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. Metro Fire responded to the Oroville Spillway incident through agreements with Cal Fire and Cal OES. Direct costs were reimbursed through the agreements and mutual aid system. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

The District noted risk to Folsom Dam. Operationally, Metro Fire overburdened and would likely need mutual aid assistance. If stations were rendered inoperable due to inundation, apparatus wouldn't be deployable.

Assets at Risk

The District noted the following assets at risk to dam failure as shown in Table N-5.

Table N-5 SMFD – Assets at Risk to Dam Failure

Name of Asset	Facility Type	Replacement Value ($)
Station 50	Essential	9,023,606
Station 51	Essential	2,633,071
Station 52	Training	1,002,297
Station 53	Essential	982,137
Station 54	Essential	943,672
Station 61	Essential	1,973,109
Station 62	Essential	2,024,654
Station 63	Essential	904,049
Station 64	Essential	349,588
Station 65	Essential	2,458,004
Station 66	Essential	2,520,734
Station 68	Essential	6,460,650
Station 105	Essential	1,960,039
Station 106	Essential	2,758,026
Station 110	Essential	3,293,177
Station 111	Essential	6,352.585
Station 116	Essential	1,214,663

Name of Asset	Facility Type	Replacement Value ($)
Station 117	Essential	576,391
Headquarters	Essential	30,645,922
Logistics	Essential	6,066,361
Gold Canal	Leased	3,263,704
Total		**$81,060,207**

Source: SMFD

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the District, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the District and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There has been two state and one federal disaster declaration due to drought since 1950. This can be seen in Table N-6.

Table N-6 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the District are the same as those for the County and includes 5 multi-year droughts over an 85-year period. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the District, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult.

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. With a reduction in water, water supply issues based on water rights becomes more evident. Climate change may create additional impacts to drought and water shortage in the County and the District.

During periods of drought, vegetation can dry out which increases fire risk. Drought that occurs during periods of extreme heat and high winds can cause Public Safety Power Shutoff (PSPS) events to be declared in the County. More information on power outage and failure can be found in the discussion at the beginning of Section N.5.3, as well as in Section 4.3.3 of the Base Plan.

The District noted that access to water is an issue for wildland fire suppression. Helicopter operations rely largely on surface water for suppression. Also, decreasing water levels in rivers make our boat inoperable for rescue operations. Shallow bottom boats may be required

Assets at Risk

The District noted that no facilities were at risk from drought directly. Drought can exacerbate wildfire, which could affect both District property and those the District is sworn to protect. More information on these facilities can be found in the Assets at Risk of the Wildfire section below.

Earthquake

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The District is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the District fall within a low to moderate shake risk, with most of the moderate risk in the Delta area of the County.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquakes or that affected the District in any meaningful way.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured buildings can be very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. A majority of Metro Fire's older stations are structurally masonry. Whether or not its reinforced is unknown.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The SMFD is within the less hazardous Zone 3.

Impacts from earthquake in the District will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

The District noted that the Search and Rescue Team would be at risk if they were sent out to respond to an earthquake event.

Assets at Risk

SMFD has assets at risk to earthquake, as shown on Table N-7.

Table N-7 SMFD – Assets at Risk to Earthquake

Name of Asset	Facility Type	Replacement Value ($)
Station 21	Essential	5,441,361
Station 22	Essential	1,014,640
Station 23	Essential	1,361,669
Station 24	Essential	1,615,274

Name of Asset	Facility Type	Replacement Value ($)
Station 25	Essential	1,879,527
Station 26	Essential	2,521,810
Station 27	Essential	999,352
Station 28	Essential	801,362
Station 29	Essential	6,147,942
Station 31	Essential	1,315,817
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Station 41	Essential	1,487,942
Station 42	Essential	851,879
Station 50	Essential	9,023,606
Station 51	Essential	2,633,071
Station 52	Training	1,002,297
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Station 54	Essential	943,672
Station 55	Essential	1,554,895
Station 58	Essential	996,861
Station 59	Essential	1,687,979
Station 61	Essential	1,973,109
Station 62	Essential	2,024,654
Station 63	Essential	904,049
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Station 66	Essential	2,520,734
Station 68	Essential	6,460,650
Station 101	Essential	4,267,007
Station 102	Essential	801,514
Station 103	Essential	837,945
Station 105	Essential	1,960,039
Station 106	Essential	2,758,026
Station 108	Essential	939,409
Station 109	Essential	3,340,863
Station 110	Essential	3,293,177
Station 111	Essential	6,352.585
Station 112	Essential	779,918
Station 114	Essential	County Owned
Station 115	Essential	County Owned
Station 116	Essential	1,214,663

Name of Asset	Facility Type	Replacement Value ($)
Station 117	Essential	576,391
Headquarters	Essential	30,645,922
Logistics	Essential	6,066,361
Fleet	Essential	13,112,495
Hurley	Leased	5,987,786
Gold Canal	Leased	3,263,704
Total		**$60,867,322**

Source: SMFD

Earthquake: Liquefaction

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the County are rebuilt or leveed areas are dewatered, and the levees rebuilt. In Sacramento County, the Delta and areas of downtown Sacramento are at risk to liquefaction. The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand and silt in the levees and their foundations indicates that liquefaction is also a possibility. No District facilities are located in these areas.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquake liquefaction or that affected the District in any meaningful way.

Vulnerability to and Impacts from Liquefaction

Earthquake is discussed above, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas. In Sacramento County, two of these areas have been identified: downtown Sacramento and the Delta area, which could lead to a possible collapse of delta levees and any above ground structures. While this levee failure differs from the levee failure discussion below which generally focuses on levee failure due to high water conditions or other types of structural failure, the resulting impacts would be similar and include those related to a large flood event. Though no facilities are at risk, the District noted that there would be an increased call volume for rescue subject to secondary effects.

Assets at Risk

Though no facilities are at risk, the District noted that there would be an increased call volume for rescue subject to secondary effects.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

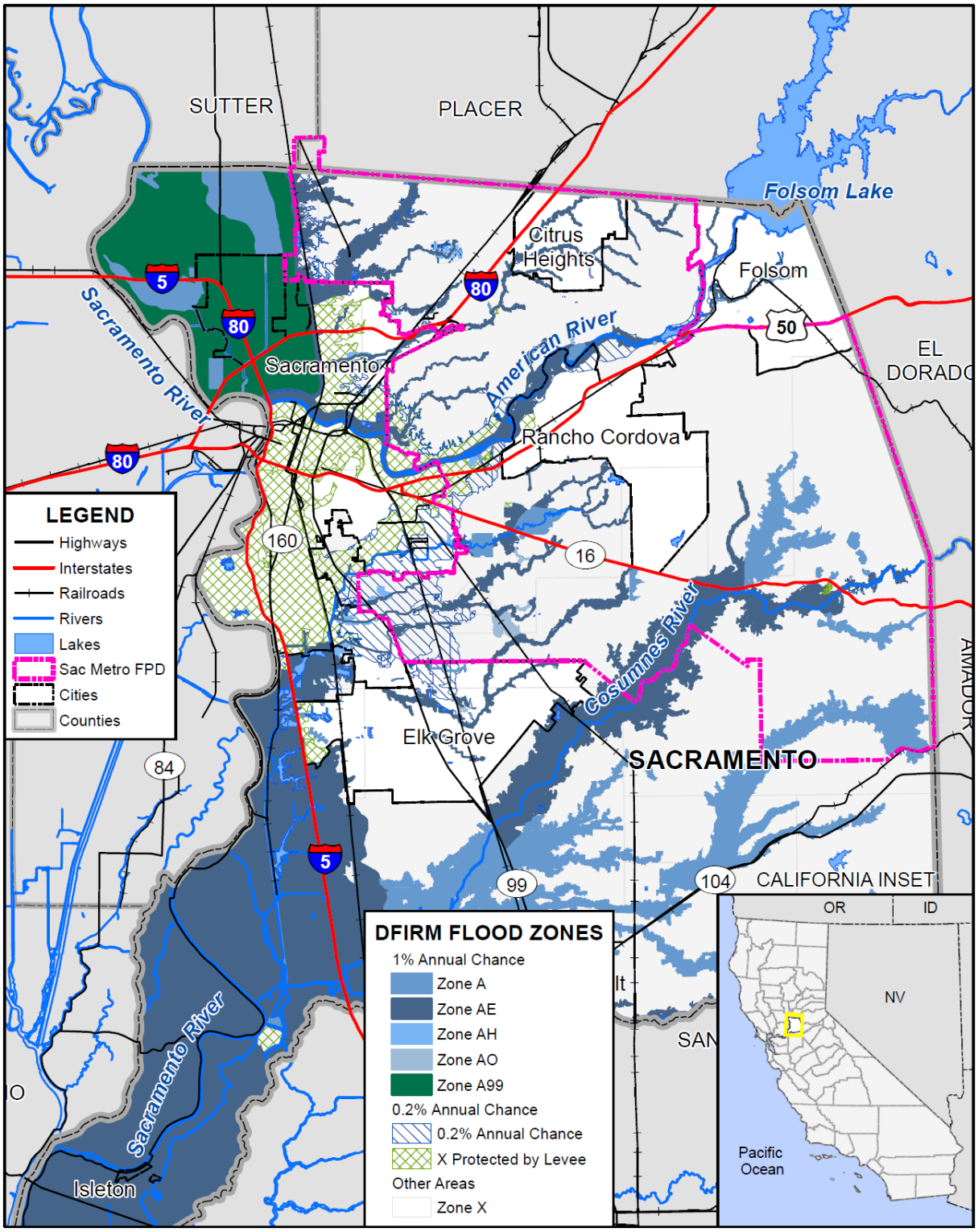
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the SMFD have been subject to historical flooding.

Location and Extent

The SMFD has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure N-5.

Figure N-5 SMFD – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento Metro Fire Protection District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table N-8 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table N-8 SMFD– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	X
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	X
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X
X	Outside of flood zones	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table N-9. These events also likely affected the District to some degree.

Table N-9 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

The District noted that the Search and Rescue team could be called upon to respond to flood events, putting those individuals at risk

Assets at Risk

The District noted that there were certain assets at risk to flooding, as shown in Table N-10.

Table N-10 SMFD Assets at Risk to Flooding

Name of Asset	Facility Type	Replacement Value ($)
Station 51	Essential	2,633,071
Station 52	Training	1,002,297
Station 53	Essential	982,137
Station 54	Essential	943,672
Station 61	Essential	1,973,109
Station 65	Essential	2,458,004
Station 105	Essential	1,960,039
Total		**$11,952,329**

Source: SMFD

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The SMFD is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

The District noted no specific areas of localized flooding that affect District facilities. While facilities may not be affected, transportation routes that are flooded can cause response times to incidents to increase.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted no past occurrences of localized flooding that caused damages to District facilities.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Assets at Risk

The District noted no specific areas of localized flooding that affect District facilities. While facilities may not be affected, transportation routes that are flooded can cause response times to incidents to increase.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

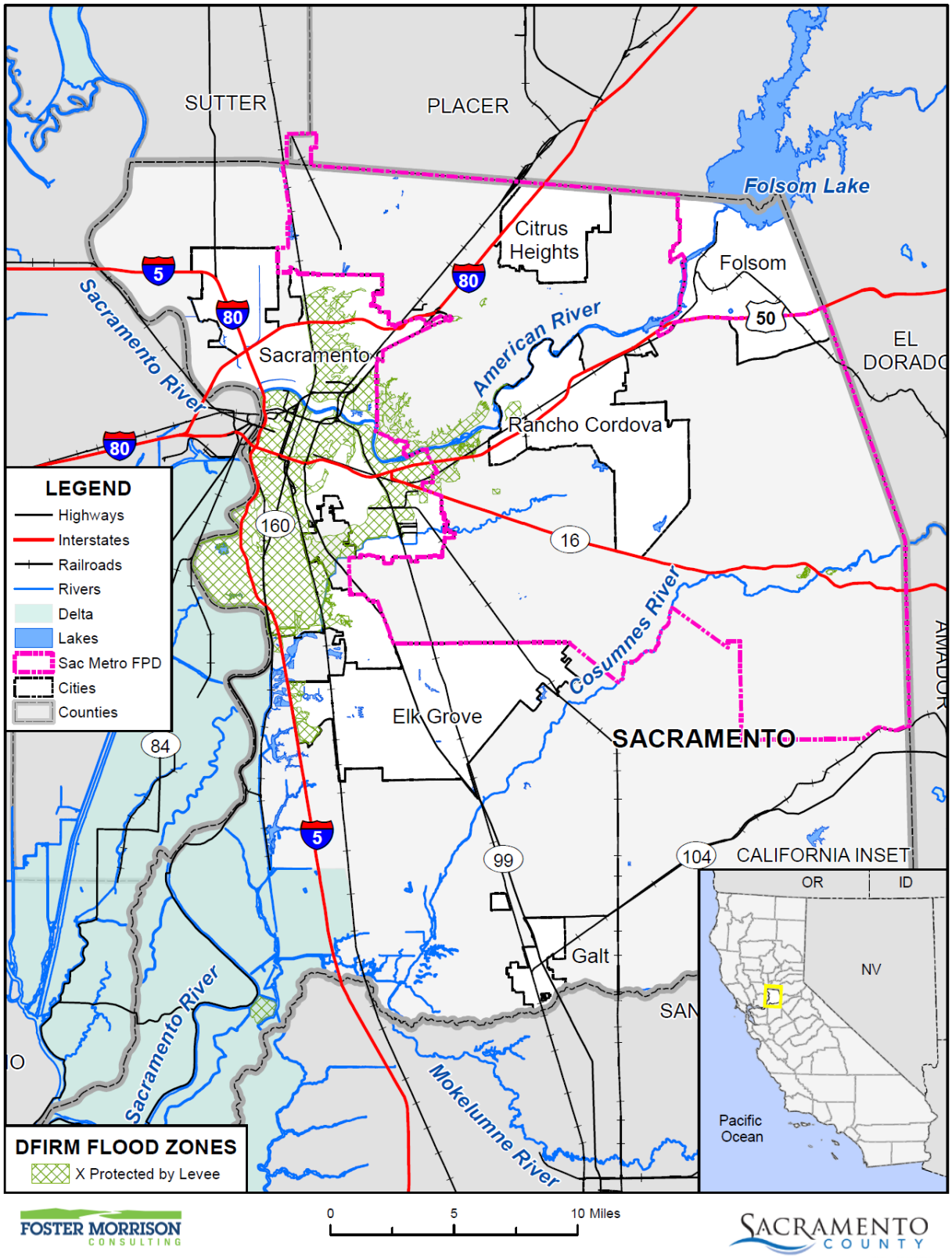
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure N-6.

Figure N-6 SMFD – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Sacramento Metro Fire Protection District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Assets at Risk

The District noted that its facilities would likely not be affected by levee failure flooding, but that there would be mutual aid and Search and Rescue responses to a levee failure.

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the District, County, and surrounding region is at risk, as pandemic is a regional, national, and international event. The speed of onset of pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no

scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table N-11.

Table N-11 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic.

- The 1918-1919 Influenza Pandemic (H1N1)
- The February 1957-1958 Influenza Pandemic (H2N2)
- The 1968 Influenza Pandemic (H3N2)

To date, the 21st century has seen two acknowledged pandemics.

- 2009 Swine Flu (H1N1)
- 2019/2020 COVID 19

Vulnerability to and Impacts from Pandemic

Pandemics have and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding the current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent the spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the District. Pandemic can have varying levels of impact to the citizens of the District and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently), and unemployment rose significantly. Supply chains for food and essentials can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

The impact of the COVID-19 pandemic on Metro Fire has been profound, both fiscally and operationally. More than one month before a State of Emergency Declaration was made in California, Metro Fire began

changing operational response protocols as the CDC confirmed the first COVID-19 case in the State on January 26, 2020. These changes altered every aspect of how service is provided, including PPE protocols, patient care protocols, supply utilization and stocking, health and safety procedures, staffing plans, and exposure reporting, among a multitude of others. Each time new guidance and recommendations were issued by public health officials, operational changes were necessary. Implementing these changes came at a significant cost. Faster PPE and supply burn rates resulted in increased PPE and supply costs; increases that were exacerbated by supply chain disruptions. Workers' compensation claims and overtime costs skyrocketed as maintaining sufficient staffing in a high-exposure environment became the norm. Labor costs were further increased to provide support to public health officials in their testing and vaccination efforts throughout the State.

While response and recovery costs were mounting, vital revenue sources were reduced, with fee-for-service EMS transport revenues plummeting for a good portion of 2020. For the Sacramento Metropolitan Fire District (Metro Fire), this impact has been a net loss of nearly $5.5 million since March of 2020, with only an estimated $1 million expected to be reimbursed through current available relief sources.

The mission of Metro Fire is to ensure the safety of our community. The losses experienced as a result of the COVID-19 pandemic have compromised the capacity to fulfill this mission, resulting in reduced service, un-funded programs, and deferred capital projects, among others. While other industries and public service agencies have access to lifeline funding, this funding has not been made available to the very agencies that provide lifeline support to the community.

Assets at Risk

Pandemics do not affect District facilities, but can affect District personnel who operate District facilities.

Severe Weather: Extreme Cold and Freeze

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

According to the National Weather Service (NWS), extreme cold often accompanies a winter storm or is left in its wake. Freezing temperatures can also occur without the accompanying winter storm.

Location and Extent

Extreme cold and freeze are regional issues, meaning the entire City is at risk to cold weather and freeze events. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of extreme cold and freeze, temperature data from the County from the WRCC indicates that there are 21.8 days that fall below 32°F in western Sacramento County. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days to weeks at a time.

Past Occurrences

There has been no federal or state disaster declarations in the County for cold or freeze. The District noted that cold and freeze is a regional phenomenon; events that affected the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.2.

Vulnerability to and Impacts from Severe Weather: Freeze and Winter Storms

The District experiences temperatures below 32 degrees during the winter months. Freeze can cause injury or loss of life to residents of the District. While it is rare for buildings to be affected directly by freeze, damages to pipes that feed building can be damaged during periods of extreme cold. This is the greatest concern to the District.

Assets at Risk

No District facilities are at direct risk from extreme cold and freeze. District response personnel would be at risk.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature." Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the District, there are risk to the built environment from extreme heat. While extreme heat on its own does not usually affect structure, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat and high winds can cause power outages and PSPS events, causing issues to buildings in the District.

Location and Extent

Heat is a regional phenomenon and affects the whole of the District. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for heat. The District Planning Team note that since extreme heat is a regional phenomenon, events that affected the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.3.

Vulnerability to and Impacts from Extreme Heat

The District experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-110°F in rather extreme situations. During these times, drought conditions may worsen. Also, power outages and PSPS events may occur during these times as well. Health impacts are the primary concern with this hazard, though economic impacts are also an issue.

Days of extreme heat have been known to result in medical emergencies, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts. Extreme heat can also dry out vegetations, making it more vulnerable to wildfire ignitions.

Many firefighter injuries are due to heat stress, which exacerbates the likelihood of a variety of injuries including muscle sprains and strains, respiratory distress, stroke, and cardiac arrest (which accounts for approximately 50% of firefighter line-of-duty deaths).

The risk of heat-related injury in wildland firefighting is something that firefighters face practically daily during fire season each year. While wearing and carrying an average of 50lbs of gear, and working in temperatures that can soar to 1,472 degrees, firefighters lose approximately 1 gallon of sweat per hour, putting them at a high risk for dehydration. Dehydration significantly affects firefighter performance, causing delays and inefficiencies, and, most importantly, compromises firefighter safety.

This risk is especially significant considering the high response rate of Metro Fire's personnel to wildland fires. Metro Fire personnel respond to more wildland fires than structure fires each year; last year, responding to 685 wildland fires that burned more than 6 times the acreage of the previous year. Additionally, Metro Fire provides automatic aid to 5 neighboring jurisdictions and mutual aid for wildland fire incidents throughout the state. In recent years, approximately 65% of Metro Fire personnel are deployed at some point during the 7-month wildland season, an average of 12 deployments per month in-season. These deployments typically last 1-2 weeks with firefighters spending 12-24 hours on shift.

Recent wildfires throughout California have resulted in billions of dollars of property loss and many fatalities for both civilians and firefighters. Some of these fires have spread at rates upward of 50 acres per minute. Minutes matter in wildland incidents. Delays and inefficiencies on the part of firefighters due to

compromised performance caused by dehydration have catastrophic implications. Ensuring proper hydration leads to a chain reaction of benefits including increased operational effectiveness and efficiency of suppression and property conservation activities, drop in property damage, and reduction of injuries and fatalities for firefighters and civilians. Proper hydration is a matter of life and death.

Assets at Risk

While the District has no assets at risk to extreme heat, District personnel would be at risk. In addition, extreme heat can exacerbate wildfire risk in the District. Facilities at risk to wildfire are discussed in the Assets at Risk section of Wildfire below.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the

ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power outage and failure can be found at the beginning of Section N.5.3 above, as well as in Section 4.3.3 of the Base Plan.

Assets at Risk

There are no District facilities at direct risk to heavy rains and storms. It is the resultant flooding that puts the District at Risk. These facilities were discussed in the Assets at Risk section of the Flood: 1%/0.2% Chance above.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power outage and failure can be found at the beginning of Section N.5.3 above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Increased PSPS events
- Occasional building damage, primarily to roofs

Assets at Risk

The District noted that all assets from Table N-4 are at risk to this hazard.

Wildfire

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

Hazard Profile and Problem Description

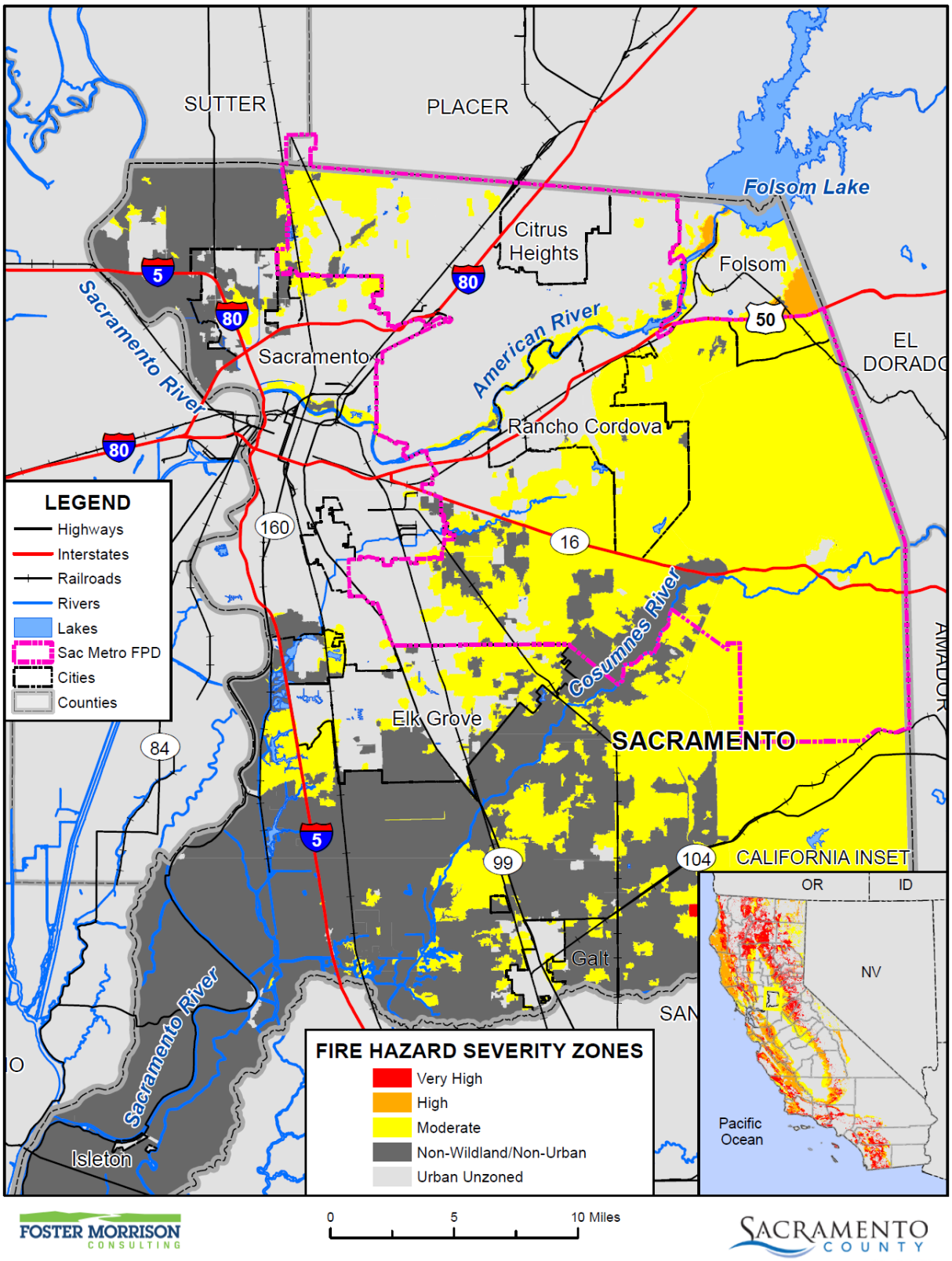
Wildland fire and the risk of a conflagration is an ongoing concern for the SMFD. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem.

Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

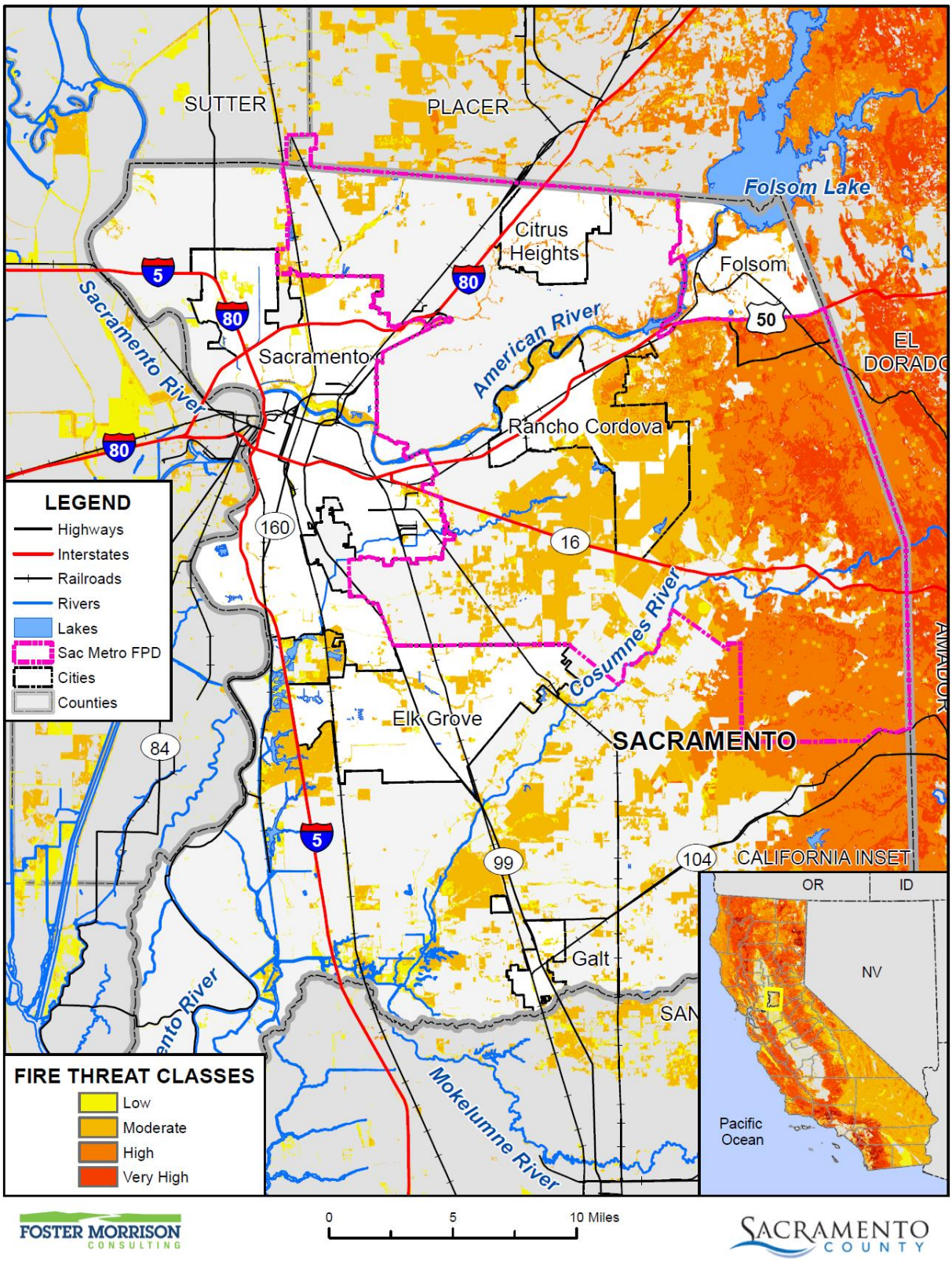
Wildfire can affect all areas of the District. CAL FIRE has estimated that the risk varies across the District and has created maps showing risk variance. Following the methodology described in Section 4.3.16 of the Base Plan, wildfire maps for the SMFD were created. Figure N-7 shows the CAL FIRE FHSZ in the District. As shown on the maps, fire hazard severity zones within the District range from Urban/Unzoned to Moderate. Figure N-8 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, fire threat within the District ranges from No Threat to High.

Figure N-7 SMFD – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento Metro Fire Protection District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure N-8 SMFD – Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento Metro Fire Protection District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more.

Past Occurrences

There has been one state and no federal disaster declarations for Sacramento County from fire. It should be noted that this was from Southern Pacific Railroad Fires and Explosions (Roseville), so it was not truly a wildfire.

Table N-12 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

The SMFD averages over 100 initial attack wildland and structure fires a year. This is usually between May and November for wildland incidents.

Vulnerability to and Impacts from Wildfire

Risk and vulnerability to the Sacramento County Planning Area and the District from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in the Planning Area, combined with a large built environment and population, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. During the May to October fire season, the dry vegetation and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and the District, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the District. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the District by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the District; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from large fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat

of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate PSPSs which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. More information on power outage and failure can be found at the beginning of Section N.5.3 above, as well as in Section 4.3.3 of the Base Plan. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

The SMFD averages over 100 initial attack wildland and structure fires a year. This is usually between May and November for wildland incidents. Prairie lands are often damaged. Grass and woodland damaged, and there are losses of crop for cattle. Minor business and economic impacts occur each year. Road and school closures are usually minor to moderate depending on incident.

Many firefighter injuries are due to heat stress, which exacerbates the likelihood of a variety of injuries including muscle sprains and strains, respiratory distress, stroke, and cardiac arrest (which accounts for approximately 50% of firefighter line-of-duty deaths).

The risk of heat-related injury in wildland firefighting is something that firefighters face practically daily during fire season each year. While wearing and carrying an average of 50lbs of gear, and working in temperatures that can soar to 1,472 degrees, firefighters lose approximately 1 gallon of sweat per hour, putting them at a high risk for dehydration. Dehydration significantly affects firefighter performance, causing delays and inefficiencies, and, most importantly, compromises firefighter safety.

This risk is especially significant considering the high response rate of Metro Fire's personnel to wildland fires. Metro Fire personnel respond to more wildland fires than structure fires each year; last year, responding to 685 wildland fires that burned more than 6 times the acreage of the previous year. Additionally, Metro Fire provides automatic aid to 5 neighboring jurisdictions and mutual aid for wildland fire incidents throughout the state. In recent years, approximately 65% of Metro Fire personnel are deployed at some point during the 7-month wildland season, an average of 12 deployments per month in-season. These deployments typically last 1-2 weeks with firefighters spending 12-24 hours on shift.

Recent wildfires throughout California have resulted in billions of dollars of property loss and many fatalities for both civilians and firefighters. Some of these fires have spread at rates upward of 50 acres per minute. Minutes matter in wildland incidents. Delays and inefficiencies on the part of firefighters due to compromised performance caused by dehydration have catastrophic implications. Ensuring proper hydration leads to a chain reaction of benefits including increased operational effectiveness and efficiency of suppression and property conservation activities, drop in property damage, and reduction of injuries and fatalities for firefighters and civilians. Proper hydration is a matter of life and death.

Assets at Risk

The District noted that there are a few fire stations at risk to wildfire, as shown on Table N-13.

Table N-13 SMFD Assets at Risk to Wildfire

Name of Asset	Facility Type	Replacement Value
Station 55	Essential	1,554,895

Name of Asset	Facility Type	Replacement Value
Station 58	Essential	996,861
Station 59	Essential	1,687,979
Total		**$4,239,735**

Source: SMFD

N.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

N.6.1. Regulatory Mitigation Capabilities

Table N-14 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the SMFD.

Table N-14 SMFD Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2021	Community Risk Assessment/ Community Risk Reduction Plan
Capital Improvements Plan		Yes
Economic Development Plan		N/A
Local Emergency Operations Plan		Yes
Continuity of Operations Plan		
Transportation Plan		N/A
Stormwater Management Plan/Program		N/A
Engineering Studies for Streams		
Community Wildfire Protection Plan		Yes, 2016
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	N	
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N/A	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N/A	Score:
Fire department ISO rating:	Varies	Rating:

Site plan review requirements		
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N/A	
Subdivision ordinance	N/A	
Floodplain ordinance	N/A	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N/A	
Flood insurance rate maps	N/A	
Elevation Certificates	N/A	
Acquisition of land for open space and public recreation uses	N/A	
Erosion or sediment control program	N/A	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
The Community Risk Reduction Plan will identify specific educational, outreach and/or enforcement programs to mitigate the District's Identified Risks. The programs are identified at the community level based on specific needs and will include benchmarks, as well as feedback, to measure effectiveness.		

Source: SMFD

N.6.2. Administrative/Technical Mitigation Capabilities

Table N-15 identifies the District department(s) responsible for activities related to mitigation and loss prevention in SMFD.

Table N-15 SMFD's Administrative and Technical Mitigation Capabilities

Administration	**Y/N**	**Describe capability Is coordination effective?**
Planning Commission	N/A	
Mitigation Planning Committee	Y	Put together for this LHMP planning effort.
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)		
Mutual aid agreements	Y	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	N	
Community Planner	N	

Civil Engineer	N	
GIS Coordinator	Y PT	
Other	Y	Exec. Director, Fire Marshal, Chief Development Officer, Administrative Specialist are trained on mitigation (though additional training is always sought). Coordination is effective.
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)		
Hazard data and information		
Grant writing	Y FT	
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Additional training is needed. The Community Risk Reduction Plan will be implemented and some of the training from it will help the District reduce risk.		

Source: SMFD

N.6.3. Fiscal Mitigation Capabilities

Table N-16 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table N-16 SMFD's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Could be used in the future
Authority to levy taxes for specific purposes	Y	No, unlikely
Fees for water, sewer, gas, or electric services		
Impact fees for new development	Y	Station Construction, unlikely
Storm water utility fee		
Incur debt through general obligation bonds and/or special tax bonds	Y	No, unlikely
Incur debt through private activities		
Community Development Block Grant		
Other federal funding programs	Y	Yes
State funding programs	Y	Yes
Other		
How can these capabilities be expanded and improved to reduce risk?		

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
The District is always looking for additional revenues to increase and expand its abilities. The District will continue to seek state, federal, and other grant sources to expand mitigation capabilities.		

Source: SMFD

N.6.4. Mitigation Education, Outreach, and Partnerships

Table N-17 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table N-17 SMFD's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	CERT
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Community Relations
Natural disaster or safety related school programs	Y	Fire Safety
StormReady certification	N	
Firewise Communities certification	Y	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The District will seek to expand its CERT teams, community relations, and mitigation partnerships with the County and the cities SMFD serves and protects.		

Source: SMFD

N.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

- The District trains firefighters on the most up to date methods of firefighting, EMT, and Search and Rescue.

N.7 Mitigation Strategy

N.7.1. Mitigation Goals and Objectives

The SMFD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

N.7.2. Mitigation Actions

The planning team for the SMFD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Earthquake Liquefaction
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Severe Weather: Wind and Tornado
- Wildfire

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Finalization and Implementation of Metro Fire's Community Risk Assessment and Associated Community Risk Reduction Plan

Hazards Addressed: Earthquake, Earthquake: Liquefaction, Flooding, Drought/Water Shortage, Pandemic, Wildfire

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Identifying and prioritizing risks at the community level is a significant investment to aid in the safety, sustainably and resiliency of the Communities Metro Fire serves. Through the completion of a comprehensive and evidence-based evaluation that identifies, prioritizes, and defines risks within a particular community, we are able to coordinate the application of resources to mitigate or minimize the occurrence and/or impact of such risks.

Project Description: Deployment of the Community Risk Reduction Plan (CRRP) based on the findings and priorities identified in the comprehensive assessment as they relate to the hazards noted above. This process provides data-driven guidance for the effective deployment of education, prevention, enforcement and/or mitigation strategies to maximize impact on safety enhancement of the community. The majority of the actionable items will relate to educational and outreach opportunities, however there will be mitigation items we would be able to incorporate and/or expand upon. Because this document is in draft form, it will be difficult to provide all mitigation measures. Some examples of potential mitigation measures might be offering residence sandbags to areas subject to flooding, assistance to the business community with emergency evacuation plans, community based projects to incorporate drought resistant/fire restive landscaping in rural/WUI areas. A more complete list of measures will be included in the final draft of Metro Fire's CRRP.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Actions will be implemented based on Metro Fire's CRRP.

Responsible Agency/ Department/Partners: Metro Fire and identified partners when applicable.

Cost Estimate: Individual and total costs for mitigation measures will be outlined in Metro Fire's CRRP.

Benefits (Losses Avoided): Continuous monitoring and evaluation along with the specific details of benefits, status updates and challenges will be outlined in Metro Fire's CRRP. The information and results will be documented and updated on an annual basis.

Potential Funding: Grant funding

Timeline: Metro Fire's CRA and CRRP will be reviewed on an annual basis with the potential of a comprehensive review and revision every 5 years.

Project Priority (H, M, L): H

Action 2. Evaluation and Implementation of Measures Necessary to Mitigate Fire Stations that Would be Directly Affected by Dam Failure

Hazards Addressed: Dam Failure

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: There are several fire stations that would be significantly impacted in the event of dam failure. These stations would become uninhabitable and apparatus and equipment would be vulnerable to damage.

- Fire Station 50
- Fire Station 51
- Fire Station 52
- Fire Station 53
- Fire Station 54
- Fire Station 61
- Fire Station 62
- Fire Station 63
- Fire Station 64
- Fire Station 65
- Fire Station 66
- Fire Station 68
- Fire Station 105
- Fire Station 106
- Fire Station 110
- Fire Station 111
- Fire Station 116
- Fire Station 117
- Headquarters
- Logistics
- 3101 Gold Canal

Project Description: Determine the extent of mitigation and retrofitting of the above noted facilities, including items such as flood proofing or relocation of the facilities to outside the inundation zone.

Other Alternatives: Elevating the fire station structures above the flood level.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Capital Improvement Plan (CIP)

Responsible Agency/ Department/Partners: Sacramento Metropolitan Fire District Chief Financial Officer

Cost Estimate: Individual and total cost estimates are listed in the CIP

Benefits (Losses Avoided): Prevents the loss of critical infrastructure facilities.

Potential Funding: Capital Improvement Funds, Grant Funding

Timeline: 5 years (CIP contains detailed timeframes)

Project Priority (H, M, L): Medium

Action 3. Modernization/Upgrade all District Facilities to Comply with Essential Services Code Requirements

Hazards Addressed: Multi-Hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Earthquake Liquefaction, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Severe Weather: Wind and Tornado, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: All of Metro Fire's facilities are categorized as essential services facilities, thus requiring upgrades for code compliance.

Project Description: Upgrade fire stations to address all hazard related codes/best practices and/or locate suitable properties and construct new fires stations to replace the current station locations vulnerable to natural hazards. This includes relocating/hardening all facilities to withstand severe weather events, flooding, levee failure, dam failure, and other natural hazards of concern.

Other Alternatives: Relocation of specific facilities.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Capital Improvement Plan (CIP)

Responsible Agency/ Department/Partners: Sacramento Metropolitan Fire District Chief Financial Officer

Cost Estimate: Individual and total cost estimates are listed in the CIP, Grant Funds

Benefits (Losses Avoided): Prevents the loss of critical infrastructure facilities.

Potential Funding: Capital Improvement Funds, Grant Funding

Timeline: 5-10 years (CIP contains detailed timeframes)

Project Priority (H, M, L): Medium

Action 4. Community Wildfire Protection Plan (CWPP) – Revision and Implementation of Resulting Changes

Hazards Addressed: Wildfire

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: There is a significant portion of Metro Fire's jurisdiction that consists of larger rural/agricultural properties that remain undeveloped and/or will not be developed in the foreseeable future. Many of these properties are adjacent to pockets of smaller, developed residential communities posing a potential threat to life and property.

Project Description: Mitigate the loss of life and property during wildfires, with drought like conditions compounding and intensify fire behavior. These measures will be implemented through a combination of education, outreach, fuels reduction and enforcement.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Community Wildfire Protection Plan

Responsible Agency/ Department/Partners: Community Risk Reduction Division

Cost Estimate: Total and individual costs will be outlined in Metro Fire's CWPP.

Benefits (Losses Avoided): Mitigate the potential for property loss in rural/agricultural areas by reducing ignitable fuels and the ignition potential for structures.

Potential Funding: Grant Funding, Staff time

Timeline: 1-2 years

Project Priority (H, M, L): high

Action 5. Relocate the Essential Facilities in the 200 year Floodplain

Hazards Addressed: Flooding

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Three fire stations are located within the 200 year flood plain of the American River. These stations would become uninhabitable during a significant flood. Apparatus ad equipment are vulnerable to damage.

- Fire Station 51
- Fire Station 52
- Fire Station 53
- Fire Station 54
- Fire Station 61
- Fire Station 65
- Fire Station 105

Project Description: Locate suitable properties and construct the new fires stations to replace the current station locations falling within the flood plain.

Other Alternatives: Elevating the fire station structures above the flood level.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Capital Improvement Plan (CIP)

Responsible Agency/ Department/Partners: Sacramento Metropolitan Fire District Chief Financial Officer

Cost Estimate: Individual and total cost estimates are listed in the CIP

Benefits (Losses Avoided): Prevents the loss of critical infrastructure facilities.

Potential Funding: Capital Improvement Funds, Grant Funding

Timeline: 5 years (CIP contains detailed timeframes)

Project Priority (H, M, L): Medium

Annex O Sacramento Regional County Sanitation District

O.1 Introduction

This Annex details the hazard mitigation planning elements specific to Sacramento Regional County Sanitation District (SRCSD, Regional San, or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to Regional San, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

O.2 Planning Process

As described above, Regional San followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table O-1. Additional details on plan participation and District representatives are included in Appendix A.

Table O-1 Regional San – Planning Team

Name	Position/Title	How Participated
Steve Nebozuk	Senior Civil Engineer	HMPC: collect data, draft text, review documents, attend meetings
Vyomini Upadhyay	Associate Civil Engineer	HMPC: collect data, draft text, review documents, attend meetings
Piper Crawford	Assistant Civil Engineer	HMPC: collect data, draft text, review documents, attend meetings
Bryan Young	Natural Resource Supervisor	Natural Resource Updates: draft text, review documents
Roger Jones	Senior Natural Resources Specialist	Natural Resource Updates: draft text, review documents
Jack Naves	GIS Analyst 3	GIS data collection
William Yu	Senior Civil Engineer	Information on EchoWater costs
Raul Rodriguez	GIS Analyst 2	Update Hazard tables based on new hazard layers

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved

2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table O-2.

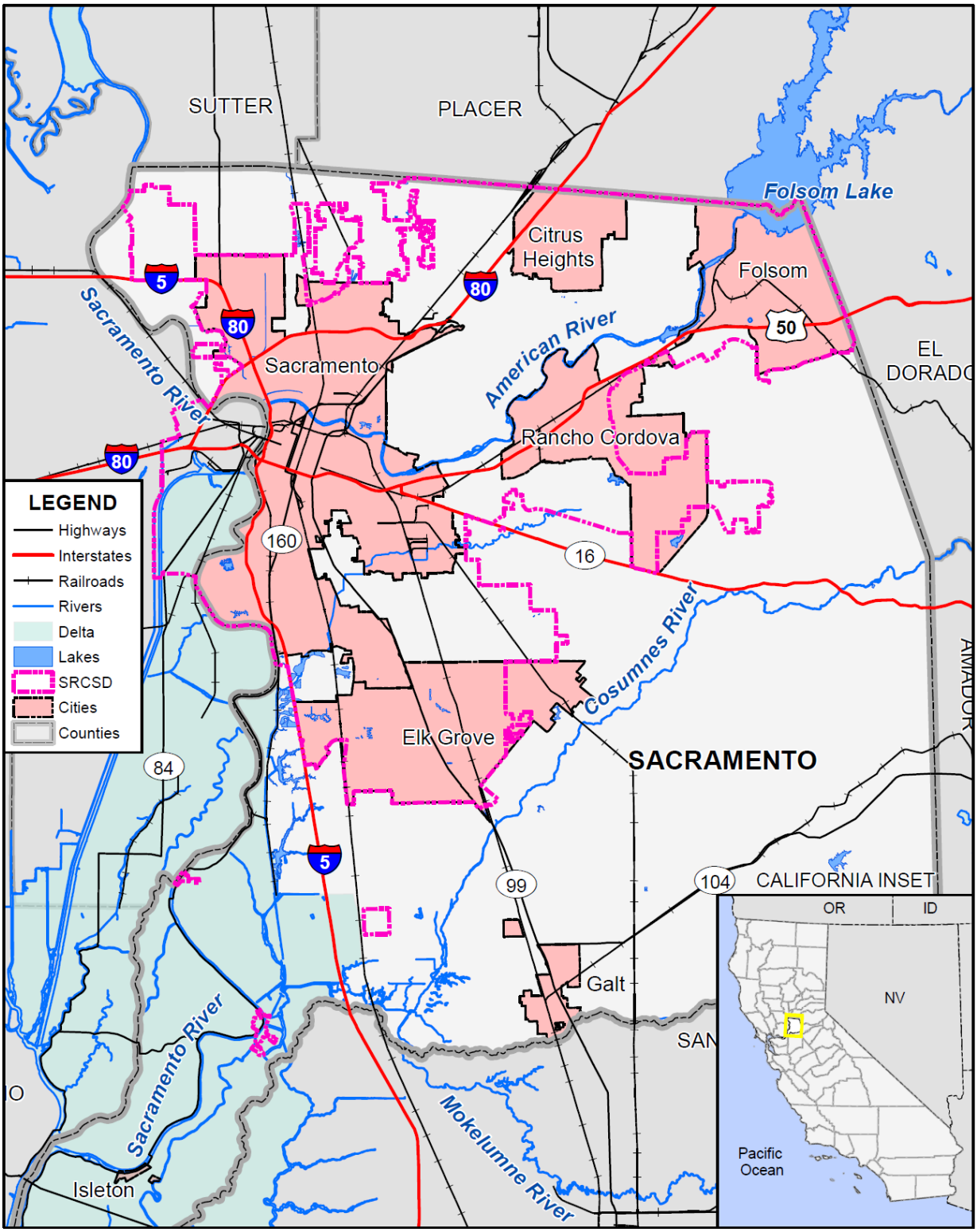
Table O-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
N/A	No mitigation related planning mechanisms have been completed since 2016.

O.3 District Profile

The District profile for Regional San is detailed in the following sections. Figure O-1 displays a map and the location of the District within Sacramento County.

Figure O-1 Regional San



Data Source: Sacramento Regional County Sanitation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

O.3.1. Overview and Background

The following is a brief history about the Sacramento Regional County Sanitation District.

Following World War II, the Sacramento region grew, and wastewater treatment plants were built along the Sacramento and American Rivers to accommodate the population increase. In the early 1970s, 22 separate wastewater collection and treatment systems collected and treated the wastewater for the 600,000 residents of the Sacramento region. All of the plants discharged into local waterways, and many discharged into the American River.

In 1973, the County of Sacramento and the City of Sacramento joined forces and, together with the City of Folsom, formed the Sacramento Regional County Sanitation District. The Regional San assumed responsibility for wastewater treatment facilities, which were operated by the County's Water Quality Division. As a result, $460 million was invested in development of a regional wastewater collection and treatment program. A regional system of interceptor pipelines gathered sewage flow from various areas and conveyed the flow to the County Central Plant in Elk Grove.

In 1976, with one of the largest single grants in the nation under the Federal Water Pollution Control Act Amendments of 1972, commonly known as the Clean Water Act, the District upgraded the County Central Plant and entered into construction contracts to build the Sacramento Regional Wastewater Treatment Plant (SRWTP), the City Interceptor and the Emergency Storage Basins. Construction of the SRWTP was completed in 1982 and the facility began treating 136 million gallons per day. The SRWTP was designed to be a pure oxygen activated sludge treatment plant that provided secondary treatment and disinfection.

Regional San provides wastewater service to the cities of Sacramento, Citrus Heights, Folsom, Ranch Cordova and Elk Grove, and the unincorporated area of Sacramento County. In 2007, the City of West Sacramento, in Yolo County, connected to the Regional San system. In 2010, the Delta communities of Courtland and Walnut Grove were connected to the Regional San system.

December 9, 2010, the Central Valley Regional Water Quality Control Board adopted a new NPDES permit for the SRWTP. This permit mandates strict new standards for the SRWTP requiring nutrient removal and filtration. Regional San has initiated the EchoWater Project. Per the terms of the permit, the EchoWater Project has to be constructed and operational beginning in 2021 for nutrient removal and by 2023 for filtration. The estimated cost for the EchoWater Project is $1.7 billion.

Today, as the only regional provider of sewer collection and treatment services for the greater Sacramento area, Regional San continues to maintain its status as a leader in environmental stewardship through quality service and efficient projects and programs.

Regional San provides sewer service to the cities of Citrus Heights, Elk Grove, Folsom, Rancho Cordova, Sacramento, West Sacramento, the unincorporated areas of Sacramento County and portions of Yolo County.

O.4 Hazard Identification

Regional San identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table O-3).

Table O-3 Regional San—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Negligible	Low	–
Dam Failure	Significant	Unlikely	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Low	High
Earthquake	Extensive	Occasional	Catastrophic	Low	Low
Earthquake Liquefaction	Limited	Occasional	Critical	Low	Low
Floods: 1%/0.2% annual chance	Significant	Unlikely	Negligible	Low	Medium
Floods: Localized Stormwater	Extensive	Highly Likely	Negligible	Low	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Unlikely	Critical	High	Medium
Pandemic	Extensive	Likely	Negligible	Medium	Low
Severe Weather: Extreme Cold and Freeze	Extensive	Highly Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Negligible	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Negligible	Low	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Negligible	Low	Low
Subsidence	Significant	Highly Likely	Negligible	Low	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Negligible	Medium	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

O.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

O.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 0, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table O-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

O.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the Regional San's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> *Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table O-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. Regional San's physical assets, valued at over $5.8 billion, consist of the buildings and infrastructure to support the District's operations.

Table O-4 Regional San Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Affect the Asset?
Underground Pipeline, Structures, Equipment and Appurtenances (2)	Essential	$2,221,657,200	Dam failure, Levee failure, Flood
S94 – Regional Wastewater Treatment Plant	Essential	$2,826,033,042 (4)	Dam failure, Levee failure, Flood, Severe Weather
SRWTP Perimeter Levee	Essential	$11,445,347	Dam failure, Levee failure, Flood, Earthquake
SRWTP Outfall Facility	Essential	$16,737,266	Dam failure, Levee failure, Flood, Earthquake?
N50 – South River Pump Stn	Essential	$125,925,748	Dam failure, Levee failure, Flood, Severe Weather
N51 – New Natomas Pump Stn	Essential	$109,050,972	Dam failure, Levee failure, Flood, Severe Weather
N40 – Iron Point Pump Stn	Essential	$15,831,075	Dam failure, Levee failure, Flood, Severe Weather
N52 – Power Inn Pump Stn	Essential	$9,595,578	Dam failure, Levee failure, Flood, Severe Weather
N19 – Arden Pump Stn	Essential	$43,650,971	Dam failure, Levee failure, Flood, Severe Weather
N53 – Van Maren Pump Stn	Essential	$26,557,887	Dam failure, Levee failure, Flood, Severe Weather
N27 – Sump 55 Facility	Essential	$18,500,755	Dam failure, Levee failure, Flood, Severe Weather
N28 – Sump 119 Facility	Essential	$17,777,768	Dam failure, Levee failure, Flood, Severe Weather
N29 – Sump 2/2A Facility	Essential	$10,103,210	Dam failure, Levee failure, Flood, Severe Weather
N35 – Sump 76 Facility	Essential	$4,024,703	Dam failure, Levee failure, Flood, Severe Weather
N43 – Roseville/Watt Liquid Waste Disposal Facility	High Potential Loss	$4,350,180	Dam failure, Levee failure, Flood, Severe Weather
S33 – Cordova Pump Stn	Essential	$18,663,866	Dam failure, Levee failure, Flood, Severe Weather
S55 – Northeast Pump Stn	Essential	$1,329,255	Dam failure, Levee failure, Flood, Severe Weather
N15, N16 – Northeast Siphon	Essential	$10,361,710	Dam failure, Levee failure, Flood, Severe Weather
Bufferlands and Environmental Mitigation Lands	Natural Resource	$12,200,900	Fire, Dam failure, Levee failure, Flood, Severe Weather
Sims Ranch	Historic Resource	145,961	Fire, Dam failure, Levee failure, Flood, Severe Weather

Name of Asset	Facility Type	Replacement Value	Which Hazards Affect the Asset?
Nicolaus Dairy	Historic Resource	1,333,666	Fire, Dam failure, Levee failure, Flood, Severe Weather
Regional San Archeological Site CA-SAC-83	Cultural Resource	(3)	Fire, Dam failure, Levee failure, Flood, Severe Weather
Real Property, Land and Easements	Essential	$71,051,726	
Buildings	Essential	$223,987,995	
TOTAL		**$5,800,316,781**	

Source: Regional San Finance, Engineering, and Policy and Planning Offices

(1) Asset value includes facility, site structures, site equipment, mobile equipment, miscellaneous items that may have soft cost components, some associated adjacent pipeline components. Values taken from Regional San 2010 Comprehensive Annual Financial Report, and engineering project reports. Values from the 2011 LHMP have been escalated 4% per year for inflation.

(2) Pipelines include gravity and force mains ranging in size from 36-inch to 144-inch. Structures and appurtenances include valves, vaults, junction structures, flow meters, and roller gates, etc.

(3) Costs for these sites have not been estimated.

(4) EchoWater costs are included in the Sacramento Regional Wastewater Treatment Plant value.

An inventory of facilities in the Regional San is summarized in Table O-5 and shown in Figure O-2.

Table O-5 Regional San Facilities: Summary Table

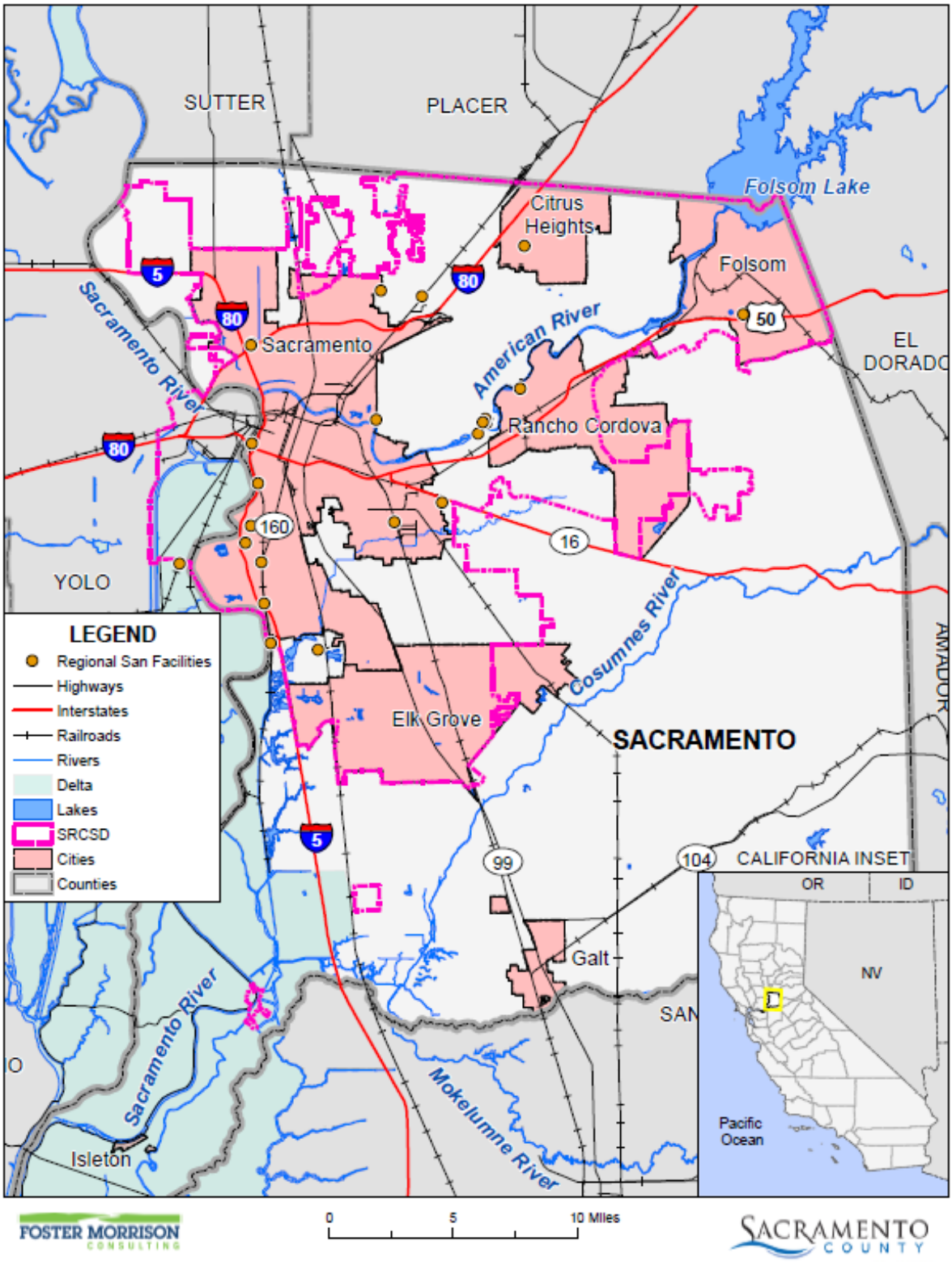
CF Definition Category	Type	Total by Location
Essential Services Facilities	Sewer Pipelines (1)	169 miles
Essential Services Facilities	Pipe Structures & Appurtenances (2)	27
Essential Services Facilities	Sewer Pump Stations	11
Essential Services Facilities	Siphon	1
Essential Services Facilities	Regional Wastewater Treatment Plant	1
Essential Services Facilities	SRWTP Perimeter Levee	1
Essential Services Facilities	SRWTP Outfall Facility	1

Source: Regional San

(1) Pipelines include gravity-flow pipes and force main pipes and range in size from 36-inch to 120-inch.

(2) Appurtenances include underground valves, vaults, junction structures, flow meters, and roller gates.

Figure O-2 Regional San Key Assets



Data Source: Sacramento Regional County Sanitation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Source: Regional San

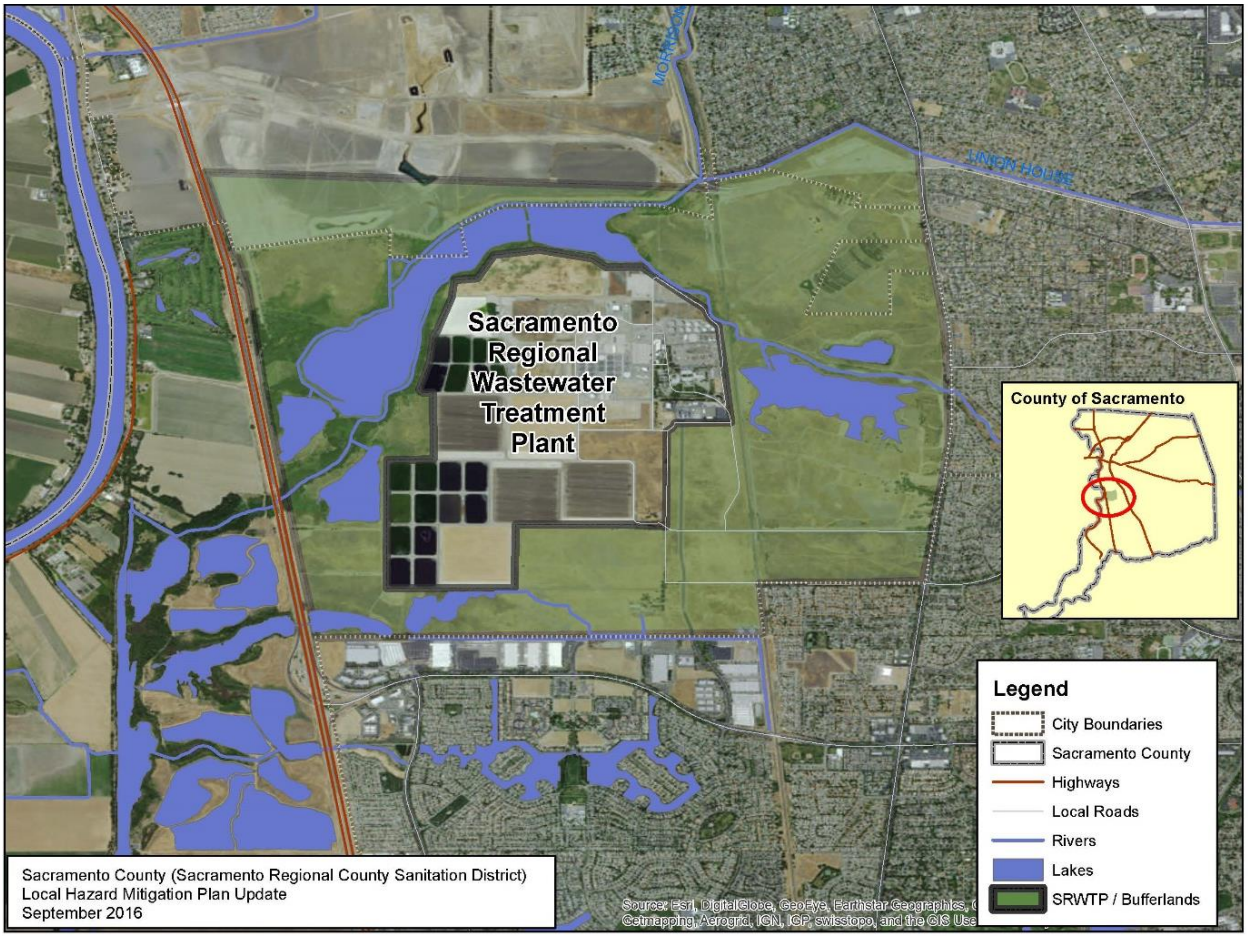
Natural Resources

Regional San has a variety of natural resources of value to the District. It is important for Regional San to operate its regional wastewater treatment facility in a manner so as to provide efficient and reliable service while minimizing impacts of the facility to the adjacent communities. In the 1970s, the District planned a large undeveloped buffer area between the Sacramento Regional Wastewater Treatment Plant and the surrounding residential neighborhoods in southern Sacramento County. That farsighted decision led to conservation of increasingly scarce wetlands, grasslands and riparian forest habitats on Regional San's 2,150 acres of Bufferlands. The District has the following natural resources of value to the local communities;

Regional San Bufferlands: Surrounding the Sacramento Regional Wastewater Treatment Plant in Elk Grove is the Bufferlands. This 2,150-acre expanse, shown in Figure O-3, of open space minimizes the potential for odor and other nuisances that could impact the surrounding neighborhoods. The Bufferlands has been developed into an important natural area that provides a large contribution of high quality wildlife habitat, farmland and open space. It provides a varied mix of upland and wetland habitats and important wildlife area, supporting over 240 species of birds, 25 species of mammals and several dozen native fish, amphibians and reptiles. The Bufferlands is also home to more than 20 species of rare plants (Table O-6) and animals (Table O-7) including several threatened and endangered species such as Swainson's hawks, burrowing owl, vernal pool fairy shrimp and giant garter snakes.

Through grant funding and mitigation efforts, Regional San has restored or created approximately 250 acres of managed seasonal wetlands, 100 acres of open water and emergent marsh, 350 acres of native grasslands, and the establishment of over 35,000 trees in restored riparian forests and oak woodlands covering nearly 250 acres. These restoration efforts augment the upland, wetland, and forest habitat that previously existed on the Bufferlands, including Laguna, Unionhouse, and Morrison Creeks, four small lakes, nearly 25 acres of vernal pools, approximately 50 acres of mature riparian forest, and hundreds of acres of annual grassland. Approximately 700 acres of the Bufferlands is leased for agricultural production. Row crop, hay crop, and rangeland leases are all managed to be compatible with conservation efforts occurring throughout the Bufferlands.

Figure O-3 Regional San Bufferlands



Source: Regional San, 2016

Table O-6 Special Status Plant Species that Occur or that May Occur on the Bufferlands

Species	Status*Federal/ State/CNPS	Habitats	Flowering Period
Dwarf downingia *Downingia pusilla*	X/X/2	Vernal pools and vernally wet areas in annual grasslands	March–May
Stinkbells *Fritillaria agrestis*	X/X/4	Clay depressions or other areas with heavy soils in chaparral, cismontane woodland, and annual grassland	March–April
Bogg's Lake hedge-hyssop *Gratiola heterosepala*	X/E/1B	Shallow water and margins of vernal pools	April–June
Ahart's dwarf rush *Juncus leiospermus var. ahartii*	X/X/1B	Margins of vernal pools	March–May
Legenere *Legenere limosa*	X/X/1B	Vernal pools and other vernally wet areas	May–June
Pincushion navarretia *Navarretia myersii*	X/X/1B	Vernal pools	May

Species	Status*Federal/ State/CNPS	Habitats	Flowering Period
Slender orcutt grass *Orcuttia tenuis*	T/E/1B	Vernal pools	May–June
Sacramento orcutt grass *Orcuttia viscida*	E/E/1B	Vernal pools	May–June
Sanford's arrowhead *Sagittaria sanfordii*	X/X/1B	Ponds, ditches, marshes, and other shallow freshwater habitats	May–August

Source: Regional San, 2016

* Status explanations

Federal

E = listed as endangered under the federal Endangered Species Act.

T = listed as threatened under the federal Endangered Species Act.

SC =species of concern (species for which existing information may warrant listing but for which substantial biological information to support a proposed rule is lacking).

X = no status definition

State

E = listed as endangered under the California Endangered Species Act

X = no status definition

California Native Plant Society

1B = List 1B species (rare, threatened, or endangered in California and elsewhere).

2 = List 2 species (rare, threatened, or endangered in California but more common elsewhere).

4 = List 4 species (plants of limited distribution).

Table O-7 Special Status Wildlife Species that Occur or that May Occur on the Bufferlands

Species	Status* Federal/State	Habitats	Potential for Occurrence
Vernal pool fairy shrimp *Branchinecta lynchi*	T/X	Common in vernal pools; also found in sandstone rock outcrop pools.	Present
Vernal pool tadpole shrimp *Lepidurus packardi*	E/X	Vernal pools and ephemeral.	Present
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/X	Riparian and oak savanna habitats with elderberry shrubs; elderberries are host plant.	Present
Northwestern pond turtle *Clemmys marmorata marmorata*	SC/SSC	Woodlands, grasslands, and open forests; occupies ponds, marshes, rivers, streams, and irrigation canals that have muddy or rocky bottoms and contain watercress, cattails, water lilies, or other aquatic vegetation	Present
Giant garter snake *Thamnophis gigas*	T/T	Sloughs, canals, and other small water-ways where there is a prey base of small fish and amphibians; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter	Present
White-tailed kite *Elanus leucurus*	X/FP	Low foothills and valley areas with valley or live oaks, riparian areas, and marshes; requires access to open grasslands for foraging	Present

Species	Status* Federal/State	Habitats	Potential for Occurrence
Northern harrier *Circus cyaneus*	X/SSC	Grasslands, meadows, marshes, and seasonal and agricultural wetlands providing tall cover	Present
Swainson's hawk *Buteo swainsoni*	X/T	Nests in oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grain fields.	Present
Ferruginous hawk *Buteo regalis*	SC/SSC	Open terrain in plains and foothills where ground squirrels and other prey are available.	Present
Golden Eagle *Aquila chrysaetos*	X/FP	Forages in grasslands, deserts and other open terrain.	Present
Bald Eagle *Haliaeetus leucocephalus*	X/E	Forages near lakes, rivers, and coastlines where prey is abundant.	Present
American peregrine falcon *Falco peregrinus anatum*	E/E	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large populations of other bird species	Present
Greater sandhill crane *Grus canadensis tabida*	X/T	Summers in open terrain near shallow lakes or freshwater marshes; winters on plains and in valleys near bodies of fresh water.	Present
Lesser sandhill crane *Grus canadensis tabida*	X/SSC	Summers in open terrain near shallow lakes or freshwater marshes; winters on plains and in valleys near bodies of fresh water.	Present
Least Tern *Childonias niger*	E/E	Nests on gravel roads around wastewater treatment ponds.	Present
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	X/E	Wide, dense riparian forests with a thick understory of willows for nesting; prefers sites with a dominant cottonwood overstory for foraging; may avoid valley-oak riparian habitats where scrub jays are abundant	Low
Western burrowing owl *Athene cunicularia hypugea*	SC/SSC	Rodent burrows in sparse grassland, desert, and agricultural habitats	Present
Long-eared owl *Asio otus*	X/SSC	Dense riparian stands of willows, cottonwoods, live oaks, or conifers; uses adjacent open lands for foraging. Nests in abandoned crow, hawk, or magpie nests	Present
Short-eared owl *Asio flammeus*	X/SSC	Freshwater and salt marshes, lowland meadows, and irrigated alfalfa fields; needs dense tules or tall grass for nesting and for daytime roosting	Present

Species	Status* Federal/State	Habitats	Potential for Occurrence
Little willow flycatcher *Empidonax traillii brewsteri*	SC/E	Riparian areas and large, wet meadows with abundant willows for breeding; usually found in riparian habitats during migration	Present
Purple martin *Progne subis*	X/SSC	Nests in abandoned woodpecker holes in valley oak and cottonwood forests; also nests in vertical drainage holes under elevated freeways and highway bridges. Requires open areas for feeding	Low
Bank swallow *Riparia riparia*	X/T	Nests in bluffs or banks, usually adjacent to water, where the soil consists of sand or sandy loam that allows digging	Present
Loggerhead shrike *Lanius ludovicianus*	X/SSC	Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches	Present
Least Bell's vireo *Vireo bellii pusillus*	E/E	Riparian thickets either near water or in dry portions of river bottoms; may also be found using mesquite and arrow weed in desert canyons. Nests along margins of bushes and forages near the ground	Present
California yellow warbler *Dendroica petechia brewsteri*	X/SSC	Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral; may also use oaks, conifers, and urban areas near streamcourses.	Present
Yellow-breasted chat *Icteria virens*	X/SSC	Nests in dense riparian habitats dominated by willows, alders, Oregon ash, tall weeds, blackberry vines, and grapevines	Present
Tricolored blackbird *Agelaius tricolor*	SC/C	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or at upland sites with blackberries, nettles, thistles, and grainfields; nesting habitat must be large enough to support 50 pairs. Probably requires water at or near the nesting colony. Requires large foraging areas where insect prey is abundant, such as marshes, pastures, agricultural wetlands, dairies, and feedlots	Present
Pallid bat *Antrozous pallidus*	X/SSC	Rocky outcrops, cliffs, and crevices for Low roosting; requires access to open habitats for foraging	Low

Source: Regional San, 2016

* Status explanations

Federal

E = listed as endangered under the federal Endangered Species Act.

T = listed as threatened under the federal Endangered Species Act.
C = species for which U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded.
SC = species of concern (species for which existing information may warrant listing but for which substantial biological information to support a proposed rule is lacking).
X = no status definition.
State
E = listed as endangered under the California Endangered Species Act.
T = listed as threatened under the California Endangered Species Act.
C = Candidate species for listing under California Endangered Species Act.
FP = fully protected under the California Fish and Game Code.
SSC = species of special concern in California.
X = no status definition.

South River Pump Station Habitat Area: To the north and west of the South River Pump Station in Yolo County, Regional San owns approximately 26-acres of open space. This property was previously used as a private hunting and fishing reserve. The property contains approximately 10 acres of wetlands including the northern tip of Glide Lake, consisting primarily of open water with emergent marsh on the margins. Additionally, there are several acres of mature valley oak woodland and several mature elderberry shrubs on the site.

Regional San Parkway Site: A 29-acre site within the American River Parkway in the vicinity of William B Pond is owned by Regional San. This site is predominately landscaped with irrigated turf grass. Mature native and non-native trees within the landscape provide habitat for the wide variety of wildlife that utilize the parkway.

Historic and Cultural Resources

Regional San has a variety of historic and cultural resources of value to the District. The Sacramento Regional County Sanitation District has several significant historic and cultural resources on the Bufferlands surrounding the Sacramento Regional Wastewater Treatment Plant.

- Regional San Archeological Site CA-SAC-83: An archeologically significant prehistoric and archeological site designated CA-SAC-83 exists in the Bufferlands west of the SRWTP. Artifacts including beads, shell, obsidian, slate, baked clay, charcoal, and human bone provide evidence that a Plains Miwok village once existed in this area.
- Nicolaus Dairy and Sims Ranch: Two post-European settlement resources are located on the Bufferlands. The historic Sims Ranch is located on the eastern side of the Bufferlands. This large ranch was established in 1850. While none of the original structures remain on this property, two houses built by the grandsons of the original property settler, Joseph Sims, remain at the site. These houses are regarded as excellent examples of Minimal Tradition style construction that speak to the frugal, no-frills era of the Great Depression. Both houses meet the criteria for listing in the National and California Register of Historic Places. The Nicolaus Dairy occurs in the southern portion of the Bufferlands. The Craftsman-style residence on this property dates back to 1914. While no longer in operation, the Nicolaus Dairy retains elements of a small scale 1949 dairy which contributes to its importance to local history. The historic core of this ranch also meets the criteria for listing within the National and California Register of Historic Places. The District is in process of repurposing the Nicolaus Dairy for educational outreach program for regional elementary schools.

Figure O-4 Bufferlands in the Vicinity of Historic Sims Ranch

Source: Regional San

Growth and Development Trends

Growth and development trends within the contributing agencies including the cities of Citrus Heights, Elk Grove, Folsom, Rancho Cordova, Sacramento, West Sacramento (in Yolo County), and the unincorporated portions of Sacramento County may result in increased flows to the Sacramento Regional Wastewater Treatment Plant, owned and operated by the Regional San. The District's growth and development trends typically mirror those of Sacramento County, portions of Yolo County, and the surrounding communities served by Regional San as described in the base plan. Based on the Sacramento Area Council of Governments (SACOG) 2008 projections, the Sacramento Regional Wastewater Treatment Plant service area population is expected to increase by approximately 80 percent between 2020 and 2070. The influent average dry weather flow (ADWF) is expected to increase proportionally (Biosolids Management Plan, 2021).

Development since 2016

Since 2016, various EchoWater improvements have come online, including the Biological Nutrient Removal (BNR) and Nitrifiying Sidestream Treatment (NST) projects. The constructed improvements are located at the Sacramento Regional Wastewater Treatment Plant and do not add any identifiable hazards. Regional San has also switched the disinfection process from gaseous to liquid chlorine. As such, a change in vulnerability is unlikely.

Future Development

Though the District has no influence on future development in the service area the District reviews development plans and addresses sewer service timelines. Future development in these areas parallels that of the cities of Citrus Heights, Elk Grove, Folsom, Rancho Cordova, Sacramento, West Sacramento (in Yolo County), and the unincorporated portions of Sacramento County. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan and in each City's Annex to this Plan Update.

The Sacramento Regional Wastewater Treatment Plant will see the EchoWater project completed by the end of 2023, which will produce cleaner water for discharge to the Sacramento River as well as for potential reuse for recycled water (regionalsan.com/echowater-project.com). Regional San is also in early stages of design on a recycled water program called Harvest Water, which will deliver up to 50,000 acre-feet per year of recycled water to the south county for agricultural irrigation and habitat lands creation and protection. Similarly, Regional San has recently began the Biogas Cogeneration project which will pursue an alternative use for its biogas as well as finding exemption from "covered" process regulations.

O.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table O-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan. Regional San is connected to the backbone of the Sacramento Municipal Utility District (SMUD) 69kV distribution system with dual redundant feeds. In additional, Regional San has the ability to power their facilities with a direct connection from SMUD's Carson Energy Plant which is located on Regional San's property. Therefore, Regional San's risk to power outages is low.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan. Though SMUD may need to initiate a PSPS event, Regional San is not likely to be affected by the outage, as it is unlikely SMUD will de-energize their 69kV system. SMUD has not issued a PSPS in the past.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If

prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

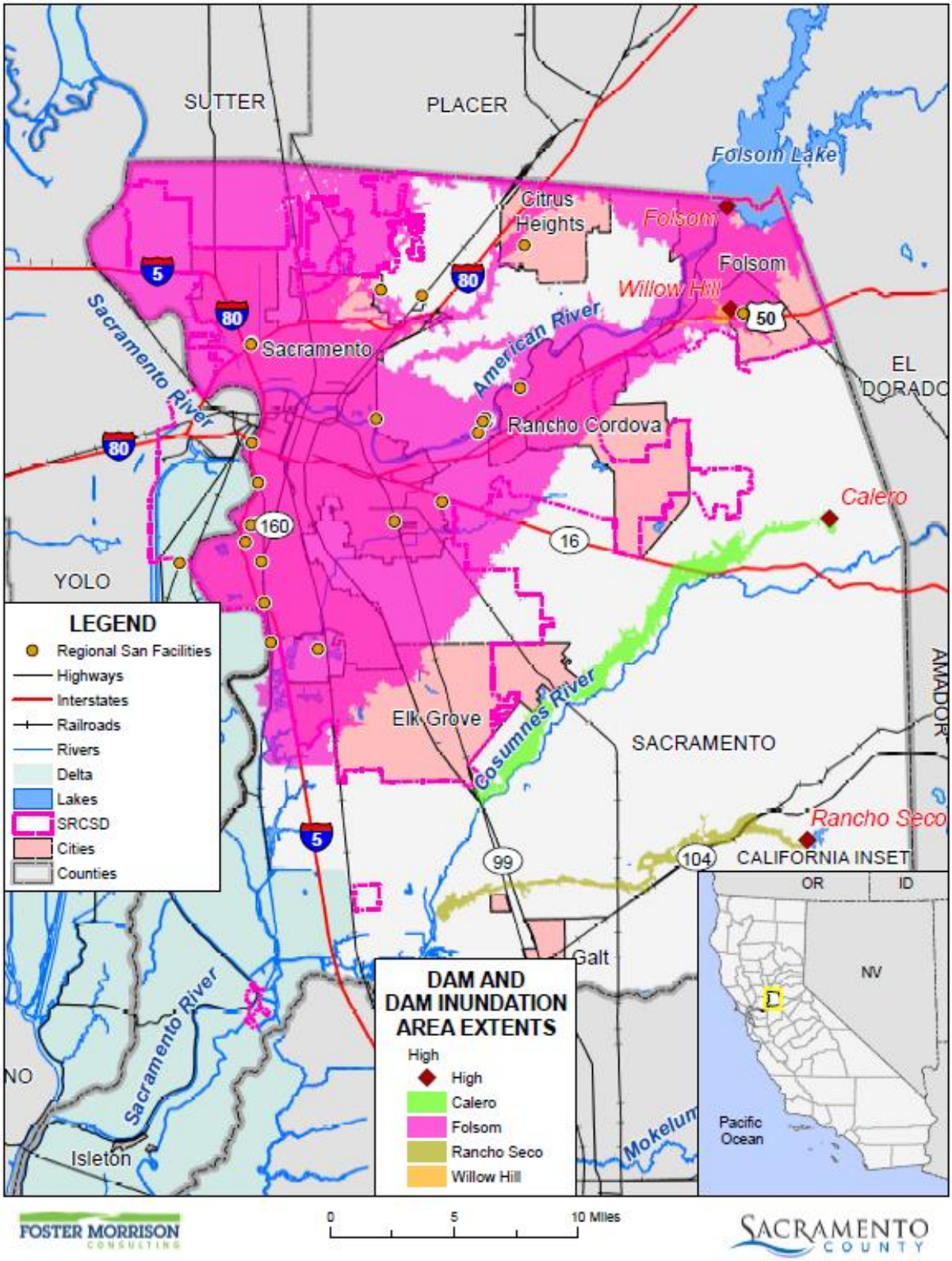
Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

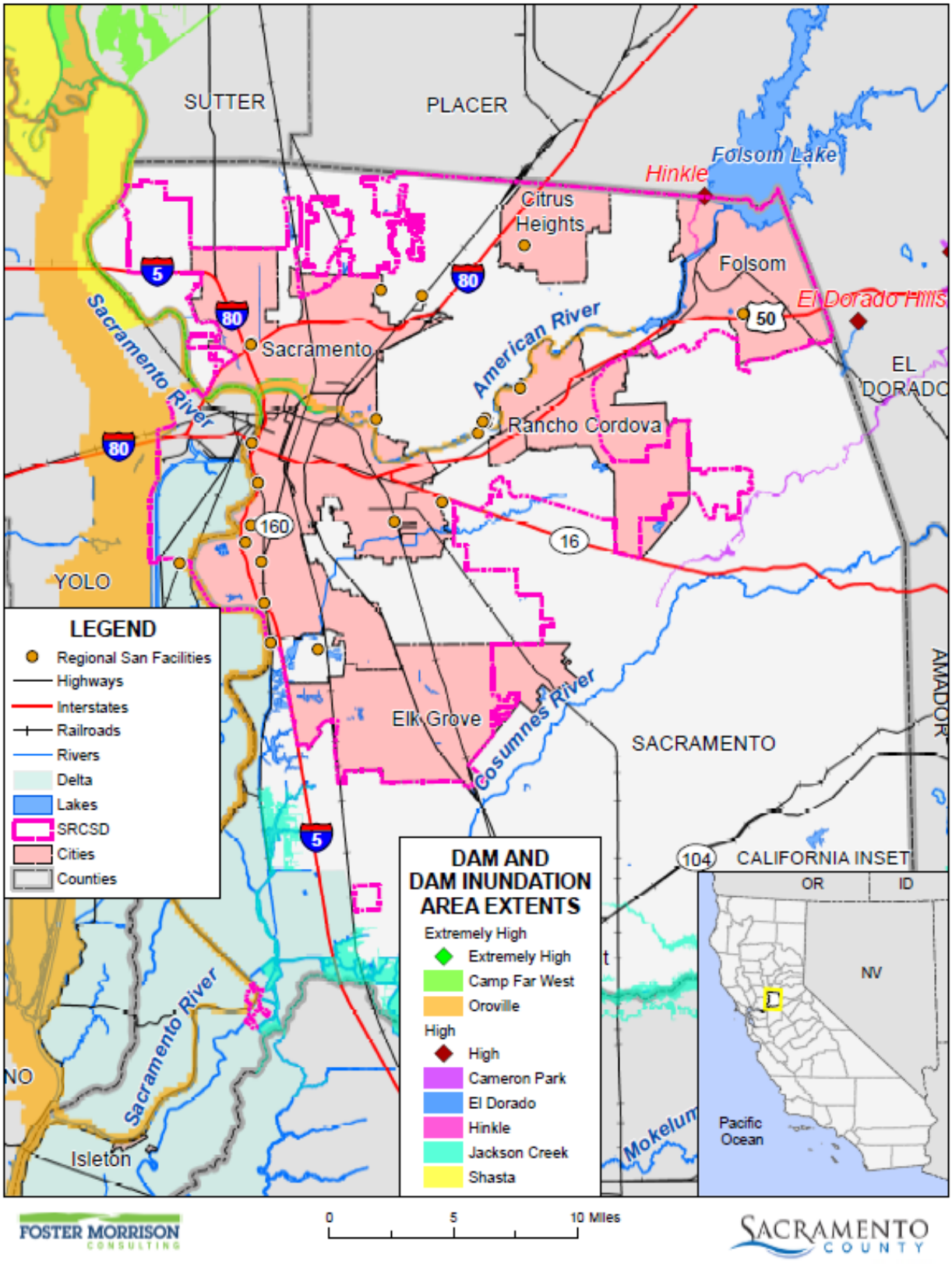
Based on dam inundation data obtained from CA DWR and Cal OES the was discussed in Section 4.3.7 of the Base Plan, dams inside the County that can affect the District can be seen on Figure O-5. Dams outside the County that can affect the District can be seen on Figure O-6. The Folsom Dam 235,000 cfs scenario dam inundation areas can be seen on Figure O-7. While Figure O-5 and Figure O-6 illustrate dam inundation areas from an actual dam failure, Figure O-7, the Folsom 235,000 cfs scenario reflects the likely inundation area associated with a possible "super" release of water from Folsom. This updated Folsom scenario reflects the Folsom dam improvements which make a dam failure unlikely, with any resulting downstream inundation from Folsom associated with an intentional release of water from the dam. It is anticipated that the worst case scenario would be a 235,000 cfs release, which is comparable to a 200-year flood. The area labeled Folsom 235,000 CFS Release Riverine Inundation is the American River corridor and the backwater of the Natomas East Main Drainage Channel (aka Steelhead Creek) to the flood control pump station.

Figure O-5 Regional San – Dam Inundation Areas from Dams Inside the County



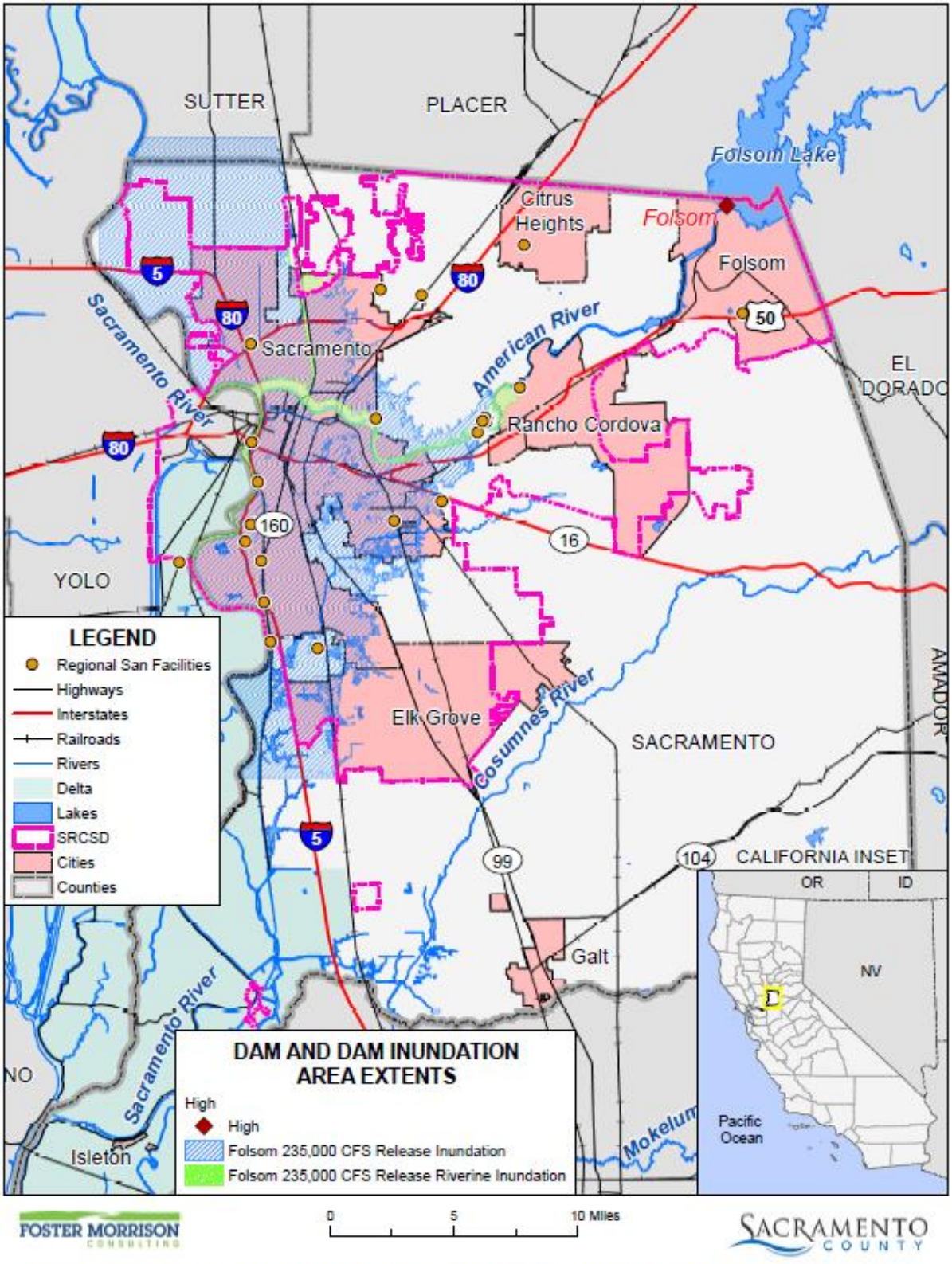
Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 2/2021.

Figure O-6 Regional San – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Figure O-7 Regional San – Dam Inundation Areas for Folsom 235,000 cfs Scenario



Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016 and CA_DWR_200YEAR_FLOODPLAIN.zip 2020), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 02/2021.

Regional San Owned Dams

Emergency Storage Basins A, B, C, D and E. The Emergency Storage Basins (ESBs) are structures at the Sacramento Regional Wastewater Treatment Plant that are used for "emergency" or occasional use. These basins normally do not have liquids stored in them, and on the occasion when they are used the fluid levels are typically only one to two feet deep. Operational use allows a minimum of 5.5 feet of freeboard. A constructed spillway is designed to direct any excess fluid volume back into the wastewater treatment plant. During review of these basins, DSOD engineers concurred with Regional San engineers that there were no risk factors for downstream property or human life in the event of structure failure, and that a study was not required to determine the extent of property damage and/or risk to life resulting from a hypothetical facility failure. Thus, this facility meets the "Low Hazard" classification in that a failure would result in minimal property damage and loss of life is unlikely. As part of the EchoWater upgrades, emergency storage basins were deepened and lined to provide additional volume for storage. Emergency storage basin C was subdivided into three sub-basins and lined with roller compacted concrete floors and shotcrete walls. Additional valves, pipelines, inlet and outlet, gates and drains were installed to aid in dual use of the basins – storage of untreated and treated wastewater.

Solids Storage Basin (SSB) Battery III Ponds CA01421. The SSB ponds operate with a minimum 3 feet of freeboard. The SSBs are also provided with an emergency overflow that directs any excess fluid volume back into the SRWTP. Any fluid volume that escaped the SSB structure would be contained within the SRWTP perimeter levee system (discussed in the Levee Failure section below). Thus, a dam failure for this asset meets the "Low Hazard" classification in that a failure would result in minimal property damage and loss of life is unlikely.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

Folsom Dam, owned by the US Bureau of Reclamation, is the major dam, which affects the Regional San and the populations in the inundation areas. The flood waters from a dam failure would likely affect the Sacramento Regional Sanitation District's service area. Flood waters could inundate sewer pump stations, regional collector pipes, underground structures, and equipment, resulting in the inability to access or operate Regional San's facilities within the flooded areas. A severe flood could jeopardize the operation of the regional sewer treatment plant. Access to the regional sewer treatment plant, affected pipe systems and pump station facilities to assess and restore operation could be limited until such time that the flood waters receded.

Assets at Risk

Regional San has identified the following assets in Table O-8 as being potentially affected if the listed dams in Figure O-5 inside the county were to fail. Table O-9 identifies Regional San assets that may be affected if the Folsom Dam were to have a catastrophic failure.

Table O-8 Regional San Assets and Values at Risk in the Sacramento County Dam Inundation Zone

Facility #	Facility Name	2021 Asset Value
N11	City Interceptor Valve Structure	$2,960,489
N13	City Interceptor Air Intake Structure	$2,220,366
N52	Power Inn Sewage Pumping Station & Force Main	$9,595,578
N51	New Natomas Sewage Pumping Station & Force Mains	$109,050,972
N41	City Water Line to the SRWTP	$518,086
N19	Arden Sewage Pumping Station & Force Mains	$43,650,971
S33	Cordova Sewage Pumping Station & Force Main	$18,663,866
N29	Sump 2A Sewage Pumping Station & Force Main	$10,103,211
N20	Arden Force Main Oxygen Structure	$3,404,562
N15&N16	Northeast Siphon Inlet & Outlet Structure	$10,361,710
N53	Van Maren Sewage Pumping Station & Force Mains	$26,557,887
N27	Sump 55 Sewage Pumping Station & Force Mains	$18,500,755
N12	City Interceptor Oxygen Structure	$2,960,489
N28	Sump 119 Sewage Pumping Station & Force Main	$17,777,767
N40	Iron Point Sewage Pumping Station & Force Mains	$15,831,075
S94	Sacramento Regional Wastewater Treatment Plant	$2,826,033,042
X009	SRWTP Outfall	$2,433,306
Total		**$3,120,624,131**

Source: Regional San

Table O-9 Regional San Assets and Values at Risk in the Folsom Dam Inundation Zone

Facility #	Facility Name	2021 Asset Value
N11	City Interceptor Valve Structure	$2,960,489
N13	City Interceptor Air Intake Structure	$2,220,366
N51	New Natomas Sewage Pumping Station & Force Mains	$109,050,972
N41	City Water Line to the SRWTP	$518,086
N19	Arden Sewage Pumping Station & Force Mains	$43,650,971
N29	Sump 2A Sewage Pumping Station & Force Main	$10,103,211
N15&N16	Northeast Siphon Inlet & Outlet Structure	$10,361,710
N27	Sump 55 Sewage Pumping Station & Force Mains	$18,500,755
N12	City Interceptor Oxygen Structure	$2,960,489

Facility #	Facility Name	2021 Asset Value
N28	Sump 119 Sewage Pumping Station & Force Main	$17,777,767
S94	Sacramento Regional Wastewater Treatment Plant	$2,826,033,042
X009	SRWTP Outfall	$2,433,306
Total		**$3,046,571,163**

Source: Regional San

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

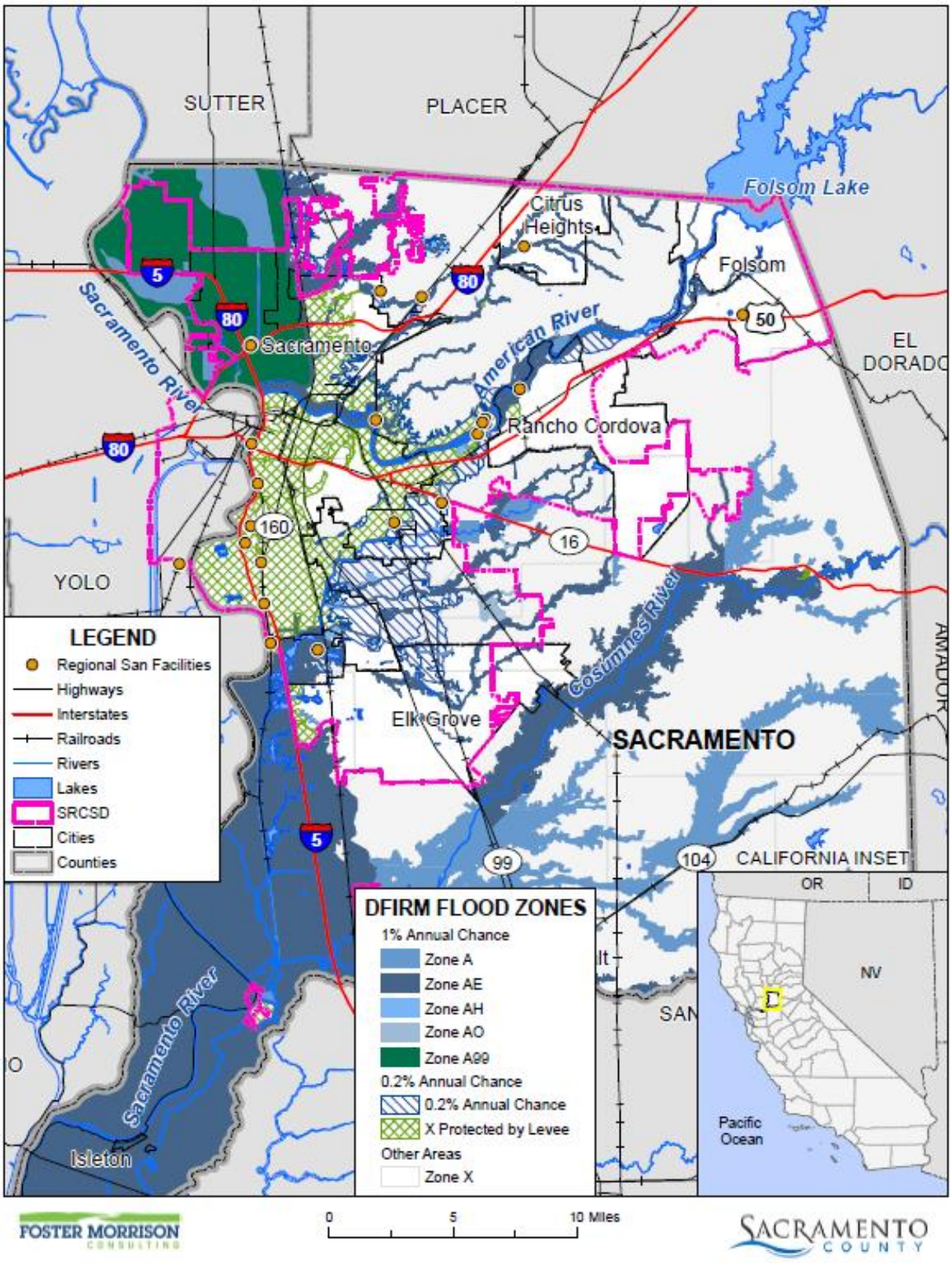
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the Regional San have been subject to historical flooding.

Location and Extent

Major surface waters in the vicinity of the Regional San service area include the American River, Nimbus Reservoir, Folsom Reservoir, Lake Natoma, the Sacramento River, and the Cosumnes River. In the Regional San service area, the potential for flood damage would occur in the floodplains of the American River, Sacramento River, Cosumnes River, Mokelumne River, Laguna Creek, Morrison Creek, Dry Creek and Strawberry Creek. The Regional San has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure O-8.

Figure O-8 Regional San – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento Regional County Sanitation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table O-10 details the DFIRM mapped flood zones within the 1% and 0.2% annual chance flood zone as well as other flood zones located within the District.

Table O-10 Regional San– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	X
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	X
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X
X (unshaded)	Outside of flood zones	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table O-11. These events also likely affected the District to some degree.

Table O-11 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Regional San facilities are impacted by wet weather and flood events that affect the Sacramento Region including localized and regional flooding. Historical large rainfall events have been noted in 1986, 1995, 2005/06, and 2016/17. More information regarding these events can be found in Table O-12.

Table O-12 Regional San Historical Flood Events

Date	Facility	Performance Comments
1986 storm, a 100-year storm event	SRWTP Perimeter Levee	No overtopping of the perimeter levee with peak water surface elevation predicted at 15.3 to 15.8-feet NVGD
December 2005 / January 2006 storm events	SRWTP and local construction projects.	SRWTP operations were impacted by high inlet flows. These flows plus localized flooding at on-site construction project(s) resulted in the discharge of a mixture of fully treated and partially treated wastewater for two days. Effluent sampling demonstrated that the discharge was in compliance with NPDES permit limits.
December 2005 / January 2006 storm events		Heavy rains impacted construction sites and caused four sanitary sewer overflows in the regional sewer collection system. Some reimbursements received from FEMA for flood-related damages.
1986, Spring 1995, and December 2005 / January 2006, December 2016 / January 2017 storm events	SRWTP Perimeter Levee	No impacts

Source: Regional San

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what

to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

In Regional San's case, floods can have large consequences on the treatment plant. Water and debris can inundate the plant, damaging equipment and structures. These impacts can lead to disruptions of services and the inability to adequately treat wastewater. Floods also cause large spikes in influent, which can be difficult to predict. If unable to predict the flows received and properly divert, the plant could flood causing major safety and health risks to the surrounding community.

Assets at Risk

Regional San has identified the following assets as being potentially affected by a 100-year (Table O-13) or a 500-year (Table O-14) flood event.

Table O-13 Regional San – Assets at Risk in the 100-year Floodplain

Facility #	Facility Name	2021 Asset Value
N51	New Natomas Sewage Pumping Station & Force Mains	$109,050,972
N19	Arden Sewage Pumping Station & Force Mains	$43,650,971
N15&N16	Northeast Siphon Inlet & Outlet Structure	$10,361,710
S94	Sacramento Regional Wastewater Treatment Plant	$2,826,033,042
Total		**$2,989,096,694**

Source: Regional San

Table O-14 Regional San Assets at Risk in the 500-year Floodplain

Facility #	Facility Name	2021 Asset Value
N52	Power Inn Sewage Pumping Station & Force Main	$9,595,578
S33	Cordova Sewage Pumping Station & Force Main	$18,663,866
N20	Arden Force Main Oxygen Structure	$3,404,562
N53	Van Maren Sewage Pumping Station & Force Mains	$26,557,887
Total		**$58,221,893**

Source: Regional San

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

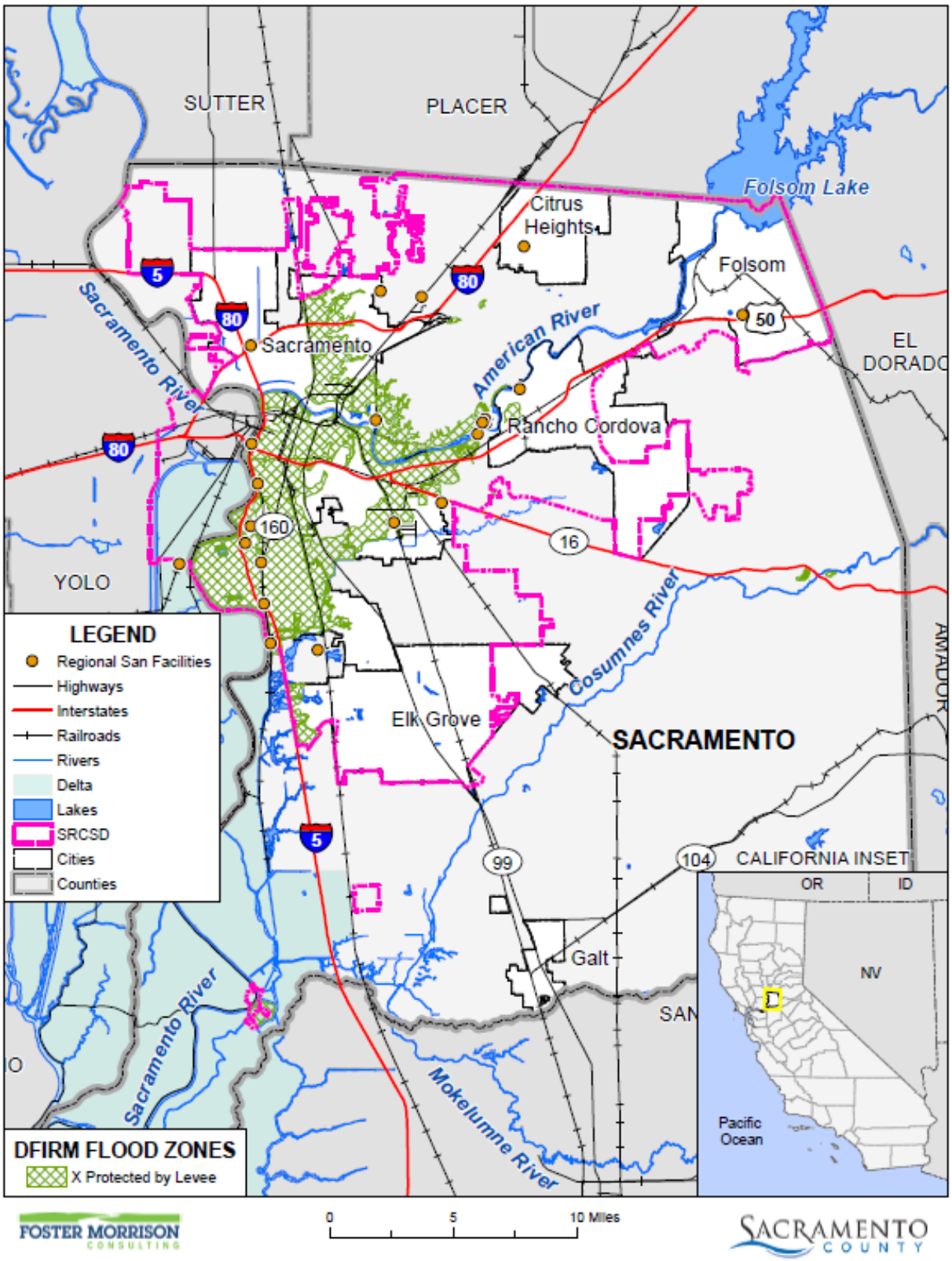
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure O-9.

Figure O-9 Regional San – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Sacramento Regional County Sanitation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Regional San Owned Levees

SRWTP Perimeter Levee. The Sacramento Regional Wastewater Treatment Plant is protected by an earthen perimeter levee system that is owned by Regional San. The Perimeter Levee was originally designed to mitigate the risk of immediate failure of a local levee along the Sacramento River while the river is at flood stages (elevation 25 ft – 33 feet above mean sea level). Recent levee improvement efforts along the Sacramento River and the American River reduced the risk of levee failure throughout all of the urban areas of Sacramento County. However, Sacramento River levee systems located along the east side at all points south of the Freeport area are still considered to present a risk of failure potential. Should one or more levees fail from Freeport south into the Delta area, it could contribute some water at elevations that could approach the SRWTP levee. In 1998, the perimeter levee was raised to an elevation that provides flood protection for 100, 200 and 400-year flood events based on recent studies within the Sacramento River floodplain which increased the predicted 100-year floodplain elevation approximately 2 feet above previous studies. The current SRWTP Perimeter Levee provides 100- and 200-year flood protection with approximately 3 feet of freeboard. The levee provides 400-year flood protection with no freeboard, which complies with US Army Corps of Engineers standards to ensure protection from a 400-year flood event with no overtopping.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures.

SRWTP Perimeter Levee. During the 1986 storm, a 100-year storm event, there was no overtopping of the perimeter levee with peak water surface elevation predicted at 15.3 to 15.8-feet NVGD. During the 1995 series of storm events which lead to flooding in both the Sacramento and American River floodplains, Interstate 5 was temporarily closed in close proximity to the SRWTP due to flooding. During this event, none of the storm water in the combined floodplain reached the levee at the SRWTP.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

In the case of a levee failure, similar impacts as those of a flood could occur. The Sacramento Regional Wastewater Treatment Plant could become inundated with water if the perimeter levee failed. Damaged equipment and flooding of facilities could lead to inadequate treatment of influent and unsafe discharge to

the Sacramento River. If surrounding levees fail, the collection system could surcharge, leading to sewer system overflows and a peak influent at the treatment plant.

Assets at Risk

Regional San has identified the following assets as being potentially affected from a levee failure event in Table O-15.

Table O-15 Regional San – Assets at Risk in the X Protected by Levee Zone

Facility #	Facility Name	2021 Asset Value
N50	South River Sewage Pumping Station & Force Mains	$125,925,747
N52	Power Inn Sewage Pumping Station & Force Main	$9,595,578
N51	New Natomas Sewage Pumping Station & Force Mains	$109,050,972
N19	Arden Sewage Pumping Station & Force Mains	$43,650,971
S33	Cordova Sewage Pumping Station & Force Main	$18,663,866
N20	Arden Force Main Oxygen Structure	$3,404,562
N15&N16	Northeast Siphon Inlet & Outlet Structure	$10,361,710
N53	Van Maren Sewage Pumping Station & Force Mains	$26,557,887
N40	Iron Point Sewage Pumping Station & Force Mains	$15,831,075
N43	Roseville/Watt Liquid Waste Disposal Facility	$4,350,180
S94	Sacramento Regional Wastewater Treatment Plant	$2,826,033,042
FM692	McClellan Flow Meter	$13,756,812
Total		**$3,207,182,402**

Source: Regional San

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of which might cause a pandemic and to assist with pandemic planning and preparation. An especially severe pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the District, County, and surrounding region is at risk, as a pandemic is a regional, national, and international event. The speed of onset of a pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of a pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table O-16.

Table O-16 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic.

- The 1918-1919 Influenza Pandemic (H1N1)
- The February 1957-1958 Influenza Pandemic (H2N2)
- The 1968 Influenza Pandemic (H3N2)

To date, the 21st century has seen two acknowledged pandemics.

- 2009 Swine Flu (H1N1)
- 2019/2020 COVID 19

Though Regional San was not specifically affected by the 2019-2021 COVID 19 pandemic, the employees of the District were affected. During the entirety of the pandemic, operations staff for Regional San who are considered essential workers continued to report to work but followed safety protocol. On March 18, 2020, Sacramento County Public Health directed employers countywide to implement telecommuting for all employees who do not need to physically come to work to complete their duties. The District enforced this order to the greatest possible extent without compromising the duties of a wastewater entity. To allow employees to work from home, the District improved VPN capabilities, purchased video communication licenses such as GoToMeeting, and allowed the flexibility of bringing computer equipment to employees' households.

As it gradually becomes safer to return to in-person work, the District is beginning to transition to going back into the office. The District is prepared for flexible work schedules to minimize the number of employees in the office at once. The District is also replacing current equipment with touchless technologies to create a more hygienic workplace, such as adding hands-free thermometer stations.

Vulnerability to and Impacts from Pandemic

Pandemics have and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding the current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent the spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the District. Pandemic can have varying levels of impact to the citizens of the District and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently), and unemployment rose significantly. Supply chains for food and essentials can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

Assets at Risk

Pandemics do not affect District facilities, but can affect District personnel who operate District facilities.

Wildfire

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

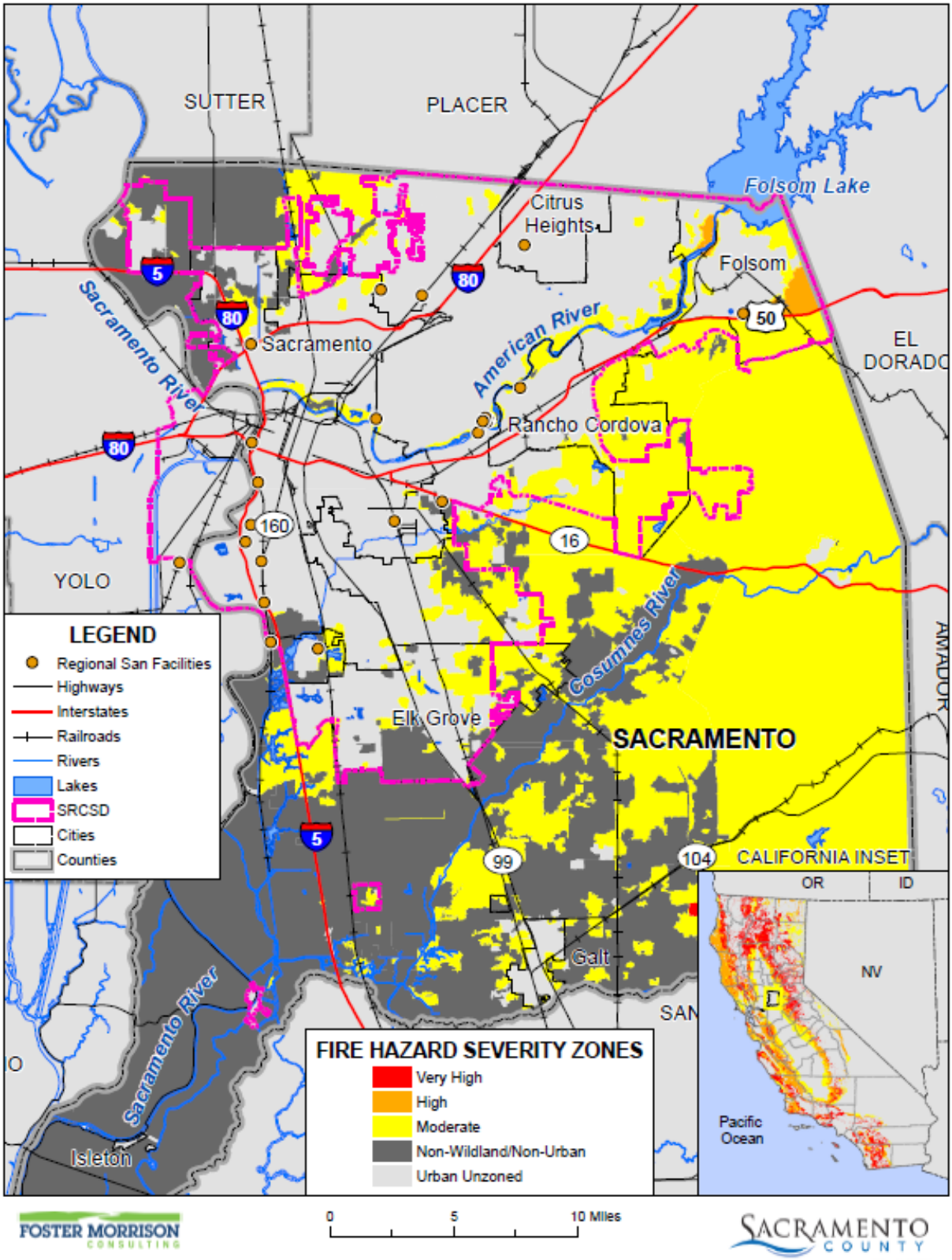
Wildland fire and the risk of a conflagration is an ongoing concern for Regional San. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

Wildfire can affect all areas of the District. CAL FIRE has estimated that the risk varies across Regional San and has created maps showing risk variance. Following the methodology described in Section 4.3.16

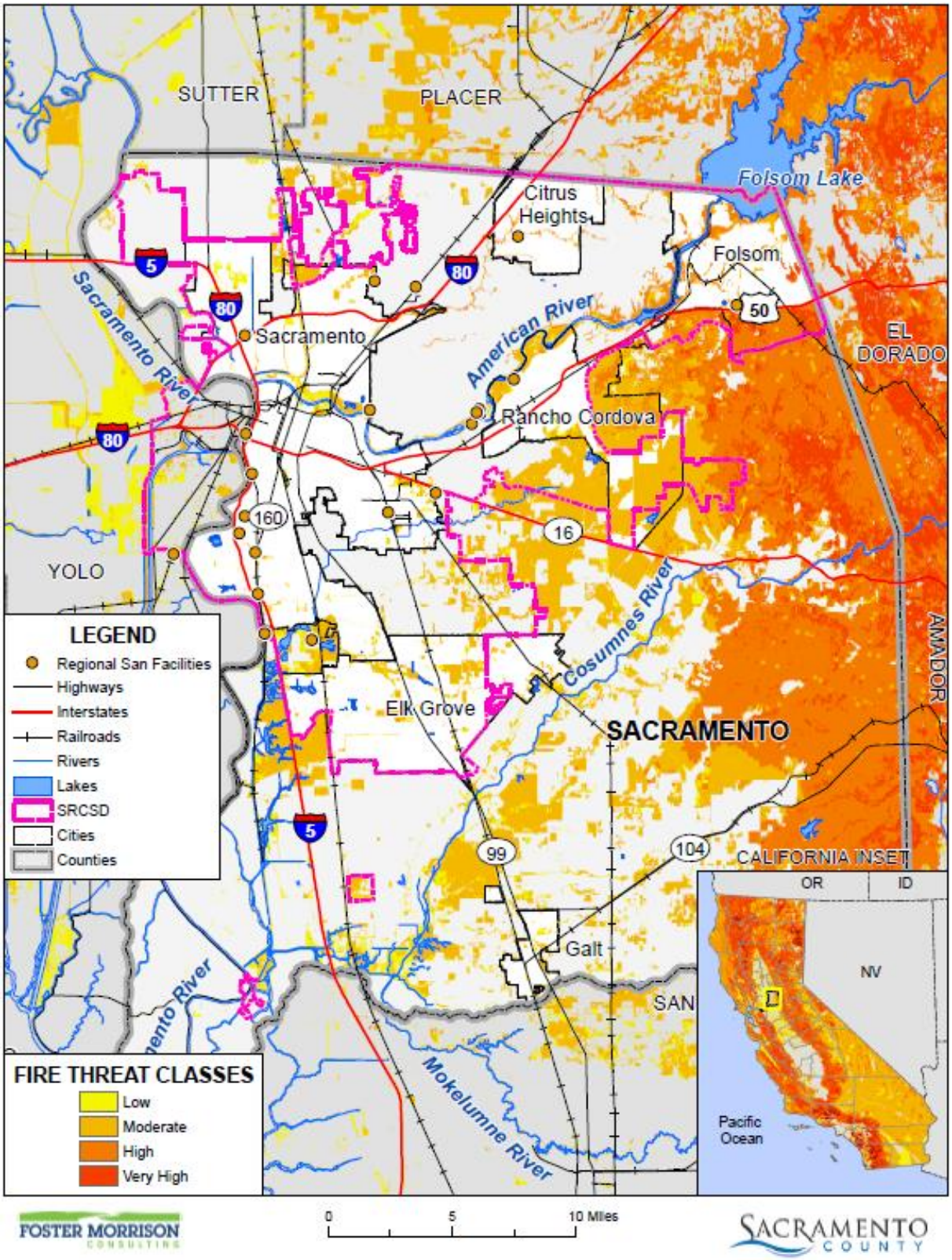
of the Base Plan, wildfire maps for Regional San were created. Figure O-10 shows the CAL FIRE Fire Hazard Severity Zone (FHSZ) in the District. As shown on the maps, fire hazard severity zones within the District range from Urban Unzoned to Moderate. Figure O-11 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, fire threat within the District ranges from No Threat to Very High. Regional San has identified areas and District assets at risk to wildfire. The Bufferlands, Nicolaus Dairy, and the Sims Ranch structures are susceptible to wildfire and Regional San has a plan to mitigate those risks.

Figure O-10 Regional San – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento Regional County Sanitation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure O-11 Regional San – Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento Regional County Sanitation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more.

Past Occurrences

There has been one state and no federal disaster declarations for Sacramento County from fire. It should be noted that this was from Southern Pacific Railroad Fires and Explosions (Roseville), so it was not truly a wildfire.

Table O-17 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

Regional San Bufferlands: The Bufferlands are subject to periodic grassfires which are extinguished by local firefighters. Damage estimates typically range from $1,000 to $5,000.

Nicolaus Dairy and Sims Ranch: There have not been any recorded fires affecting these historic structures, but since they are surrounded by native grasses, they are subject to fires during the seasonally dry months.

Vulnerability to and Impacts from Wildfire

Risk and vulnerability to the Sacramento County Planning Area and the District from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in the Planning Area, combined with a large built environment and population, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. During the May to October fire season, the dry vegetation and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and the District, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the District. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the District by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the District; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from large fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings

and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate PSPSs which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. More information on power outage and failure can be found at the beginning of Section 0 above, as well as in Section 4.3.3 of the Base Plan. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Though Regional San was not significantly affected by wildfire and its impacts, the employees of the District may be inadvertently affected by the damages wildfires cause in surrounding areas and the resulting poor air quality. There were some limited impacts to construction and outdoor maintenance activities due to dense smoke. Safety protocols were established and followed by staff affected.

Assets at Risk

Regional San has identified the following assets in Table O-18 as being potentially affected from a wildfire event.

Table O-18 Regional San – Assets at Risk in Fire Threat Areas

Facility #	Facility Name	2021 Asset Value
Little or Moderate Fire Threat		
-	Regional San Bufferlands	$12,200,901
-	Sims Ranch	$145,961
-	Nicolaus Dairy	$1,333,666
-	Regional San Archeological Site CA-SAC-83	(1)
Moderate Fire Threat		
N41	City Water Line to the SRWTP	$518,086
N20	Arden Force Main Oxygen Structure	$3,404,562
N15&N16	Northeast Siphon Inlet & Outlet Structure	$10,361,710
N40	Iron Point Sewage Pumping Station & Force Mains	$15,831,075
FM692	McClellan Flow Meter	$13,756,812
Total		**$57,552,773**

Source: Regional San

(1) Costs for this site have not been estimated.

O.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

O.6.1. Regulatory Mitigation Capabilities

Table O-19 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the Regional San.

Table O-19 Regional San Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y	Regional San Emergency Response Plan (October 2009) SRWTP Flood Response Manual (October 2007) Sanitary Sewer Overflow Response Plan for Interceptor System (September 2007)
Capital Improvements Plan	Y	Rate and Fee Study (2009 and 2011) Capital Funding Needs Projections (Annual) SRWTP 2020 Master Plan 2000 Interceptor Master Plan 2009 Interceptor Sequencing Study
Economic Development Plan	N	
Local Emergency Operations Plan	Y	SRWTP Administrative Operating Procedures (2011)
Continuity of Operations Plan	Y	Regional San Continuity of Operations Plan (November 2017)
Transportation Plan	N	
Stormwater Management Plan/Program	Y	Regional San requires compliance with Sacramento County Standard Construction Specifications Stormwater Compliance sections and State Water Resources Control Board Construction General Permit, Order 2009-0009-DWQ and Industrial General Permit, State Water Board Order No. 97-03-DWQ
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Regional San Flood Risk Evaluation for the South River Pump Station South River Pump Station Emergency Response Plan Pump Station Protection Plan for the South River Pump Station Flood Protection Project Draft Report
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	Y	Rating: 3/9 (urban/rural)

Site plan review requirements	Y	Work in conjunction with the Sacramento Area Sewer District and other local jurisdictional authorities to review site plans to ensure code compliance for building, mechanical, plumbing, etc. and to ensure compliance with local ordinances. County of Sacramento Construction Management and Inspection Division services are utilized during construction to ensure continued compliance.
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	The ordinance is an effective measure for reducing hazard impacts. The ordinance is adequately administered and enforced.
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	Y	Require compliance with Sacramento County Standard Construction Specifications Erosion and Sediment Control Compliance sections State Water Resources Control Board Construction General Permit, Order 2009-0009-DWQ
Other	Y	Use design standards for facilities. These standards include items such as fire protection systems, building alarms, etc. These standards are shown in Sewage Pump Station Design Manual (Feb ;2005); Interceptor Design Manual (October 2003); and SRWTP Guide Specifications (2006/07).
How can these capabilities be expanded and improved to reduce risk?		
The capabilities can be improved upon by continuing to regularly update the plans with respect to the hazards identified as destructive to Regional Sans operations. We will also work with the County of Sacramento for plans that do not apply specifically to Regional San.		

Source: Regional San

Regional San Emergency Response Plan

The purpose of this Emergency Response Plan (ERP) is to provide Regional San with a response and recovery protocol to prepare for, minimize, and mitigate injury and damage resulting from emergencies or disasters of man-made or natural origin, while ensuring continuity of treatment plant and interceptor sewer collector system operations. This plan assigns roles and responsibilities to individuals for managing emergency response and support services. The ERP documents the steps needed to ensure reliable conveyance and treatment of wastewater during an emergency event. The ERP assists in meeting the following objectives:

- Provide for a safe and coordinated response to emergencies
- Ensure effective communication between local or regional responders to an emergency

- Ensure continuity of the wastewater collection system and treatment process
- Minimize wastewater system damage
- Minimize adverse effects on the environment
- Minimize negative impacts on public health and employee safety

SRWTP Flood Response Manual

The SRWTP Flood Response Manual was created in 1997 and is updated periodically to maintain up-to-date flood response procedures. The document provides recommended actions for possible flood scenarios at SRWTP. The document is meant to provide preventative measures to help prevent flooding of SRWTP as well as response procedures for responding to unavoidable flood situations. The plan contains recommended actions to help prevent the SRWTP from flooding and to minimize damages when preventing flooding is not possible. Each flood alert state has corresponding flood response actions.

Sanitary Sewer Overflow Response Plan

The Sanitary Sewer Overflow (SSO) Response Plan for the Interceptor System identifies measures to protect public health and the environment. It contains important information and resources that will be used during and after an SSO occurrence. The purpose of this plan is to identify the necessary procedures for notification, response, reporting, and clean-up of SSOs that may occur within the Interceptor System. Additionally, the document attempts to improve communication between satellite agencies and Regional San through the development and implementation of the practices described in this report.

Sewage Pump Station Design Manual

This manual was prepared for use as an overall criteria or standard to ensure consistency for pump station design projects. The manual provides guidance for the most effective design practices for new pumping stations and is intended to:

- Establish design guidelines for new pump stations in interceptor conveyance and local trunk collection systems,
- Identify design functions required by a pump station design consultant,
- Provide an acceptable level of quality and uniformity in pump station design,
- Provide design consistency.

Interceptor Design Manual

The Regional San Interceptor Design Manual is used for design and construction of the interceptor system including ancillary components. This manual provides guidelines that are used for interceptor projects such as pipe design criteria, hydraulic analysis, geotechnical reports, right of way recommendations, surveying, construction techniques and materials, inspection, safety, project management and administration, and other topics that are standard to the Districts interceptor pipe projects. The manual provides clear guidance and direction for interceptor projects to set forth working relationships among the parties involved in the projects, establish criteria that will result in acceptable levels of quality and uniformity in procedure and finished project, and obtain cost savings in production of design and construction.

SRWTP Guide Specifications

The guide specifications provide standards for construction projects at the Sacramento Regional Wastewater Treatment Plant (SRWTP). These specifications provide guidance on bidding, contractor experience requirements, equipment and materials, general conditions, coordination with existing operations, etc. The guide specifications ensure that construction projects are completed so as to conform with SRWTP standards.

2000 Interceptor Master Plan/Interceptor Sequencing Study

Long range planning is essential to managing expansion of the regional wastewater system in a cost-effective manner. Construction typically occurs only in response to actual growth and facilities constructed will have a projected 50-100 year service life. The Interceptor Master Plan and subsequent Interceptor Sequencing Study are based on the master plans of surrounding cities, counties and communities within the service area. The planning documents provide long-term guidance for timely investment of resources.

SRWTP Flood Response Manual

This manual provides preventative measures to help prevent flooding of SRWTP as well as response procedures for unavoidable flood situations. The report is updated annually to maintain current flood response procedures.

Flood Risk Evaluation for the South River Pump Station

This study included an evaluation and analysis of the pump station including a comprehensive evaluation of the current level of flood protection at the South River Pump Station and analysis of alternatives for improvements to provide additional flood protection. The study evaluated the impacts of the 100 and 200-year storm events caused by local flooding and levee failure on the Sacramento River in the vicinity of the South River Pump Station. The study also provided an assessment of potential damage to the facility caused by flooding.

South River Pump Station Emergency Response Plan

This plan provides the District with preparation and response procedures to ensure continued operation of the South River Pump Station in the event of major or minor flooding events.

West Sacramento Emergency Flow Plan

This plan provides procedures for operation of the South River Pump Station during flood events to maintain sewer service to the City of West Sacramento.

O.6.2. Administrative/Technical Mitigation Capabilities

Table O-20 identifies Regional San department(s) responsible for activities related to mitigation and loss prevention in Regional San.

Table O-20 Regional San's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	Y	Annual emergency and risk planning. Coordination is effective.
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	N	
Mutual aid agreements	Y	Folsom, City of Sacramento, City of West Sacramento, Sacramento Area Sewer District
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigation. Coordination is effective.
Community Planner	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigation. Coordination is effective.
Civil Engineer	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigation. Coordination is effective.
GIS Coordinator	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigation. Coordination is effective.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	N	
Hazard data and information	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigation. Coordination is effective.
Grant writing	Y FT	Staff is adequate to enforce regulations. Staff is trained on hazards and mitigation. Coordination is effective.
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Capabilities can be expanded on by holding regular meetings to alert the staff of any mitigation risks and hazards identified to ensure proper conduct. Capabilities can also be improved by converting any part-time employees to full-time to guarantee consistency and technical improvement in the role.		

Source: Regional San

O.6.3. Fiscal Mitigation Capabilities

Table O-21 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table O-21 Regional San's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	This funding resource has been used in the past and could be used to fund future mitigation actions.
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	Y	This funding resource has been used in the past and could be used to fund future mitigation actions.
Impact fees for new development	Y	This funding resource has been used in the past and could be used to fund future mitigation actions.
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	This funding resource has been used in the past and could be used to fund future mitigation actions.
Incur debt through private activities	N	
Community Development Block Grant	Y	This funding resource has been used in the past and could be used to fund future mitigation actions.
Other federal funding programs	Y	This funding resource has been used in the past and could be used to fund future mitigation actions.
State funding programs	Y	This funding resource has been used in the past and could be used to fund future mitigation actions.
Other		
How can these capabilities be expanded and improved to reduce risk?		
The capabilities can be expanded upon by continuing to train staff and allocate resources to reducing hazard risks. In addition, we can improve upon this list by researching other funding resources to fund future mitigation actions.		

Source: Regional San

O.6.4. Mitigation Education, Outreach, and Partnerships

Table O-22 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table O-22 Regional San's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Conservation of water relating to mitigation of drought effects. The program can help implement future mitigation activities.
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
These capabilities can be improved upon by updating the programs and outreach as new hazards and risks present themselves to Regional San. Regional San will continue to train staff to ensure quality mitigation education.		

Source: Regional San

O.6.5. Other Mitigation Efforts

Regional San will participate as required during activation of the Sacramento County Office of Emergency Services for local and emergency events to assist in emergency coordination and intends to look for funding required to continue and complete projects identified that are necessary to protect Regional San assets to allow continued service to local communities.

Some of Regional San's past or current hazard mitigation projects include:

- SRWTP Ring Levee Improvements: In 1997, the design and construction for the perimeter levee improvements were completed. The purpose of the project was to enhance the level of flood protection for the SRWTP by improving existing flood protection facilities and constructing new facilities.
- South River Pump Station Low Level Flood Protection Project: In 2009, Regional San completed a temporary flood mitigation project for the South River Pump Station (SRPS) located in Yolo County. When the SRPS was designed and constructed, the SRPS was shown on the Yolo County FIRM to be in the 500-year floodplain. Shortly afterwards, the surrounding levees were re-evaluated and the SRPS is now shown in the 100-year flood plain. The temporary flood mitigation project for the SRPS consisted of constructing a sealed, custom (no holes) 2-foot 8-inch K-Rail wall around the pump station perimeter at an estimated cost of $76,000. This temporary mitigation is effective against low-level flooding (i.e., 8 to 12 inches of water depth).
- Bufferlands Fire Break Maintenance (ongoing): Annually by the end of May, Regional San uses a combination of mowing and disking to establish firebreaks on the Bufferlands as a fire control measure. The firebreak widths vary from 30-60 feet depending on the habitat types and fire risks.
- South River Pump Station (SRPS) Flood Protection Project: The project, completed in 2018, consisted of constructing a new flood protection levee and a raised all-weather access road around the existing

SRPS. The ring levee and raised access road consist of a 22-foot high, 160-foot wide bottom width, earthen embankment that surrounds the SRPS and provides access from South River Road in the event that flooding occurs. The newly constructed flood protection system is designed to provide a minimum of 200-year level of protection.

O.7 Mitigation Strategy

O.7.1. Mitigation Goals and Objectives

The Regional San adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

O.7.2. Mitigation Actions

The planning team for the Regional San identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Dam Failure
- Floods: 1%/0.2% annual chance
- Levee Failure
- Pandemic
- Wildfire

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Develop Climate Change Resiliency Plan

Hazards Addressed: Climate Change, Dam Failure, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather, Wildfire

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: With climate change creating more intense seasons of drought and extreme weather, it is important to prepare adaptation and mitigation measures for continuing or worsening climate change effects.

Project Description: To perform an asset level risk assessment based on climate variability and change, and develop recommendations for adaptation and mitigation actions to reduce vulnerabilities intensified by climate change.

Other Alternatives: Develop a Climate Action Plan (CAP)

Existing Planning Mechanism(s) through which Action Will Be Implemented: Develop scope of work; procure consultant; perform study

Responsible Agency/ Department/Partners: Regional San Policy and Planning Department

Cost Estimate: $300,000

Benefits (Losses Avoided): Mitigate continuing or worsening climate change effects with recommended projects.

Potential Funding: Grants; Regional San Operations Fund

Timeline: Release RFP by end of 2021

Project Priority (H, M, L): H

Action 2. Replace current equipment with touchless technologies

Hazards Addressed: Pandemic

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The transfer of germs can be enhanced by every-day actions like using equipment in shared spaces and opening doors. These are especially important in society's current state of pandemic to mitigate by installing touchless technologies to provide a more hygienic workplace.

Project Description: Replace current equipment with touchless technologies to create a more hygienic workplace.

Other Alternatives: No other alternatives.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Installing touchless thermometer stations; installing touchless hand-drying stations, hand-washing stations and soap dispensers.

Responsible Agency/ Department/Partners: Regional San Safety Office

Cost Estimate: $50,000

Benefits (Losses Avoided): Bring staff back to office safely, avoid outbreak of illnesses.

Potential Funding: Regional San Operations Fund

Timeline: current

Project Priority (H, M, L): H

Action 3. Complete I&I Study and Develop I&I Policy

Hazards Addressed: Dam Failure, Floods: 1%/0.2% annual chance, Flood: Localized Stormwater, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The SRWTP has experienced recent increases in Peak Wet Weather Flows (PWWF) due to suspected inflow and infiltration (I/I) during peak storm events. I/I is problematic for the SRWTP because it creates inconsistency in flow patterns and changes the quality of the influent which has an adverse impact on operational efforts.

Project Description: Regional San executed a District Engineer's agreement with Woodard & Curran to develop a work plan to coordinate and perform a region-wide interagency study. The study will evaluate I&I in the conveyance systems tributary to the SRWTP and inform the development of a policy to comprehensively address I&I in an efficient and cost effective manner.

Other Alternatives: Do nothing.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Hire consultant to execute a workplan for I&I study; develop I&I policy

Responsible Agency/ Department/Partners: Woodard & Curran, Regional San Policy & Planning, Contributing Agencies

Cost Estimate: $700,000

Benefits (Losses Avoided): Avoid inconsistent flow patterns; avoid impact to SRWTP Operations, and unsafe discharge of wastewater.

Potential Funding: Regional San operations fund

Timeline: current

Project Priority (H, M, L): M

Action 4. Regional San Biogeneration Facility

Hazards Addressed: Climate Change, Extreme Heat

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Regional San currently delivers renewable biogas to SMUD in exchange for reliable utility and backup power, steam for digester heating, and revenue according to the terms of the existing Commodity Agreement. The original driver for the agreement was the co-location of the Carson Cogeneration Plant on the SRWTP site, where digester gas helped fuel the power plant, and steam from the power plant could be returned for digester heating, but SMUD no longer combusts the digester gas on-site. Currently, SMUD sends Regional San's biogas offsite to the Cosumnes Power Plant (via private pipeline), and steam for the digesters is produced by a natural-gas-fueled auxiliary boiler instead of the Carson Cogen Plant. With the Commodity Agreement expiring in 2025, Regional San is pursuing an alternative use for its biogas. Another driving force for a new biogas utilization project is to get Regional San exempted from "covered" process regulations via onsite biogas use. The level of effort associated with compliance with these regulations is significant.

Project Description: Sacramento Regional County Sanitation District (Regional San) is soliciting Design-Builders to design, build, provide extended commissioning/transitional operation, and maintenance services for the Sacramento Regional Wastewater Treatment Plant (SRWTP) Biogas Cogeneration System (Project) in Elk Grove, California.

Other Alternatives: No other alternatives.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Design-Build contractor procurement in progress; execute design builder agreement anticipated early 2022; project completion anticipated 2025

Responsible Agency/ Department/Partners: Regional San

Cost Estimate: $104,000,000

Benefits (Losses Avoided): Onsite biogas-use reducing our carbon footprint

Potential Funding: Regional San Capital Outlay Fund, grants

Timeline: Current-2025

Project Priority (H, M, L): H

Action 5. Reduction of Fire Hazard of Regional San Bufferlands

Hazards Addressed: Severe Weather: Extreme Heat, Wildfires, Drought and Water Shortage

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Hot, dry summers increase the likelihood of wildfire on the Bufferlands area surrounding the Sacramento Regional Wastewater Treatment Plant (SRWTP). While much of the habitat of the Bufferlands is fire adapted, high fuel loads associated with the prevalent annual herbaceous vegetation on the property puts some habitats, crops, and infrastructure at risk.

Project Description: To minimize the risk of wildfire on the Bufferlands, Regional San annually establishes firebreaks between public roads and sensitive resources. Firebreaks are either disked to bare ground at a width of 30 feet or mowed to a height of 4-inches or less at a width of 100 feet. Grazing leases are utilized to reduce summer fuel loads on a large portion of Regional San upland habitat. Through lease agreements, Regional San requires that agricultural tenants be responsible for establishing fire breaks around their sensitive crop areas.

Other Alternatives: No other alternatives.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Annual O&M planning

Responsible Agency/ Department/Partners: SRWTP Bufferlands Office

Cost Estimate: $50,000 annually

Benefits (Losses Avoided): Avoids fire damage to grasslands, tree mitigation lands, sensitive habitat area, crops, infrastructure.

Potential Funding: Regional San Operations Fund; tenants required to fund mitigation on tenant-occupied land

Timeline: Annually

Project Priority (H, M, L): L

Action 6. Update GHG Emissions Inventory

Hazards Addressed: Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Regional San's GHG emissions inventory will be separate but supplemental to the Climate Resiliency Plan. Updating the inventory will allow Regional San to identify areas that produce the greatest emissions.

Project Description: Update the GHG emissions inventory last tabulated for 2005 values using improved best practices.

Other Alternatives: Escalate 2005 emissions using population, employment and housing data.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Collect data from the SRWTP, fleet, and Goethe office; coordinate with Climate Resiliency Study

Responsible Agency/ Department/Partners: Regional San Policy & Planning

Cost Estimate: $100,000

Benefits (Losses Avoided): Identify high emissions to reduce our climate change footprint.

Potential Funding: Grants, Regional San Operations Fund

Timeline: 2021-2022

Project Priority (H, M, L): M

Action 7. Study Telecommute Options and Enhanced Information Technology Needs to Support Workforce

Hazards Addressed: Pandemic, Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: During the COVID-19 shut-down, Regional San has become more equipped to work from home. As the county begins to return to business-as-usual, Regional San can study telecommute options seen during this work-from-home period to prepare for a resilient workforce in the chance of further lock-down situations.

Project Description: Evaluate a policy that permits telecommuting amongst employees that have the capability to work from home.

Other Alternatives: Update existing telecommuting policy to reflect lessons learned from COVID-19

Existing Planning Mechanism(s) through which Action Will Be Implemented: Enhancing VPN capabilities, updating and researching video conferencing software, providing equipment for an optimal at-home desk setup.

Responsible Agency/ Department/Partners: Regional San

Cost Estimate: $50,000

Benefits (Losses Avoided): Increases resiliency to future pandemic issues and reduces GHG emissions.

Potential Funding: Regional San Operations Fund

Timeline: June 2021

Project Priority (H, M, L): H

Annex P Sacramento Area Sewer District

P.1 Introduction

This Annex details the hazard mitigation planning elements specific to the Sacramento Area Sewer District (SASD or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to SASD, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

P.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table P-1. Additional details on plan participation and District representatives are included in Appendix A.

Table P-1 SASD – Planning Team

Name	Position/Title	How Participated
Michael Redfern	Sr. Safety Specialist	Attended planning meetings, collected information, completed documents

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table P-2.

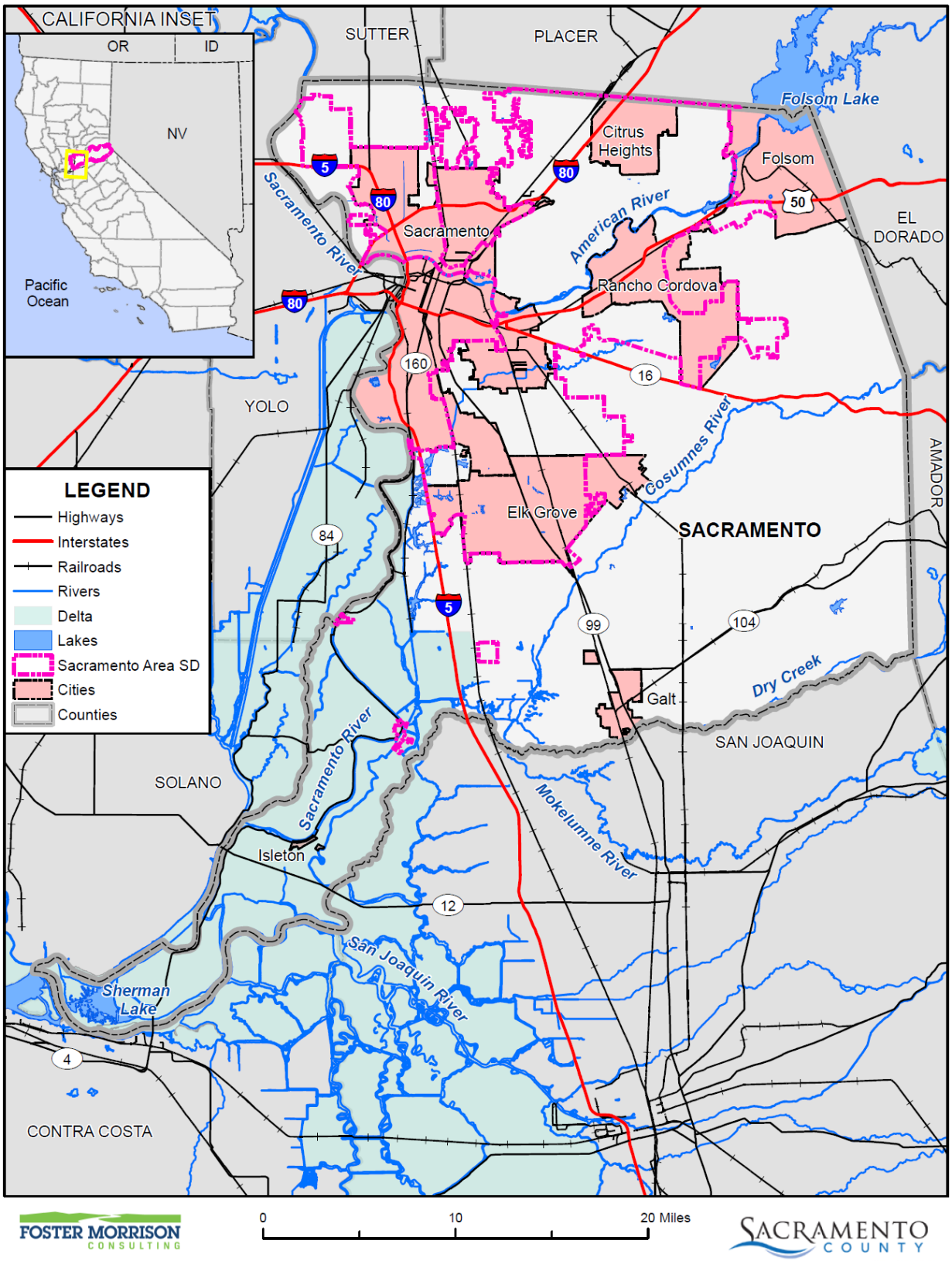
Table P-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
N/A	No mitigation related planning mechanisms have been completed since 2016.

P.3 District Profile

The District profile for the SASD is detailed in the following sections. Figure P-1 displays a map and the location of the District within Sacramento County.

Figure P-1 SASD



Data Source: Sacramento Area Sewer District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

P.3.1. Overview and Background

The SASD is a sewer utility providing service to more than one million people in the Sacramento region, including the unincorporated areas of Sacramento County; the cities of Citrus Heights, Rancho Cordova, and Elk Grove; as well as portions of the cities of Folsom and Sacramento. The District serves residential, commercial and industrial customers.

SASD owns and operates thousands of miles of lower lateral and main line pipes and is responsible for the day-to-day operations and maintenance of these sewer pipes. Once collected in the system, sewage flows into the Regional San interceptor system, where it is conveyed to the Sacramento Regional Wastewater Treatment Plant near Elk Grove.

SASD was formed in 1978 and is governed by a 10-member Board of Directors representing the various city and county jurisdictions in the District's service area.

P.4 Hazard Identification

SASD identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table P-3).

Table P-3 SASD—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Low	–
Dam Failure	Significant	Unlikely	Catastrophic	Medium	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Low	High
Earthquake	Limited	Occasional	Critical	Low	Low
Earthquake Liquefaction	Limited	Occasional	Critical	Low	Low
Floods: 1%/0.2% annual chance	Significant	Occasional	Critical	High	Medium
Floods: Localized Stormwater	Limited	Highly Likely	Limited	Low	Low
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Significant	Likely	Critical	Medium	Medium
Pandemic	Extensive	Likely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Low	Medium
Severe Weather: Wind and Tornado	Limited	Likely	Limited	Low	Low
Subsidence	Significant	Highly Likely	Limited	Low	Medium
Volcano	Limited	Unlikely	Limited	Low	Low
Wildfire	Limited	Likely	Limited	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

P.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

P.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section P.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table P-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

P.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the SASD's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table P-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. SASD's physical assets, valued at over $6 billion, consist of the buildings and infrastructure to support the District's operations.

Table P-4 SASD Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
SACY	Essential	$60,600,000	Minimal flood, airplane crash, fire
NACY	Essential	$26,800,000	Minimal flood, fire
Main Lines	Essential	$2,930,400,000	Minimal earthquake
Lower Laterals	Essential	$2,335,753,000	Minimal earthquake
Manholes	Essential	$647,695,000	Minimal earthquake
Pump Stations	Essential	$97,200,000	Minimal fire, flood, earthquake
Total		**$6,098,448,000**	

Source: SASD

Natural Resources

SASD has a variety of natural resources of value to the District. The District Planning Team noted Sacramento River, American River, creek habitats, and vernal pools are natural resources located in District boundaries. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

SASD has a variety of historic and cultural resources of value to the District. T The District Planning Team noted the City of Locke as a historic resource. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Development since 2016

Several new sewer pump stations have been constructed since 2016 but have not been constructed in identifiable hazard areas that are different than current pump station hazards. As such, a change in vulnerability is unlikely.

Future Development

The District has no control over future development in areas the District services. Future development in these areas parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

P.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table P-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan. The Sacramento Area Sewer District has stationary and portable generators that allow for operation of critical facilities in the event of a power outage.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan. The Sacramento Area Sewer District has not been affected by a PSPS event to date and has stationary and portable generators to power critical facilities in the event of a PSPS.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. The District and HMPC members did, however, note that in Sacramento County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

During the past drought in 2012-2016, the SASD Five Year Strategic Plan noted that the District faced issues related to climate change. Lower flows increase the risk of debris stoppages, odor issues, and root intrusion in the collection system. Additionally, heavy storm cycles can lead to pump station power outages

and system surcharges. Both too little and too much water in the sewer system create challenges that need to be strategically considered with long-term planning.

Vulnerability to and Impacts from Climate Change

The 2014 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

Assets at Risk

The District noted that its facilities will most likely not be at risk from climate change.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

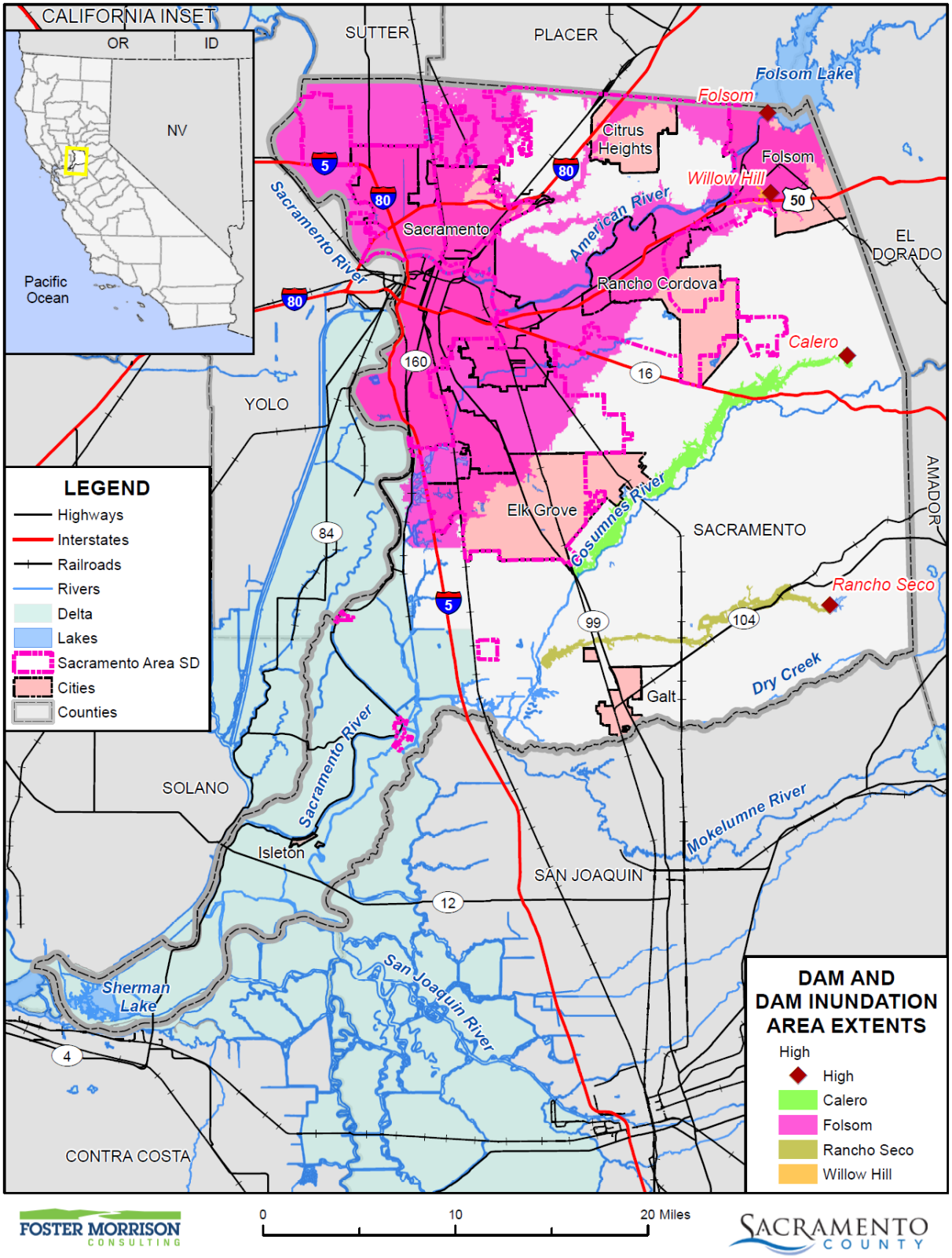
Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

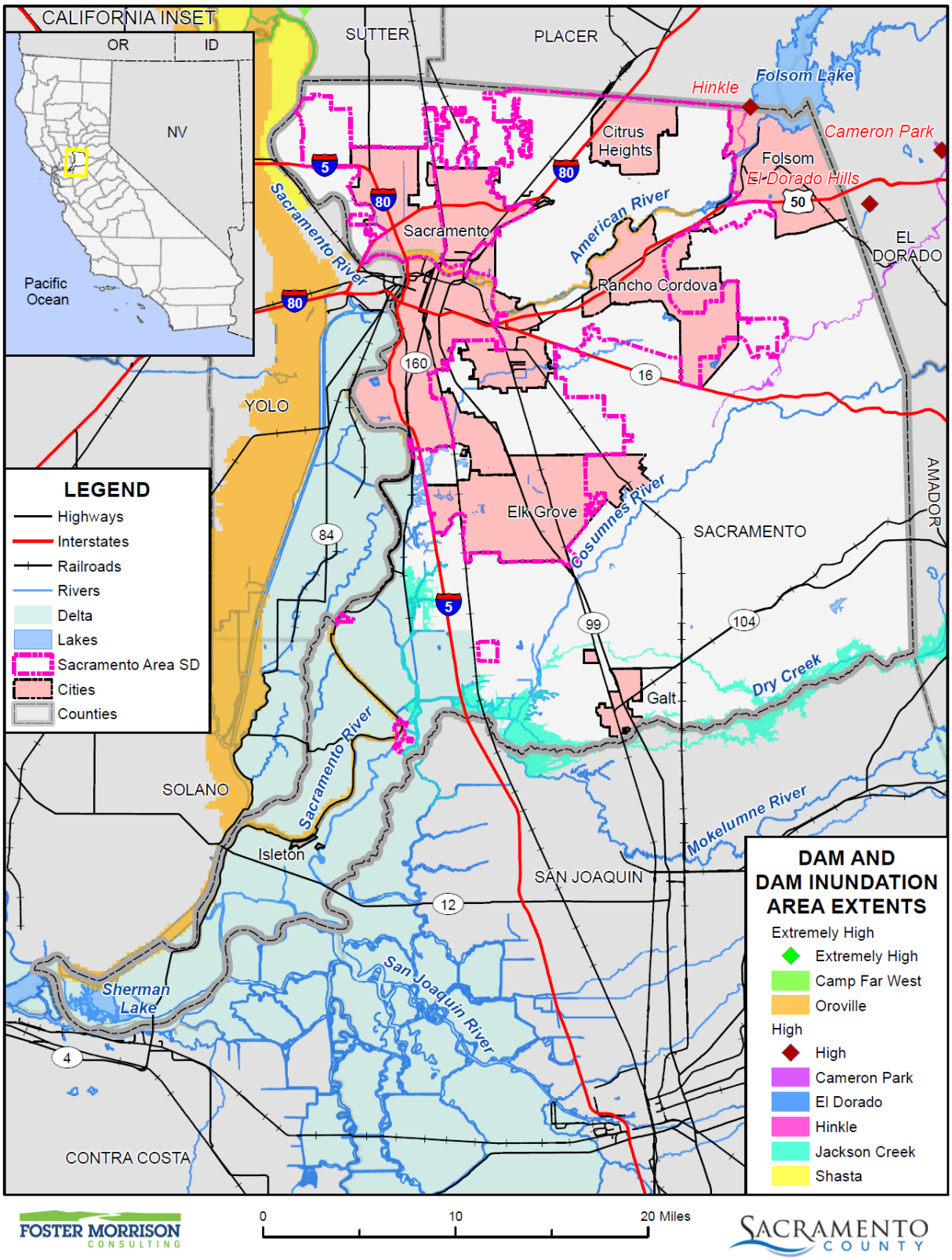
Based on dam inundation data obtained from CA DWR and Cal OES the was discussed in Section 4.3.7 of the Base Plan, dams inside the County that can affect the District can be seen on Figure P-2. Dams outside the County that can affect the District can be seen on Figure P-3. The District has areas that fall in the Folsom Dam 235,000 cfs scenario that can be seen on Figure P-4. While Figure P-2 and Figure P-3 illustrate dam inundation areas from an actual dam failure, Figure P-4, the Folsom 235,000 cfs scenario reflects the likely inundation area associated with a possible "super" release of water from Folsom. This updated Folsom scenario reflects the Folsom dam improvements which make a dam failure unlikely, with any resulting downstream inundation from Folsom associated with an intentional release of water from the dam. It is anticipated that the worst case scenario would be a 235,000 cfs release, which is comparable to a 200-year flood.

Figure P-2 SASD – Dam Inundation Areas from Dams Inside the County



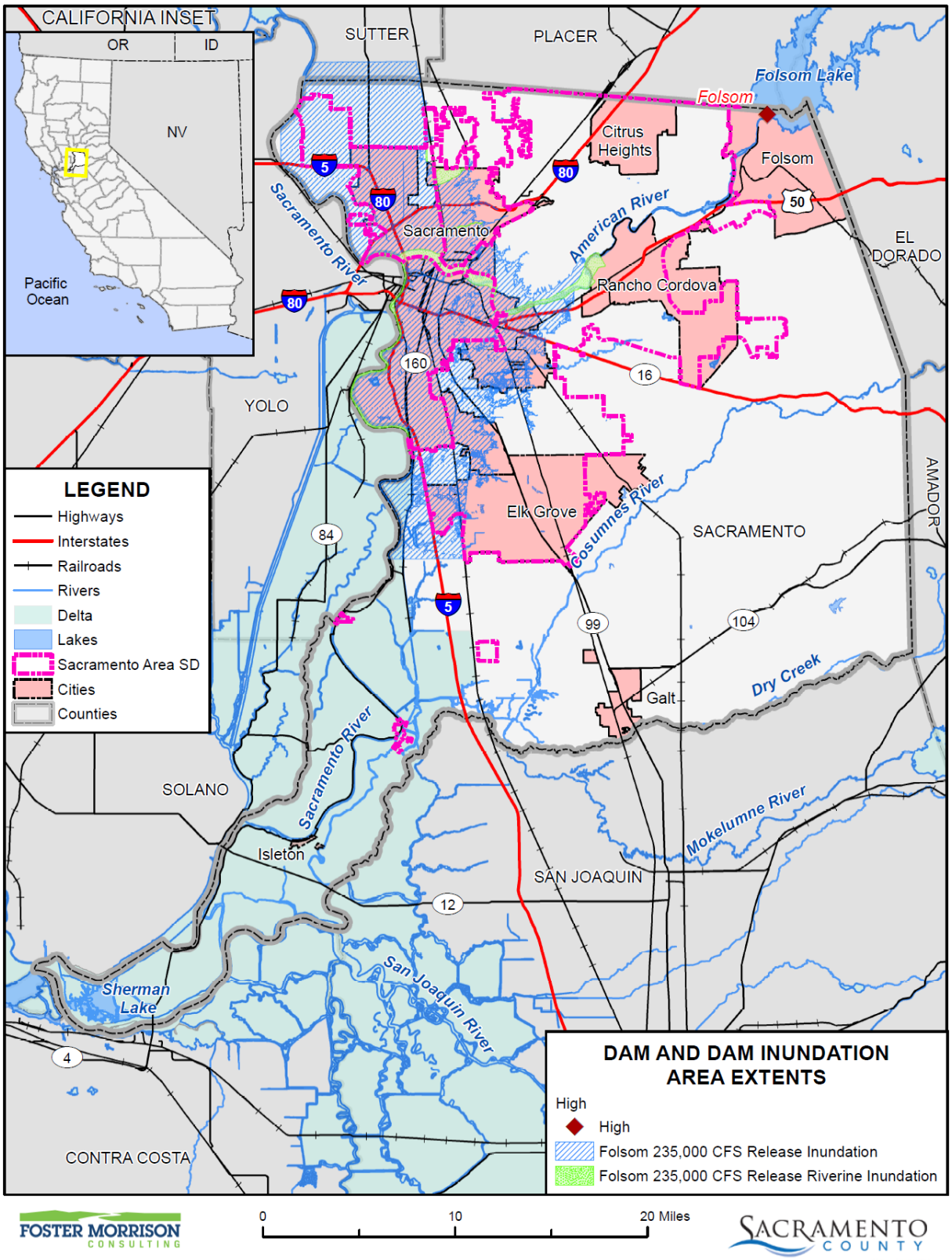
Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

Figure P-3 SASD – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento Area Sewer District, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

Figure P-4 SASD – Dam Inundation Areas from Folsom 235,000 cfs Scenario



Data Source: County-provided dam inundation data (CA_DWR_200YEAR_FLOODPLAIN.zip 2020), DWR DSOD Data 2020, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

Folsom Dam is the major dam which affects the SASD and the populations in the inundation areas. Folsom Dam is owned by the US Bureau of Reclamation. The flood waters from a dam failure would likely affect the SASD's service area. Flood waters could inundate sewer pump stations, regional collector pipes, underground structures, and equipment, resulting in the inability to access or operate SASD's facilities within the flooded areas. A severe flood could jeopardize the operation of the regional sewer treatment plant. Access to the regional sewer treatment plant, affected pipe systems and pump station facilities to assess and restore operation could be limited until such time that the flood waters receded.

Assets at Risk

SASD assets at risk are sewer pump stations, main lines, lower laterals, and operational facilities.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

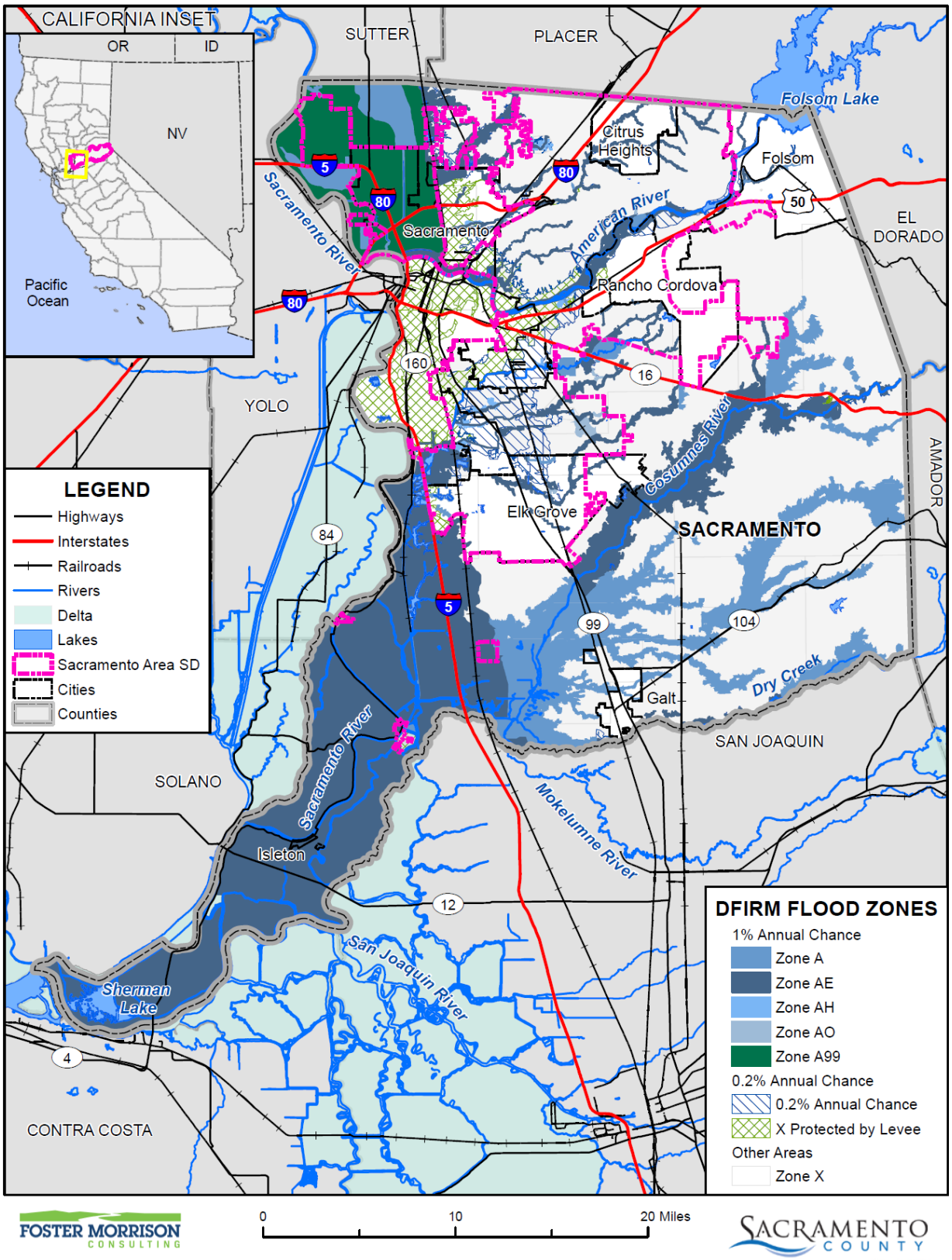
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the SASD have been subject to historical flooding.

Location and Extent

The SASD has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure P-5.

Figure P-5 SASD – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento Area Sewer District, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

Table P-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table P-5 SASD– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	X
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	X
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X
X (unshaded)	Outside of Flood Zone	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table P-6. These events also likely affected the District to some degree.

Table P-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Flood events since 2016 have not negatively impacted SASD facilities.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

SASD assets at risk from this hazard are pump stations and manholes.

Levee Failure

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

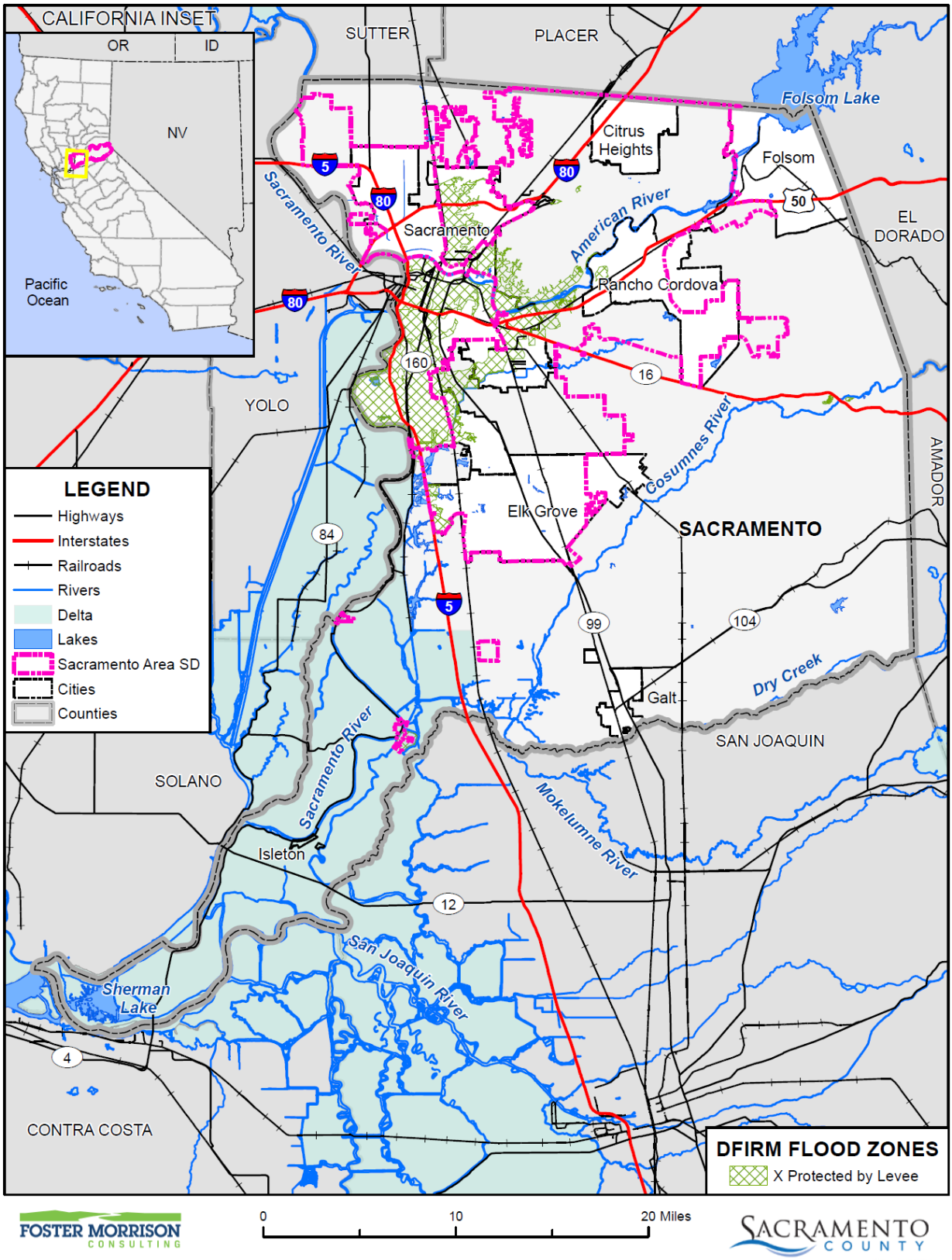
Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not

eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure P-6.

Figure P-6 SASD – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Sacramento Area Sewer District, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. SASD does not have a documented history of impacts, damages or costs associated with previous levee failure in the Sacramento region.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

SASD pump stations may be offline and unable to function when flooded. Once flood waters recede, pump stations will be evaluated and returned to service.

Assets at Risk

Pump stations and manholes along the American levee system.

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the District, County, and surrounding region is at risk, as pandemic is a regional, national, and international event. The speed of onset of pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table P-7.

Table P-7 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic.

- The 1918-1919 Influenza Pandemic (H1N1)
- The February 1957-1958 Influenza Pandemic (H2N2)
- The 1968 Influenza Pandemic (H3N2)

To date, the 21st century has seen two acknowledged pandemics.

- 2009 Swine Flu (H1N1)
- 2019/2020 COVID 19

SASD is an essential service provider so no operations were suspended during the 2019/2020 global pandemic. Operations were shifted to allow telework when possible and Cal-OSHA guidelines were followed for staff that still reported to work.

Vulnerability to and Impacts from Pandemic

Pandemics have and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding the current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent the spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the District. Pandemic can have varying levels of impact to the citizens of the District and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently), and unemployment rose significantly. Supply chains for food and essentials can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

Assets at Risk

Pandemics do not affect District facilities, but can affect District personnel who operate District facilities. Cal-OSHA guidelines were followed so that staff could maintain district facilities.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers

the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

There have been no specific high wind or tornado events that have impacted the district.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power outage and failure can be found at the beginning of Section P.5.3 above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Increased PSPS events
- Occasional building damage, primarily to roofs

Loss of power to sewage pumping stations may cause a sanitary sewer overflow that could impact the surrounding community and environment.

Assets at Risk

SASD assets at risk from this hazard are pump stations.

P.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

P.6.1. Regulatory Mitigation Capabilities

Table P-8 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the SASD.

Table P-8 SASD Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	N/A	
Capital Improvements Plan	N/A	
Economic Development Plan	N/A	
Local Emergency Operations Plan	N/A	
Continuity of Operations Plan	Y May 2020	Plan addresses hazards and provides a likelihood of occurrence.
Transportation Plan	N/A	
Stormwater Management Plan/Program	N/A	
Engineering Studies for Streams	N/A	
Community Wildfire Protection Plan	N/A	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N/A	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N/A	Score:
Fire department ISO rating:	N/A	Rating:
Site plan review requirements	N/A	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N/A	
Subdivision ordinance	N/A	
Floodplain ordinance	N/A	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N/A	
Flood insurance rate maps	N/A	
Elevation Certificates	N/A	

Acquisition of land for open space and public recreation uses	N/A
Erosion or sediment control program	N/A
Other	
How can these capabilities be expanded and improved to reduce risk?	
SASD continues to update and train on the Continuity of Operations plan. Updates and table-top exercises are performed on an annual basis.	

Source: SASD

SASD Five Year Strategic Plan (2017)

This Strategic Plan provides SASD with clear direction on what it needs to do to continue to build on its success over the next five years. This Strategic Plan outlines goals and objectives, and SASD will develop an implementation plan that identifies and prioritizes activities and tasks needed to accomplish the goals and objectives outlined in the Strategic Plan. The development of an implementation plan will precede SASD's annual business planning process so SASD can develop business initiatives to support this Strategic Plan.

As various other plans—such as the business plan, asset management plan, and financial plan—are updated, SASD will ensure alignment between them and this Strategic Plan. During annual business planning, SASD will track progress toward achieving the goals and objectives of the Strategic Plan. SASD will review the Strategic Plan goals and objectives on a one-to two-year cycle to ensure that the plan still reflects the current factors and issues that influence SASD and its work.

Sacramento Area Sewer District Continuity of Operations Plan (May 2020)

SASD prepared a Continuity of Operations Plan (COOP) to ensure continuity of essential SASD functions in the event of a major emergency or disaster affecting the community that the SASD serves. This plan was prepared using an all-hazards approach. The plan provides the decision-making framework and key information to be used by SASD personnel to implement business continuity operations, to restore essential functions within defined Recovery Time Objectives (RTO), and to sustain operations for up to 30 days following an event. This COOP incorporates best practices from the federal, state, and local levels and shall remain a living document with regular updates to ensure currency and relevance.

This plan supports SASD's vision, mission, and values and applies to SASD and its personnel. The COOP applies to potential hazards identified by SASD staff and uses an all-hazards continuity of operations strategy. This plan discusses the COOP's relationship to other SASD emergency response plans and the SASD Incident Command System, the different personnel types that are involved in a COOP implementation and the four phases that comprise continuity of operations:

- Phase 0: Normal Operations (Tan)
- Phase I: Alert (Yellow)
- Phase II: Activation (Orange)
- Phase III: Response (Red)
- Phase IV: Recovery (Green)

The COOP is used to restore essential SASD functions and support critical services as quickly as possible and to sustain these services for up to 30 days following an event.

P.6.2. Administrative/Technical Mitigation Capabilities

Table P-9 identifies the District department(s) responsible for activities related to mitigation and loss prevention in SASD.

Table P-9 SASD's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Pump Station Maintenance
Mutual aid agreements	Y	CalWARN
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	FT	Yes
Floodplain Administrator	PT	Part time duty of various positions Facilities/GIS/Safety. Staffing is adequate and trained.
Emergency Manager	PT	Part time duty of Safety. Staffing is adequate and trained.
Community Planner	N	
Civil Engineer	FT	Part Time duties of current Engineering Dept staff. Staffing is adequate and trained.
GIS Coordinator	FT	Full time GIS staff on site trained on Hazards
Other	FT	PIO and Communication specialists. Staffing is adequate and trained.
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Reverse 911 and employee hotline
Hazard data and information	Y	Identified in COOP
Grant writing	Y	Policy & Planning Department
Hazus analysis	Y	COOP identified hazard analysis
Other		
How can these capabilities be expanded and improved to reduce risk?		
SASD reviews and updates the COOP on an annual basis. Additional table-top exercises will help to expand our capabilities to reduce risk.		

Source: SASD

P.6.3. Fiscal Mitigation Capabilities

Table P-10 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table P-10 SASD's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	Y	Y. SASD is a rate payer funded utility.
Impact fees for new development	Y	Y. Impact fees are generated for new construction and follow SASDs current program.
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	Y.
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	Y	
State funding programs	Y	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
Capabilities are expanded through proper collection of rate fees and impact fees for new development. Further, SASD complies with the collection systems permit granted by the State of California.		

Source: SASD

P.6.4. Mitigation Education, Outreach, and Partnerships

Table P-11 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table P-11 SASD's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N/A	

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	N/A	
Natural disaster or safety related school programs	N/A	
StormReady certification	N/A	
Firewise Communities certification	N/A	
Public-private partnership initiatives addressing disaster-related issues	N/A	
Other	N/A	
How can these capabilities be expanded and improved to reduce risk?		
SASD does not communicate to rate payers on disaster related information. This is an area that could be expanded.		

Source: SASD

P.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

- Purchased redundant backup generators at our critical facilities.

P.7 Mitigation Strategy

P.7.1. Mitigation Goals and Objectives

The SASD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

P.7.2. Mitigation Actions

The planning team for the SASD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Dam Failure
- Floods: 1%/0.2% annual chance
- Levee Failure
- Pandemic

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts

are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Flood Control

Hazards Addressed: Dam Failure; Flood: 1%/ 0.2%; Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: SASD operates pump stations and collection lines along the American River that may be impacted by dam or levee failure and severe flood events along the river parkway.

Project Description: Identity affected pump stations that may be retrofitted with elevated electrical control panels and motor control centers that would remain out of flood waters. Also, ensure affected pump stations are able to operate with submersible pumps.

Other Alternatives: Participate in local planning efforts to identify and mitigate hazards associated with above events

Existing Planning Mechanism(s) through which Action Will Be Implemented: Design and construction planning for new pump stations that are in affected areas. Coordination with the County of Sacramento on Flood Control efforts in areas that SASD may be impacted.

Responsible Agency/ Department/Partners: SASD

Cost Estimate: To be determined.

Benefits (Losses Avoided): Prevent damage to parts of the wastewater collection system infrastructure.

Potential Funding: Cal OES, FEMA, and CA DWR grants

Timeline: As needed

Project Priority (H, M, L): Low

Action 2. Pandemic Planning

Hazards Addressed: Pandemic

Goals Addressed: 4, 5

Issue/Background: SASD is a utility district that provides sewer collection services for the greater Sacramento Area. This critical service must be provided at all times and can cause health and environmental problems if not operated and maintained at all times. A global pandemic may not allow SASD to operate and maintain the collection system.

Project Description: Develop and maintain a pandemic plan that allows the collection system to continue operations in the event of a global pandemic. Pandemic plan must comply with all local, state, and federal rules governing the operation of a business during a pandemic.

Other Alternatives: Participate in the County of Sacramento pandemic planning efforts as SASD contracts with the County for employment.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Pandemic plan will be developed with input from all SASD business sections.

Responsible Agency/ Department/Partners: SASD

Cost Estimate: $250,000

Benefits (Losses Avoided): Continued operation of the wastewater collection system. Prevention of sanitary sewer overflows.

Potential Funding: Cal OES and FEMA grants. Other public health grant sources.

Timeline: As needed

Project Priority (H, M, L): Medium

Annex Q Southgate Recreation and Park District

Q.1 Introduction

This Annex details the hazard mitigation planning elements specific to the Southgate Recreation and Park District (SRPD or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to SRPD, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

Q.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table Q-1. Additional details on plan participation and District representatives are included in Appendix A.

Table Q-1 SRPD – Planning Team

Name	Position/Title	How Participated
Nancy Oh San	Accounting Manager	Provided review and information on Assets and Risk and Critical Facilities section.
Dan Giamonna	Parks Manager	Provided information about extreme heat events and smoke air quality events.
Vince King	Associate Park Planner	Provided review and information on Growth and Development Trends section.
Juanita Cano	Associate Park Planner	Provided review and input on entire document, attended meetings and workshops.
Marge McCuan	Recreational Supervisor II	Provided information on Pandemic section.
Julia Goetz	Administrative Assistant	Provided review of entire document.
Paula Hansen	Administration Manager	Provided review and input on mitigation actions.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved

2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table Q-2.

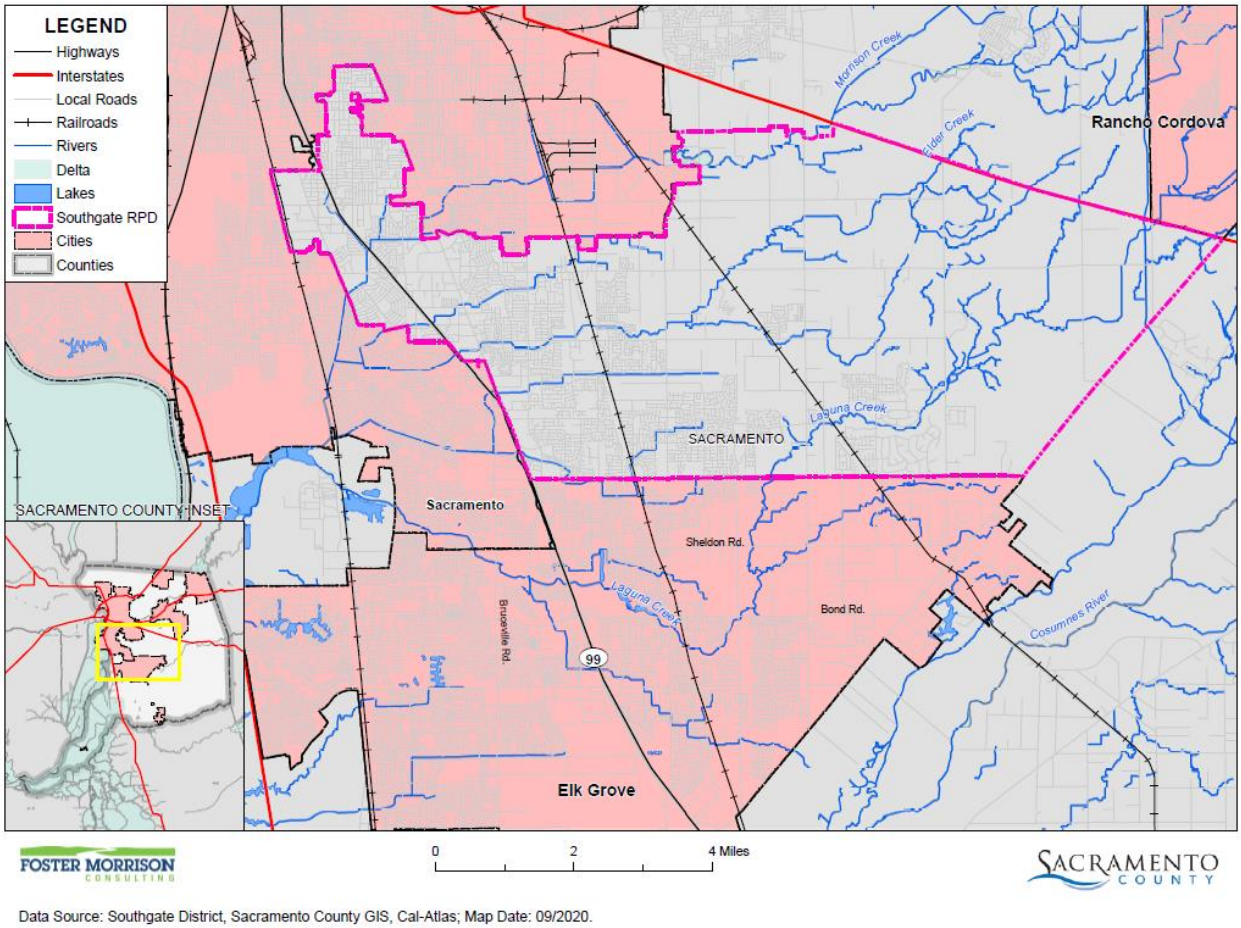
Table Q-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
None	No mitigation related planning mechanisms have been completed since 2016.

Q.3 District Profile

The District profile for the SRPD is detailed in the following sections. Figure Q-1 displays a map and the location of the District within Sacramento County.

Figure Q-1 SRPD



Q.3.1. Overview and Background

Southgate Recreation and Park District is an independent special district established in 1956 under the Public Resources Code. The District provides park and recreation services to 126,000 taxpayers in the rapidly urbanizing southeast area of Sacramento County, California. The District is managed by an elected five-member Board of Directors.

For over fifty years Southgate Recreation & Park District has been acquiring and developing parks and recreational facilities. The District encompasses a 52-square mile area of unincorporated South Sacramento County. In this area, the District currently maintains 46 parks, 6 community centers, 2 aquatic facilities, an 18-hole golf course, and numerous landscape corridors and nature preserves. The District's primary goal and its public charge is to provide recreation and park services to the 126,000 residents it serves. The District employs professional management and staff who manage the diverse services and facilities for the South Sacramento community.

Over the next twenty years we expect to add approximately 700 acres of park land and green space as new subdivision development occurs. Our strong tradition of Parks, Programs & Partnerships will continue to guide us, enabling us to continue serving the park and recreation needs of our socially, economically, and culturally diverse community.

The District lies east of Sacramento, south of Rancho Cordova and north of Elk Grove. The District's eastern boundary extends to Grant Line Road.

Q.4 Hazard Identification

SRPD identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table Q-3).

Table Q-3 SRPD—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Significant	Occasional	Catastrophic	Low	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Medium	High
Earthquake	Extensive	Occasional	Catastrophic	Low	Low
Earthquake Liquefaction	Limited	Occasional	Critical	Low	Low
Floods: 1%/0.2% annual chance	Significant	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Extensive	Highly Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Occasional	Limited	Low	Medium
Levee Failure	Extensive	Occasional	Critical	High	Medium
Pandemic	Extensive	Occasional	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Low	Low
Subsidence	Significant	Highly Likely	Limited	Low	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Critical	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Q.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

Q.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section Q.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table Q-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

Q.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the SRPD's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> *Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table Q-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. SRPD's physical assets, valued at over $148 million, consist of the buildings and infrastructure to support the District's operations.

Table Q-4 SRPD Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Corporation Yard Bldgs.	Maintenance Shop	$675,701	Levee Failure, Tornado, Severe Storm
Crofoot Clubhouse	Recreation Center	$1,215,905	Levee Failure, Tornado, Severe Storm
Florin Creek Recreation Center	Recreation Center	$2,046,773	Levee Failure, Flood, Tornado, Severe Storm
Fruitridge Aquatic Center	Swim Pool	$2,153,554	Tornado, Severe Storm
Fruitridge Community Center	Community Center	$2,358,319	Tornado, Severe Storm
Rizal Community Center	Community Center	$4,615,409	Levee Failure, Tornado, Severe Storm
Pat O'Brien Community Center	Community Center	$10,660,420	Tornado, Severe Storm
Pat O'Brien Community Aquatic Center	Swim Pool	$5,028,500	Tornado, Severe Storm
Scott Hokama Support Facility	Storage and Maintenance	$2,439,277	Tornado, Severe Storm
Sheldon Headquarters	Office	$2,807,695	Levee Failure, Tornado, Severe Storm
Fletcher Farm Community Center	Community Center	$1,155,586	Tornado, Severe Storm
WildHawk Golf Club	Clubhouse	$2,033,831	Tornado, Severe Storm
WildHawk Golf Club – Cart Barn	Cart Storage	$2,432,812	Tornado, Severe Storm
WildHawk Golf Club – Maintenance Bldg.	Maintenance Shop	$663,494	Tornado, Severe Storm
WildHawk Golf Course	Golf Course	$4,500,000	Drought, Flood, Severe Storms, Tornadoes, Extreme Heat, Climate Change
Gerry Green Head Start Facility	Preschool	$1,886,378	Tornado Severe Storm
Boulder Glen Park	Park	$833,000	Drought, Insects/Pests, Severe Storms, Tornadoes, Extreme Heat
Bowling Green Park	Park	$2,682,000	Drought, Levee Failure, Insects/Pests, Severe Storms, Tornadoes, Extreme Heat
Bradshaw Vineyards	Park	$1,280,000	Drought, Flood, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Brittany Park	Park	$525,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Calvine Crossing Park	Park	$1,960,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Calvine Station Park	Park	$1,019,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Carlisle Woods Park	Park	$1,325,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Caymus Park	Park	$931,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Churchill Downs Community Park	Park	$4,278,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Cochran Park	Park	$2,492,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Cottonwood Park	Park	$1,655,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Countryside Community Park	Park	$3,183,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Crofoot Park	Park	$906,000	Drought, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Florin Creek Park	Park	$3,870,000	Drought, Flood, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Fountain Plaza Park	Park	$1,378,000	Drought, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Fruitridge Park	Park	$3,412,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Hampton Park	Park	$3,430,000	Drought, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Hardester Park	Park	$2,204,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Illa Collin Park	Park	$3,060,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Jack W. Davis Park	Park	$612,442	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Kennedy Park	Park	$1,159,000	Drought, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Little Hawke Park	Park	$1,363,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Nicholas Park	Park	$3,461,000	Drought, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Norman S. Waters Park	Park	$2,611,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Olde Florintown Park	Park	$3,192,000	Drought, Flood, Climate Change, Severe Storms, Tornadoes, Extreme Heat

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Pacific Park	Park	$508,000	Drought, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Rainbow Park	Park	$1,408,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Royal Park	Park	$976,000	Drought, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Rutter Park	Park	$2,306,000	Drought, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Sheldon Park	Park	$3,822,000	Drought, Flood, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Silver Leaf Park	Park	$2,063,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Sky Park	Park	$1,582,000	Drought, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Southwoods Park	Park	$1,374,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Sunrise Florin Park	Park	$2,540,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Tamarindo Park	Park	$1,543,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Toby Johnson Park	Park	$2,143,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Vineyard Park	Park	$618,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Vineyard Creek Park	Park	Future Park	Drought, Flood, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Don & Brenda Notolli Community Park	Park	$$6,005,418	Drought, Flood, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Jimmie R. Yee Park	Park	$1,615,760	Drought, Flood, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Vintage Park	Park	$2,960,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Larry Gury Community Park	Park	$$8,683,739	Drought, Flood, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Willowood Park	Park	$1,099,273	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Florin Creek Trail	Ped/Bike Trail	$950,400	Drought, Flood, Levee Failure, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Tillotson Parkway	Ped/Bike Trail	$5,552,000	Drought, Climate Change, Severe Storms, Tornadoes, Extreme Heat
Laguna Creek Parkway	Ped/Bike Trail	$938,572	Drought, Flood, Climate Change, Severe Storms, Tornadoes, Extreme Heat, Wildfire

Source: SRPD

Natural Resources

The Southgate Recreation & Park District has a variety of natural resources of value to the community:

- Laguna Creek Parkway (125.5 acres)
- Bradshaw Vineyards Open Space Preserve (3.08 Acres)
- Elder Creek Open Space Preserve (15.29 acres)
- Gerber Creek Open Space Preserve (4.93 acres)
- Kingsbridge Open Space Preserve (29.36 acres)
- Dunmore Park Preserve (32.87 acres)
- Gene Andal Park Preserve (Sacramento County)
- Various mitigation banks and conservancies also identified as the Vernal Pool Prairie Preserve not owned by Southgate

Historic and Cultural Resources

There are no nationally recognized landmarks but there are still a few scattered pre-World War II buildings along Florin Rd. The area previously known as Florin was a flourishing Japanese community of Issei and Nisei immigrant farmers. One of those buildings includes Florin East Grammar School which became a segregated school for kids of oriental decent in 1923 and is now owned by the County of Sacramento and operated by Southgate RPD under a lease agreement.

Growth and Development Trends

Growth within the Southgate RPD has increased. Planning areas such as the Vineyard Springs Comprehensive Plan, North Vineyard Station Specific Plan, Florin Vineyard Community Plan, Olde Florintown Special Planning Area, and the planned West Jackson Highway Master Plan accommodate new growth in the Southgate RPD.

Development since 2016

The District has recently completed constructed of a community center, aquatic center, and support facility. In addition, the District has also constructed 3 new parks, Don and Brenda Nottoli Community Park, Larry Gury Community Park, and Jimmie R. Yee Park and updated the facilities at several parks and buildings since 2016. These were built to modern building codes. As such, a change in vulnerability is unlikely.

Future Development

The District has limited control over future development in areas the District services. Future development in these areas parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

Olde Florintown Special Planning Area

The Final Environmental Impact Report (FEIR) for the Olde Florintown Special Planning Area (OFT SPA) was approved by the Board of Supervisors on May 25, 2011. The intent of the OFT SPA is to preserve the Historic Village Center, create additional housing opportunities, and to create a theme for the area with development standards and design guidelines. The OFT SPA is located within the unincorporated area of Sacramento County, along Florin Road approximately between Power Inn Road and Florin Perkins Road/French Road, in the South Sacramento Community Plan Area.

The District previously reviewed and commented on this plan regarding parkland dedication requirements, infill development, trail alignment along the Florin Creek drainage corridor, parking, and inclusion of a parkway along Alta-Florin Road. The District's concerns were considered throughout the County's development of the Olde Florintown Special Planning Area planning documents, land use diagram, and development standards and guidelines and were satisfactorily addressed and incorporated into the FEIR.

Florin Vineyard "Gap" Community Plan Area

In 1999, the Sacramento County Board of Supervisors initiated a community planning program for the Florin-Vineyard area, also known as the "Gap" area. The proposed Florin-Vineyard Community Plan area covers approximately 3,450+ acres and is located within the communities of Vineyard and South Sacramento. The term "Gap" has been used to refer to this area because it is located between the existing urban area to the west of Elk Grove-Florin Road and a comprehensively planned urban area to the east (i.e., North Vineyard Station and Vineyard Springs).

The Florin Vineyard Community Plan was adopted in December of 2010 and individual project applications were approved in early 2011. Additional build-out of the plan area will be reviewed on a project by project basis. Southgate Recreation and Park District will work with the County and individual project applicants to ensure that the parkland dedication requirements are met for each project and for the planning area as a whole. A pedestrian and bicycle trail network will be aligned within the Elder Creek open space and "Green Street", and 35-foot parkways will be provided along Gardner Avenue and Hedge Road.

North Vineyard Station Specific Plan Area

The North Vineyard Station Specific Plan was initiated by the Board of Supervisors in November of 1993 and approved on November 4, 1998. The Specific Plan area is approximately 1,594 acres in size and is bounded by Florin Road to the north, Gerber Road to the south, Elder Creek to the west and the extension of Vineyard Road to the east.

Southgate will own, operate and maintain the parks and open space throughout the North Vineyard Station Specific Plan Area. A pedestrian and bicycle trail will be aligned within the Gerber and Elder Creeks open space areas.

Proposed West Jackson Highway Master Plan

The West Jackson Highway Master Plan is a significant Sacramento County project that encompasses nearly 5,900 acres in the Vineyard and Cordova Community Planning Areas. The proposed project includes three alternatives. Approximately 3,000 acres (52%) of the project are located within the northern portion of the Southgate Recreation & Park District along Jackson Highway. The District will work with the development community, County, and regulatory agencies on identifying the most appropriate locations for all new parkland and associated recreation facilities. Currently there is approximately 125 acres of parks, 1,900 acres of open spaces, and multi-use trail corridors throughout the plan area. The intended result of this process is to create an overview of future park and recreation amenities in relation to residential and commercial centers.

Q.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table Q-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

The District has not had any major power outages that have affected services for extended periods of time.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan. The District has been minimally affected by power outages and/or power failures. In cases where power has been lost, most of the administration operations and recreation programs have been canceled. Administration services are computer dependent and therefore most work that is dependent on electronic devices cannot be performed when power is out. The District does not have backup generators at any of the facilities. However, SMUD has never had a PSPS event to date.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and

rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

The District has not noticed any notable changes and climate change is slow and therefore the District is able to adapt to changes as they happen. At this time the District has experience seasons of high rainfall and seasons of drought. Our operations are adaptable and everchanging based on weather not on specific impacts of climate change.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the District noted that climate change is of concern, no specific impacts of climate change could be recalled. The District and HMPC members did, however, note that in Sacramento County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability to and Impacts from Climate Change

The 2014 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors, and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

The District recognizes that climate change could have the following impacts that would affect District operations:

- Temperature increases which could increase the rates of wildfire. Wildfire hazards in District areas that are urbanized are low but areas where development has encroached into previously rural areas are more susceptible to grass fires. The District's rural areas lie mostly to the north and east are with most being currently undeveloped. There is also larger ag residential centrally located to the District. Although most urbanized areas are unlikely to experience increased fire risk, wildfires in the Sierra Nevada and areas outside the county can affect air quality in the District.
- Decreased precipitation can result in dry soil, shallow streams, and shortages of municipal water supplies. The District would have to water earlier and later into the year.

Assets at Risk

The District recognizes that changes in the earth climate can affect many things. The District facilities that will most likely be affected would be our parks and open spaces. The drier the season the higher the likelihood of fires if these facilities do not receive sufficient water.

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, commercial, and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the District, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long

period of time, water shortage becomes a larger issue. Current drought conditions in the District and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There has been two state and one federal disaster declaration due to drought since 1950. This can be seen in Table Q-5.

Table Q-5 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the District are the same as those for the County and includes 5 multi-year droughts over an 85-year period. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

In January 2014, the Governor of California declared a State of Emergency projecting that 2014 would be the driest on record and asked Californians to conserve at least 20%. May 2015 the State Water Resource Control Board required a 25% reduction in water use. The Southgate RPD reduced water consumption and irrigation to meet the requirements. The parks, golf course and landscape corridors were more dry than usual. The Southgate RPD owns and maintains over 12,000 trees. Because of the severe drought hundreds of trees died and were removed.

The District has been working to reduce water usage in and around their facilities and in all operations. Irrigation has been reduced, whenever possible, and low water use plumbing installed in buildings. The District continues to examine practices to reduce the water used.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the District, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult.

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. With a reduction in water, water supply issues based on water rights becomes more evident. Climate change may create additional impacts to drought and water shortage in the County and the District.

During periods of drought, vegetation can dry out which increases fire risk. Drought that occurs during periods of extreme heat and high winds can cause Public Safety Power Shutoff (PSPS) events to be declared in the County. More information on power outage and failure can be found in the discussion at the beginning of Section Q.5.3, as well as in Section 4.3.3 of the Base Plan.

The vulnerability is high because of the type of facilities the Southgate RPD owns and maintains which require lots of water in order to maintain them green, usable, and viable for recreational use by the community. Should there be a declared water shortage/drought event, the District will be forced to follow any water shortage restrictions from the County and the State. Landscaped and turfed areas may be stressed by additional water restrictions and more trees may die.

Assets at Risk

All park sites, parkways and landscape corridor vegetation; open space vegetation and wetlands; WildHawk Golf Club course; Fruitridge and Pat O'Brien Community Aquatic centers. Table Q-6 shows the District assets would be affected.

Table Q-6 SRPD – Assets at risk to Drought and Water Shortage

Name of Asset	Facility Type
Fruitridge Aquatic Center	Swim Pool
Pat O'Brien Community Aquatic Center	Swim Pool
WildHawk Golf Course	Golf Course
Boulder Glen Park	Park
Bowling Green Park	Park
Bradshaw Vineyards	Park
Brittany Park	Park
Calvine Crossing Park	Park
Calvine Station Park	Park
Carlisle Woods Park	Park
Caymus Park	Park
Churchill Downs Community Park	Park
Cochran Park	Park
Cottonwood Park	Park
Countryside Community Park	Park
Crofoot Park	Park
Florin Creek Park	Park
Fountain Plaza Park	Park
Fruitridge Park	Park
Hampton Park	Park
Hardester Park	Park
Illa Collin Park	Park

Name of Asset	Facility Type
Jack W. Davis Park	Park
Kennedy Park	Park
Little Hawke Park	Park
Nicholas Park	Park
Norman S. Waters Park	Park
Olde Florintown Park	Park
Pacific Park	Park
Rainbow Park	Park
Royal Park	Park
Rutter Park	Park
Sheldon Park	Park
Silver Leaf Park	Park
Sky Park	Park
Southwoods Park	Park
Sunrise Florin Park	Park
Tamarindo Park	Park
Toby Johnson Park	Park
Vineyard Park	Park
Vineyard Creek Park	Park
Don & Brenda Notolli Community Park	Park
Jimmie R. Yee Park	Park
Vintage Park	Park
Larry Gury Community Park	Park
Willowood Park	Park
Florin Creek Trail	Ped/Bike Trail
Tillotson Parkway	Ped/Bike Trail
Laguna Creek Parkway	Ped/Bike Trail

Source: SRPD

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy

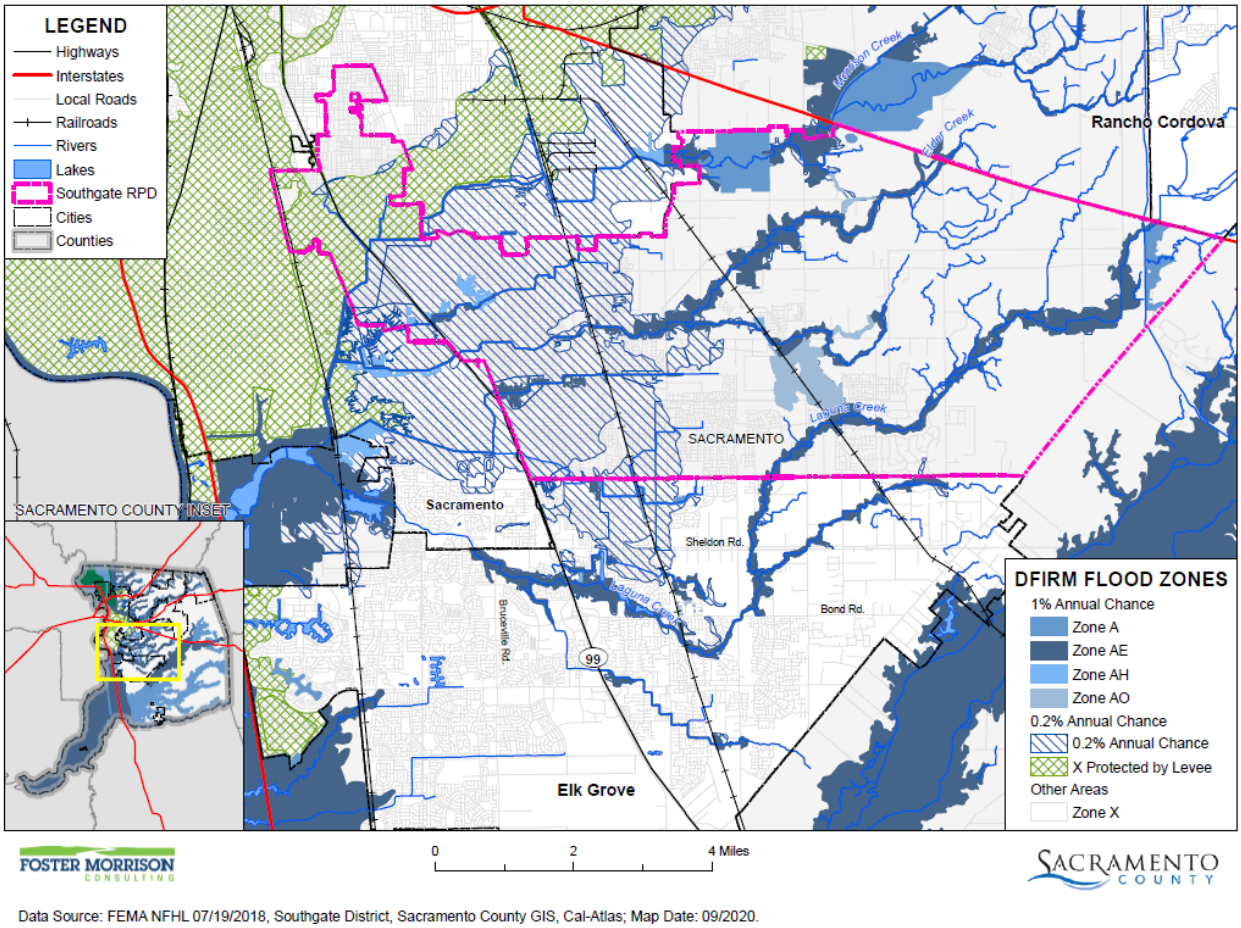
rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the SRPD have been subject to historical flooding.

Location and Extent

The District is traversed by Morrison Creek, Elder Creek, Gerber Creek, Florin Creek, and Laguna Creek, all which are potential sources of flooding. The SRPD has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure Q-2.

Figure Q-2 SRPD – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Southgate District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table Q-7 details the DFIRM mapped flood zones within the 1% and 0.2% annual chance flood zone as well as other flood zones located within the District.

Table Q-7 SRPD– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	X
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	X
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X
X (unshaded)	Outside of flood zones	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table Q-8. These events also likely affected the District to some degree.

Table Q-8 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The District has not had any flood related events since 2017. No District facilities have been affected by flood events since 2016.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities, as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Flooding risks along Morrison Creek, Elder Creek, Gerber Creek, Florin Creek, and Laguna Creek could potentially impact several District facilities. Potential damages from flooding and flood debris would impact trees and landscaping of the parks, open spaces, and the WildHawk golf course. Flood damage to park site structures and buildings could also occur.

Assets at Risk

The District noted that WildHawk Golf Club, Laguna Creek Parkway Open Space and Trail, Bradshaw Vineyards Park, and Open Space Preserve are at risk from flooding. In addition the follow facilities in Table Q-9 are with the 200-year flood zone:

Table Q-9 SRPD – Assets at Risk to Flood (0.5% Annual Chance)

Name of Asset	Facility Type
Bowling Green Park	Park
Crofoot Park	Park
Florin Creek Center	Community Center
Florin Creek Park & Trail	Park & Trail
Fountain Plaza Park	Park
Fruitridge Community Center	Community Center

Name of Asset	Facility Type
Fruitridge Community Park	Park
Hampton Park	Park
Jack Davis Park	Park
Nicholas Park	Park
Pacific Park	Park
Rainbow Park	Park
Royal Park	Park
Rutter Park	Park
Sheldon Park	Park
District Office	Main Office
Sky Park	Park
Kennedy Park	Park
Olde Florintown Park	Park
Orange Ave	Undeveloped Parcel
Olde Florintown Lot	Undeveloped Parcel
Olde Florintown Lot	Parking Lot
Heritage Park	Park
Florin Farm & Open Space	Undeveloped Parcel

Source: Sacramento County DWR, SRPD, FEMA
*Shows property in the 200-year flood zone

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The SRPD is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity

to absorb additional moisture. The majority of District facilities have good drainage with the exception of Hampton Park.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted that localized flooding is an annual occurrence and affects that area described above.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways, and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

In most instances when localized flooding occurs the only issues District staff may have, is gaining access to the site for trash pickup or mowing. There have been no incidents of localized flooding at any of the District buildings.

Assets at Risk

Hampton Park is one of the areas that does not have good drainage and tends to flood for a few days when there are consecutive days of rain.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example,

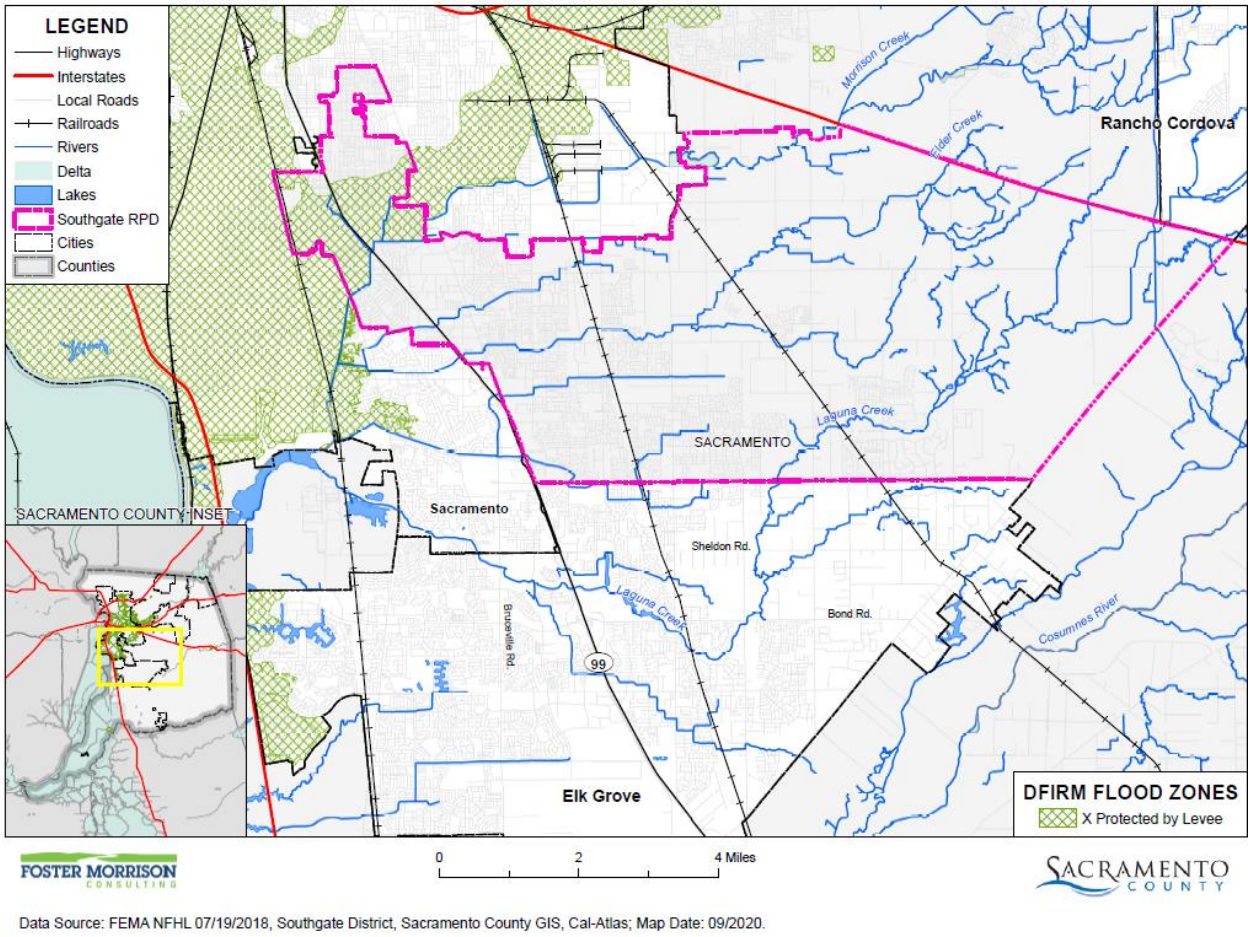
levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Figure Q-6 shows the FEMA DFIRM X Protected by Levee areas in the District. There are no project levees within the District that are part of the State plan for flood control.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure Q-3.

Figure Q-3 SRPD – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Southgate District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

The District assets would be minimally affected but its staff could be highly affected as most are from the surrounding Sacramento area. Road closures could affect circulation and possibly the District would have to deal with evacuations from areas affected.

Assets at Risk

The following assets in Table Q-10 would be affected by levee failure:

Table Q-10 SRPD – Assets at Risk from Levee Failure

Name of Asset	Facility Type
Bowling Green Park	Park
Pacific Park	Park
Fountain Plaza Park	Park
Nicholas Park	Park

Source: SRPD

Pandemic

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the District, County, and surrounding region is at risk, as pandemic is a regional, national, and international event. The speed of onset of pandemic is usually short, while the duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table Q-11.

Table Q-11 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic.

- The 1918-1919 Influenza Pandemic (H1N1)
- The February 1957-1958 Influenza Pandemic (H2N2)
- The 1968 Influenza Pandemic (H3N2)

To date, the 21st century has seen two acknowledged pandemics.

- 2009 Swine Flu (H1N1)
- 2019/2020 COVID 19

COVID-19 pandemic caused major shutdowns as a result of the State stay-at-home order and County public health orders. All recreational programs were shut down and District facility rentals were not allowed. Temporary and seasonal staff were laid off and administrative employees were allowed to work from home when their jobs permitted it.

Vulnerability to and Impacts from Pandemic

Pandemics have and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding the current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent the spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. The COVID-19 pandemic has resulted in the imposition of restrictions on gatherings and widespread temporary closings of businesses, universities, and schools.

Pandemics do not directly affect the buildings, critical facilities, and infrastructure in the District. Pandemics can have varying levels of impact to the citizens of the District and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with COVID-19, multiple businesses were forced to close temporarily (some permanently), and unemployment rose significantly. Supply chains for food and essentials can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

Southgate Recreation & Park District was greatly impacted by the pandemic. The maintenance of parks, administration, and golf operations of the District are essential services and continued to operate with modifications. Most recreation programs and facilities closed in response to the COVID-19 pandemic. Continuing the maintenance of parks and re-opening recreation programs under public health orders and guidelines require a significant modifications and investment in labor, equipment and supplies.

Assets at Risk

Pandemics are a significant risk to the health of employees, contractors, and volunteers who maintain and operate District facilities and can result in the inability to properly maintain and operate District facilities, which are critical infrastructure.,

Severe Weather: Extreme Cold and Freeze

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to the National Weather Service (NWS), extreme cold often accompanies a winter storm or is left in its wake. Freezing temperatures can also occur without the accompanying winter storm.

Location and Extent

Extreme cold and freeze are regional issues, meaning the entire County is at risk to cold weather and freeze events. While there is no scale (i.e. Richter, Enhanced Fujita) to measure the effects of extreme cold and freeze, temperature data from the County from the WRCC indicates that there are 21.8 days that fall below 32°F in western Sacramento County. Freeze has a slow onset and can generally be predicted in advance for the County. Freeze events can last for hours (in a cold overnight), or for days to weeks at a time.

Past Occurrences

There has been no federal or state disaster declarations in the County for cold or freeze. The District noted that cold and freeze is a regional phenomenon; events that affected the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.2.

Vulnerability to and Impacts from Severe Weather: Freeze and Winter Storms

The District experiences temperatures below 32 degrees during the winter months. Freeze can cause injury or loss of life to residents of the District. While it is rare for buildings to be affected directly by freeze, damages to pipes that feed building can be damaged during periods of extreme cold.

Assets at Risk

District facilities most likely affected would be parks as water pipes could burst if exposed to extreme cold for extended periods. District personnel who work outdoors may also be affected if cold temperatures drop, likely it would make it difficult to remain outside.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature." Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the District, there are risk to the built environment from extreme heat. While extreme heat on its own does not usually affect structure, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat and high winds can cause power outages and PSPS events, causing issues to buildings in the District.

Location and Extent

Heat is a regional phenomenon and affects the whole of the District. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for heat. The District Planning Team note that since extreme heat is a regional phenomenon, events that affected the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.3.

District park and golf maintenance staff has had to adjust their hours and workflow and, in some instances, staff has stopped working when the conditions are extreme and unhealthy. Outdoor recreation programs have been cancelled.

Vulnerability to and Impacts from Extreme Heat

The District experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-110°F in rather extreme situations. During these times, drought conditions may worsen. Also, power outages and PSPS events may occur during these times as well. Health impacts are the primary concern with this hazard, though economic impacts are also an issue.

Days of extreme heat have been known to result in medical emergencies and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts. Extreme heat can also dry out vegetations, making it more vulnerable to wildfire ignitions.

Extreme heat could potentially impact parks and golf maintenance workers, recreational program participants, WildHawk Golf Club customers, and vegetation. Poor air quality also resulting from extreme heat would impact any recreational programs held outdoors, WildHawk Golf customers, and parks maintenance workers. Rolling blackouts due to extreme heat would also impact district facilities.

Extreme heat impacts air quality on Spare the Air Days. Outdoor programs can be suspended or cancelled. Extreme heat also intensifies the need to water park sites, parkways, and landscape corridors, and can also affect the ability to do outdoor work for maintenance staff. Extreme heat also aggravates the drought situation that is already affecting the amount of water available for watering.

District park and golf maintenance staff has been impacted by poor air quality due to extreme heat and has had to make adjustment to work flow or send staff home in order to avoid working outdoors.

Assets at Risk

Parks, landscape corridors, and open space vegetation; outdoor recreational programs; WildHawk Golf Club and park maintenance employees.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

In January 2009, a severe storm resulted in extensive damage and loss of trees throughout the District. Severe storms could also impact building structure features such as roofing and windows.

District park and golf maintenance staff usually deal with a fair amount of fallen trees or tree branches when heavy rain and winds come through the area.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways, and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power outage and failure can be found in the discussion at the beginning of Section Q.5.3, as well as in Section 4.3.3 of the Base Plan.

Assets at Risk

Parks, landscape corridors, and open space vegetation; park site play structures and shelters; all building structures and WildHawk Golf Club course.

Wildfire

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

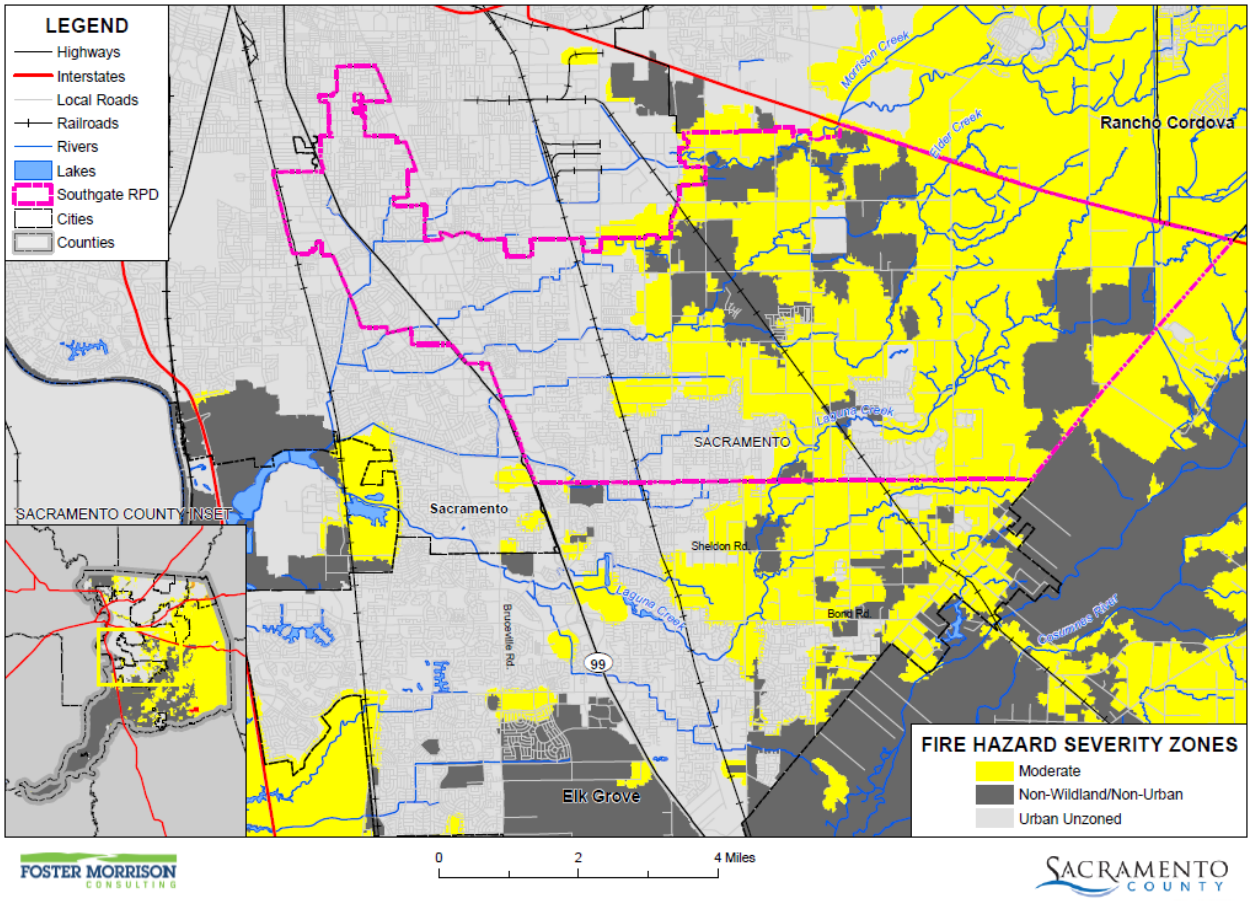
Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the SRPD. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

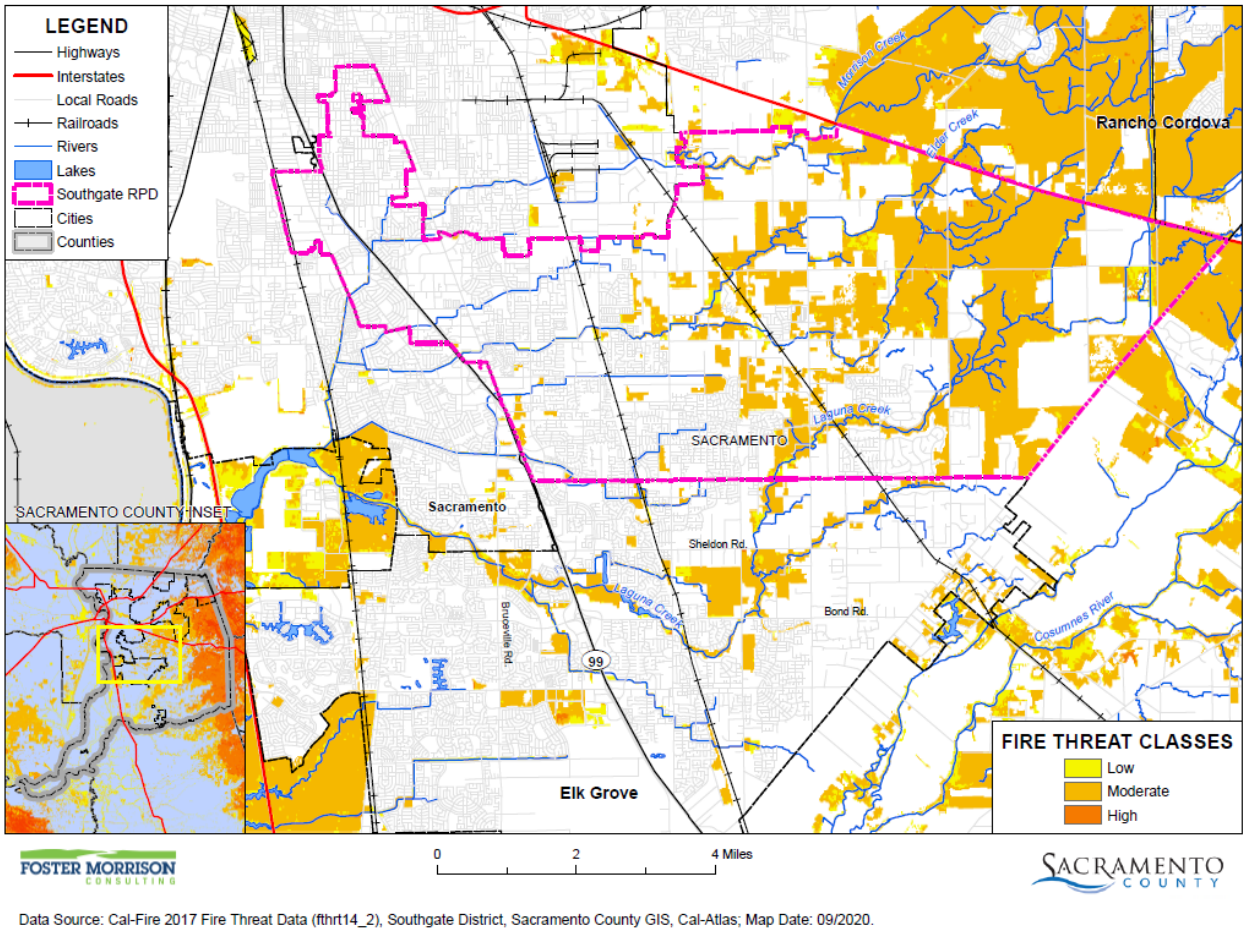
Wildfire can affect all areas of the District. CAL FIRE has estimated that the risk varies across the District and has created maps showing risk variance. Following the methodology described in Section 4.3.16 of the Base Plan, wildfire maps for the SRPD were created. Figure Q-4 shows the CAL FIRE FHSZ in the District. As shown on the maps, fire hazard severity zones within the District range from Urban Unzoned to Moderate. Figure Q-5 shows the CAL FIRE Threat Areas in the City. As shown on the maps, fire threat within the District ranges from No Threat to High.

Figure Q-4 SRPD – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Southgate District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure Q-5 SRPD – Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Southgate District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more.

Past Occurrences

There has been one state and no federal disaster declarations for Sacramento County from fire. It should be noted that this was from Southern Pacific Railroad Fires and Explosions (Roseville), so it was not truly a wildfire.

Table Q-12 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

This past late summer and fall Southgate Park and Golf Maintenance staff was impacted by poor air quality due to local fires throughout the State. Workloads and work schedules were adjusted. Staff stopped working outdoors on several occasions due to poor air quality conditions.

Vulnerability to and Impacts from Wildfire

Risk and vulnerability to the Sacramento County Planning Area and the District from wildfire is of significant concern, with some areas of the Planning Area being at greater risk than others as described further in this section. High fuel loads in the Planning Area, combined with a large built environment and population, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. During the May to October fire season, the dry vegetation, and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and the District, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the District. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the District by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the District; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from large fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate PSPSs which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. More information on power outage and failure can be found at the beginning of Section Q.5.3 above, as well as in Section 4.3.3 of the Base Plan. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

The largest impact from fire in the District is the poor air quality. The District facilities are mainly located in developed areas where wildfires are not as common. The District does own open space areas and undeveloped parcels of land. District Park Maintenance staff does perform weed abatement on a yearly basis in order to prevent fire hazards created by vegetative growth. District properties are cleared of weeds, grass, vines, or other growth that is capable of igniting and endangering neighboring properties.

Assets at Risk

Parks, landscape corridors, and open space areas in the District are at risk to wildfire.

Q.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

Q.6.1. Regulatory Mitigation Capabilities

Table Q-13 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the SRPD.

Table Q-13 SRPD Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	N	
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	N	
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Urban Forest Management Plan
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Score:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Rating:
Fire department ISO rating:	Y	District standards and specifications reviewed and updated on a regular basis
Site plan review requirements	N	Score:

Land Use Planning and Ordinances	Y/N	Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	
Other	Y	District Policy Manual
How can these capabilities be expanded and improved to reduce risk?		
Continue to implement programs and enforce County and State regulations. The District need to complete and implement a Master Plan that addresses District facilities and operations.		

Source: SRPD

Q.6.2. Administrative/Technical Mitigation Capabilities

Table Q-14 identifies the District department(s) responsible for activities related to mitigation and loss prevention in SRPD.

Table Q-14 SRPD's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	The District has maintenance crews.
Mutual aid agreements	N	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	N	
Community Planner	Y	Staff is adequate to enforce regulations. There is coordination between County agencies and District staff.
Civil Engineer	N	

GIS Coordinator	Y	Staff is trained on GIS
Other	Y	Parks Manager
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	N	
Hazard data and information	N	
Grant writing	Y	
Hazard analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The District would need to hire full-time staff or a consultant with knowledge in understanding and mitigating potential hazards.		

Source: SRPD

Q.6.3. Fiscal Mitigation Capabilities

Table Q-15 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table Q-15 SRPD's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	There are funding resources used in the past that can be used in the future.
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	The District participates in Development Impact Fee programs administered by the County of Sacramento.
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	Y	There are funding resources used in the past that can be used in the future.
Community Development Block Grant	Y	There are funding resources used in the past that can be used in the future.
Other federal funding programs	Y	
State funding programs	Y	Grants
Other		Assessment Districts
How can these capabilities be expanded and improved to reduce risk?		

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Continue to train staff, implement programs, enforce regulations, seek funding sources, and find opportunities to expand upon District capabilities.		

Source: SRPD

Q.6.4. Mitigation Education, Outreach, and Partnerships

Table Q-16 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table Q-16 SRPD's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	N	
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Partner with regional partners such as SMUD, County of Operational Emergency Services, Sacramento County Water Agency, and Sac Metro Fire to train staff and implement programs and enforce regulations and provide outreach and education on District programs and requirements.		

Source: SRPD

Q.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

- The District works with both the County Department of Water Resources (DWR) and SAFCA related to creek and stream drainage issues as well as stormwater detention. The District currently has several joint-use detention basins planned with DWR that are either on District park sites or adjacent to them. These basins provide the County with adequate basins for storm water detention but at the same time during non-storm periods that land can be used for passive and active recreational purposes.
- Voters approved Proposition 68 on June 5, 2018. The measure authorized $4 billion in general obligation bonds for state and local parks, environmental protection and restoration, water

infrastructure, and flood protection projects. The largest grant is the Statewide Park Program, administered through California State Parks. This program will award funding through competitive cycles totaling $650,275,000. To qualify, a project must be in an area with less than 3 acres park per 1,000 residents or where the median household income is below $56,982. In 2019 the District applied for and received $3.6M to renovate Nicholas Park; a project that is undergoing design and you will hear more about in the future. Now, the District Board directed staff to apply for two more locations, both of which have the potential to expand existing parks. In March, the District applied for $7.4M to augment an existing grant of $2.3M to expand and revitalize the Fruitridge Community & Aquatic Center and Park and $8.5M to expand and renovate Jack Sheldon Park. This grant cycle is the largest park grant program in California history with $395,302,155 available for competitive grant funding; however, it is highly competitive and anticipated that less than 10 percent of requested funds will be awarded. Announcements are due towards the summer of 2021, so hopefully we will have good news to report in our next issue of the Southgator.

- To mitigate winter storms and summer droughts affects District Park and Golf Maintenance staff prunes trees in parks, landscape corridors, and WildHawk Golf Club on a yearly cycle and staff responds promptly to call about trees that may pose a safety hazard. During the late spring District Park Maintenance staff clears dry brush to create fire breaks in open space areas near residential and disks soils and grasses in undeveloped parcels that have no critical habitat but will be used as parkland in the future.

Q.7 Mitigation Strategy

Q.7.1. Mitigation Goals and Objectives

The SRPD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Q.7.2. Mitigation Actions

The planning team for the SRPD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Drought & Water Shortage
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Wildfire

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts

are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five-year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Drought Mitigation Actions/Drought Contingency Plan

Hazards Addressed: Drought and Water Shortage, Extreme Heat, Wildfire

Goals Addressed: 1, 2, 3, 4

Issue/Background: In 2015 California entered its fourth year of a record-breaking drought creating an extremely parched landscape. Governor Jerry Brown declared a drought State of Emergency in January 2015 and imposed strict conservation measures statewide. Gov. Jerry Brown demanded a 25 percent cut in urban water usage due to a severe drought affecting much of California and the West.

Other Alternatives: Institute minimum reductions

Existing Planning Mechanisms through which Action will be Implemented: The Southgate RPD will continue with the implemented state mandated water conservation regulations. The Southgate RPD stopped watering by ET (evapo-transportation, i.e. irrigating based on weather data). Also, with new parks and landscape development the District is specifying drought tolerant vegetation, less turf areas, less water using sprinkler systems (i.e. Netafim, subterranean drip system, internet based controllers, and MP rotators.) All of which promote water conservation.

Responsible Office: Southgate RPD- Parks Department

Priority (H, M, L): High

Cost Estimate: $100K to $500K

Potential Funding: Unknown

Benefits (avoided Losses): Reduce water use and cost and avoid potential fines

Schedule: Ongoing

Action 2. Flood Mitigation Actions/Land Acquisition

Hazards Addressed: Floods: 1%/0.2% annual chance, Heavy Rain and Storms, Climate Change

Goals Addressed: 1, 2, 3, 4

Issue/Background: Areas to the west of Southgate RPD have historically been vulnerable to flooding from high water flows on Morrison Creek, Florin Creek, and Elder Creek. These occur during periods of high rains, which are expected to be made worse by climate change. Park lands within the North Vineyard Station Specific Plan area have been designated in locations adjacent to Elder Creek, Gerber Creek and Laguna Creek. The park sites will have storm water detentions basins with water quality treatment functions, and trail facilities. In addition, there is also a proposed park with an integrated multi-use storm water detention basin with soccer fields adjacent to Laguna Creek within the Vineyard Springs Comprehensive Plan area. In 2016 Florin Creek Park was expanded and converted to a multi-use basin for recreational use. The basin will provide flood control for areas within the 100-year flood plain of Florin Creek and improve recreational benefits at the park site. Southgate RPD continues to pursue the acquisition of open space land when it makes geographic and economic sense and proves beneficial to Southgate RPD's long term acquisition goals.

Other Alternatives: Do nothing

Existing Planning Mechanisms through which Action will be Implemented: As new development comes along Southgate RPD will continue to pursue the acquisition of open space, and parkland, and seek joint-use opportunities with partner agencies.

Responsible Office: SAFCA, Southgate RPD, City of Sacramento, County of Sacramento, FEMA, Corps of Engineers, State Department of Water Resources

Priority (H, M, L): Medium

Cost Estimate: TBD cost based on project

Potential Funding: TBD

Benefits (avoided Losses): Prevent potential flooding in urbanized areas.

Schedule: Ongoing

Action 3. Conservation Easements

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Earthquake Liquefaction, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Severe Weather: Wind and Tornado, Subsidence, Wildfire)

Goals Addressed: 1, 2, 3, 4

Issue/Background: Development has encroached into agricultural lands, and wetlands are being lost. Southgate RPD is trying to acquire those lands that are considered to contain rare wildlife habitat in order

to limit certain types of uses or prevent development from taking place by protecting the land for future generations.

Southgate RPD is in the process of acquiring property within the North Vineyard Station Specific Plan - Elder Creek and Gerber Creek open space preserve area associated with current subdivision developments and as a required by the U.S. Army Corps of Engineers. A conservation easement will be granted over each portion of the Preserve. The conservation easement will run with the land and protect the Preserve as wetland and wildlife habitat in perpetuity, subject to the long term management responsibilities of Southgate RPD and drainage maintenance responsibilities of Water Resources for the purpose of flood control maintenance. Wildlife Heritage Foundation will hold the Conservation Easement over the Preserve areas. Southgate RPD will manage and maintain the preserve as outline in the Open Space Preserve Operations and Management Plan for the North Vineyard Station Specific Plan - Elder and Gerber Creek.

Other Alternatives: Reduce General Plan open space requirements and increase developable land.

Existing Planning Mechanisms through which Action will be Implemented: As new development comes along Southgate RPD will continue to pursue the acquisition of open space, and parkland, and seek joint-use opportunities with partner agencies.

Responsible Office: Southgate RPD, Corps of Engineers, Sacramento County

Priority (H, M, L): Low

Cost Estimate: TBD cost will depend on available budget

Potential Funding: TBD

Benefits (avoided Losses): Provide permanent guarantee that the land will not be developed.

Schedule: Ongoing

Action 4. Multi-jurisdictional Cooperation within Watersheds

Hazards Addressed: Flood: Localized Stormwater Flooding, Floods: 1%/0.2% annual chance, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: County of Sacramento is proposing to construct a 15-acre multi-use detention basin to provide improvements for flood control at Larry Gury Community Park. The Project is a component of the Vineyard Springs Comprehensive Plan (VSCP) Drainage Master Plan (DMP). The Project is located on vacant land west of Wildhawk West Drive, within the Wildhawk West Estates subdivision, north of Laguna Creek in the Vineyard Springs community of unincorporated Sacramento County.

During large storm events, water spills out of Laguna Creek and travels north across the land to Gerber Creek in what is known as the inter-basin transfer. This inter-basin transfer is a shallow floodplain with a depth of two feet (2'), represented by a Federal Emergency Management Agency (FEMA) Special Flood

Hazard Area (SFHA) Zone AO. The DMP identifies this Project's flood control basin as one of the major improvements needed to stop this inter-basin transfer. The Project improvements are the first step needed to remove the FEMA SFHA Zone AO floodplain, removing flood risk to the properties within the inter-basin transfer area, and ultimately allowing the affected area to be developed. During large storm events, the detention basin will temporarily store community stormwater runoff until it can be conveyed to Laguna Creek. Most of the time, the basin will be dry and available for use as soccer fields and other play fields in the Larry Gury Community Park. Upon completion of the Project, Southgate Recreation & Park District (SRPD) will construct and maintain the soccer and play fields with lighting, irrigated turf, and landscaping.

During large storm events, the detention basin will temporarily store community stormwater runoff until it can be conveyed to Laguna Creek. Most of the time, the basin will be dry and available for use as soccer fields and other play fields in the Larry Gury Community Park. Upon completion of the Project, Southgate Recreation & Park District (SRPD) will construct and maintain the soccer and play fields with lighting, irrigated turf, and landscaping.

Other Alternatives: Do nothing

Existing Planning Mechanisms through which Action will be Implemented: As new development comes along Southgate RPD will continue to pursue the acquisition of open space, and parkland, and seek joint-use opportunities with partner agencies.

Responsible Office: FEMA, County of Sacramento, Southgate RPD

Priority (H, M, L): Medium

Cost Estimate: $6M

Potential Funding: Sacramento County and Development Impact Fees

Benefits (avoided Losses): Better flood control and additional recreational benefits.

Schedule: 2022 to 2023

Action 5. Storm Water Management Practices – Implement Storm Water Management Practices as identified in Stormwater Quality Design Manual

Hazards Addressed: Flood: Localized Stormwater Flooding, Floods: 1%/0.2% annual chance, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4

Issue/Background: Heavy rains and severe storms occur during the fall, winter and spring. The heavy storms can cause flooding as well as extensive localized drainage issues. There is a lot of growth in some areas of Southgate RPD and if not planned accordingly there may be a lack of adequate drainage systems.

Southgate RPD works collaboratively with the Sacramento County Department of Water Resources (DWR) to plan and design joint-use facilities that will provide both storm water management and recreation use to

Southgate RPD residents. These types of projects keep creek drainage corridors in their natural state and provide storm water detention basins with compatible recreational uses such as trails and sports fields. These types of projects help improve the storm water quality and drainage capacity in our neighborhoods while at the same time providing additional recreation opportunities in the community. An example of these joint-use facilities includes the Laguna Creek Parkway open space which has preserved a 130-acre portion of the 100 year flood plain of Laguna Creek while providing a multi-use trail and open space corridor for residents to enjoy. A similar joint-use open space corridor is planned for the Elder and Gerber Creek drainage corridors that traverse Southgate RPD. The Southgate RPD is also in the process of designing two storm water detention projects with the County DWR that will accommodate soccer fields within the basin areas.

Other Alternatives: Do nothing

Existing Planning Mechanisms through which Action will be Implemented: As new development comes along Southgate RPD will continue to pursue the acquisition of open space, and parkland, and seek joint-use opportunities with partner agencies.

Responsible Office: Sacramento County Department of Water Resources (DWR), Southgate RPD

Priority (H, M, L): Medium

Cost Estimate: TBD

Potential Funding: Unknown

Benefits (avoided Losses): Flooding is mitigated in new areas and adds protection to existing areas.

Schedule: Ongoing

Action 6. Severe Weather: Heavy Rains and Storms Mitigation Actions/Tree Management

Hazards Addressed: Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4

Issue/Background: Heavy rains and storms have caused trees to fall over especially when the ground becomes very saturated and the tree is weak or diseased. In past years many trees have died from the drought and will need to be removed before a big rainstorm comes through and causes them to fall over or create a hazard.

In 2012 the Southgate RPD received a grant from the Urban Forestry Program Entitled, "An Urban Forest for Every City". This Program Grant funded the development and implementation of a management plan for our urban forest which determined reasonable maintenance goals and set a standard maintenance cycle to help the District proactively manage our forest in a way that reflects the values of our community within a set budget. The grant was used to conduct a tree inventory as the first step in better understanding the needs and distribution of its trees and the value of its forest asset. A consulting arborist and certified tree

risk assessor provided an inventory of all the trees in the parks, parkways, open space and landscape corridors in the Southgate RPD. The inventory noted the location, species, size, health, and potential for infrastructure conflicts and hazards for each tree on Southgate RPD owned property as well as noting empty planting locations. High risk trees were identified and most have been removed. Southgate RPD is still in has adopted an Urban Forest Management Plan that aims to identify actions that will support a healthy and regenerative urban forest.

Other Alternatives: Do nothing

Existing Planning Mechanisms through which Action will be Implemented:

- Southgate RPD - Parks Department and Golf Department
- GIS inventory
- Planting trees with Sac Tree Foundation
- Implementing the Urban Forest Management Plan

Responsible Office: Southgate RPD

Priority (H, M, L): Medium

Cost Estimate: TBD

Potential Funding: Unknown

Benefits (avoided Losses): Those trees identified in poor condition can be removed in a timely manner to avoid a hazardous and dangerous situation at a later time.

Schedule: Ongoing

Action 7. Integrate Local Hazard Mitigation Plan into District Master Plan

Hazards Addressed: Multi-hazard (Climate Change, Dam Failure, Drought & Water Shortage, Earthquake, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Pandemic, Severe Weather: Extreme Cold and Freeze, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Communities with a FEMA-approved LHMP are eligible for FEMA pre- and post-disaster grant funding and for lower costs of flood insurance to residents through the National Flood Insurance Program's (NFIP) Community Rating System (CRS). Adoption of the local hazard mitigation plan (LHMP) in accordance with the Federal Disaster Mitigation Act of 200 will allow the district to apply for these grants. The District can adopt the LHMP and incorporate it or reference it in the Master Plan.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Master Plan

Responsible Office: Sacramento County, Districts, and Cities

Priority (H, M, L): High

Cost Estimate: TBD dependent on the frequency of events and hazards encountered annually.

Potential Funding: District funds, grant funds

Benefits (avoided Losses): Increase knowledge of potential hazards and activities required to mitigate hazards and be prepared in order to protect lives and reduce damage.

Schedule: As soon as possible

Action 8. Covid-19 Response Plan

Hazards Addressed: Pandemic

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing global pandemic of coronavirus disease 2019 (COVID-19), which is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus was first identified in December 2019 in Wuhan, China. The World Health Organization declared a Public Health Emergency of International Concern regarding COVID-19 on 30 January 2020, and later declared a pandemic on 11 March 2020.

Other Alternatives: Do nothing

Existing Planning Mechanisms through which Action will be Implemented: The District has dedicated resources immediately to identify and mitigate situations in the workplace and in public buildings which may introduce, expose, or spread COVID-19. The operations are unique to each department and program and mitigation measures will be taken in order to continue to provide a safe work practice. The plan will be updated on a regular basis for the duration of the COVID-19 situation. Along with these measures all open building facilities have been or will be fitted with MERV 13 filters along with ionization units as they are opened to the public.

Responsible Office: Southgate RPD, State of California, Centers for Disease Control and Prevention

Priority (H, M, L): High

Cost Estimate: $275K to $650K

Potential Funding: General fund,

Benefits (avoided Losses): Help prevent the spread of COVID-19.

Schedule: Ongoing

Annex R Twin Rivers School District

R.1 Introduction

This Annex details the hazard mitigation planning elements specific to Twin Rivers Unified School District (TRUSD or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to TRUSD, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

R.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table R-1. Additional details on plan participation and District representatives are included in Appendix A.

Table R-1 TRUSD – Planning Team

Name	Position/Title	How Participated
Greg Rash	Business Director	Coordination/Reports
Perry Hererra	Facilities Director	Project Planning/Implementation
Victoria Garcia	Facilities Sr. Budget	Provided Facility Records

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in

le R-2.

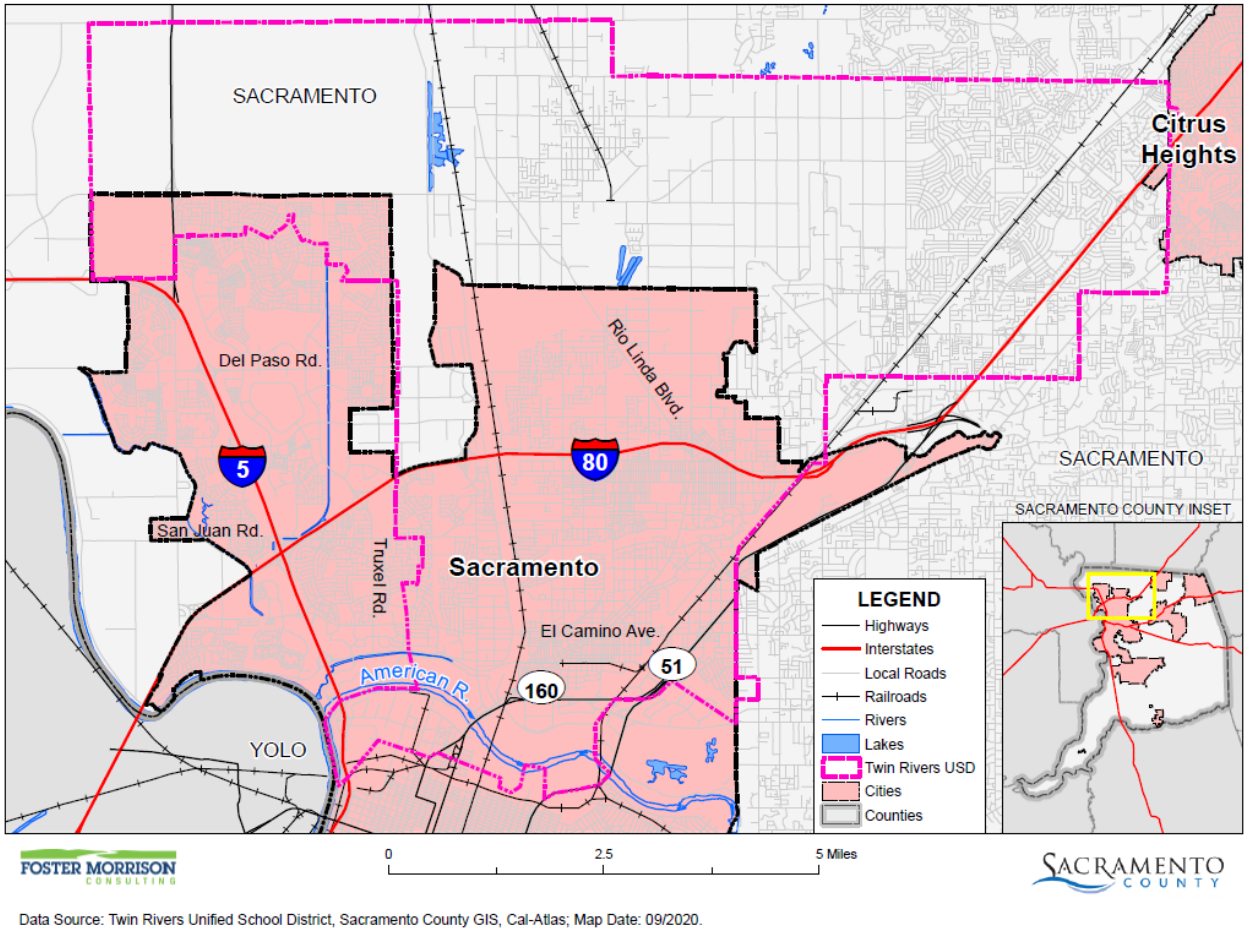
le R-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
N/A	No mitigation planning has been completed since 2016

R.3 District Profile

The District profile for the TRUSD is detailed in the following sections. Figure R-1 displays a map and the location of the District within Sacramento County.

Figure R-1 TRUSD



Data Source: Twin Rivers Unified School District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

R.3.1. Overview and Background

The small community school districts that evolved in the North Sacramento communities were long a topic of discussion and debate. While most of the country's students receive a fully articulated and unified educational experience in preschool through 12th grade systems, students in the North Sacramento area attended a variety of schools and districts depending on their neighborhood and grade level. Many educational leaders saw the need for more consistency, financial stability, and realignment of resources, but others worried that a larger system would take away a family-friendly culture the smaller districts enjoyed. In the late 1990s, a small group of community members and educators embarked upon a vision to unify the north area districts. After more than 60 years and seven attempts, voters finally approved this new vision for unification involving four of the six area school districts: Grant Joint Union High School District, North

Sacramento School District, Rio Linda Union School District, and Del Paso Heights School District. On November 7, 2007, the voters overwhelmingly adopted the unification proposal.

The voters chose a new board of trustees to lead this new unified district. They selected one trustee from each of seven geographic regions in the boundary area. The board requested that the community name our new district. After a month-long promotional contest and more than 500 suggestions, Twin Rivers Unified School District became the official name. On July 1, 2008, with much excitement and positive enthusiasm, the Twin Rivers Unified School District officially became the newest unified district in California.

The District is comprised of 760 acres utilizing over 3.4 million square feet of space, located in Sacramento County, in the northern region of the greater Sacramento area. Bordering Natomas district to the south and west, Sacramento City district to the south and San Juan district to the east, the District holds a total of 24,000 students in over 60 different schools. The District also owns a variety of other properties and buildings to house a variety of support facilities that include administrative offices, maintenance buildings, and park lands.

R.4 Hazard Identification

TRUSD identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table R-3).

Table R-3 TRUSD—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Low	–
Dam Failure	Significant	Unlikely	Catastrophic	Medium	Medium
Drought & Water Shortage	Extensive	Occasional	Limited	Low	High
Earthquake	Limited	Occasional	Critical	Medium	Low
Earthquake Liquefaction	Limited	Unlikely	Limited	Low	Low
Floods: 1%/0.2% annual chance	Limited	Occasional	Limited	High	Medium
Floods: Localized Stormwater	Significant	Occasional	Critical	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Likely	Limited	Low	Medium
Levee Failure	Limited	Unlikely	Negligible	Medium	Medium
Pandemic	Extensive	Likely	Catastrophic	High	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Occasional	Limited	Low	Medium
Severe Weather: Extreme Heat	Limited	Highly Likely	Negligible	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Critical	Medium	Low
Subsidence	Limited	Likely	Limited	Low	Medium
Volcano	Limited	Unlikely	Limited	Low	Low
Wildfire	Extensive	Highly Likely	Catastrophic	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

R.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

R.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section R.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table R-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

R.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the TRUSD's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this Plan. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table R-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. TRUSD's physical assets, valued at over $471 million, consist of the buildings and infrastructure to support the District's operations.

Table R-4 TRUSD Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Occupancy	Replacement Value	Which Hazards Pose Risk
Allison, Warren A. Elementary	275	$8,656,606	
Babcock Park	0	N/A	
Babcock, D W Elementary	400	$10,091,408	
Castori, Michael J. Elementary	750	$11,657,008	
Creative Conn. Arts Academy Charter (K-5)	540	$7,718,359	
Creative Conn. Arts Academy Charter (6-12)	105	$15,956,958	
Del Paso Heights Elementary	290	$9,858,937	Maintenance shop demolished
District Office	330	$67,947,365	
DPH Park	0	$0	
Dry Creek Elementary	115	$9,979,484	Added3840 sq ft portables
East Natomas Educational Complex	0	$20,590,225	
Fairbanks Elementary	435	$9,339,298	
Foothill High	1,270	$45,703,319	
Foothill Oaks Elementary	580	$10,789,688	
Foothill Ranch Jr. High	765	$19,910,462	
Frontier Elementary	545	$7,637,419	
Future Charter School (7-12)	565	$0	
Garden Valley Elementary	410	$4,443,049	
Grant High	1,035	$56,079,174	
Grant West	1,035	$19,791,090	
Hagginwood Elementary	455	$7,948,263	
Hayer Park (RLPA) Park	0	$0	
Higher Learning Academy	115	$2,684,822	
Higher Learning Academy	115	N/A	
Highlands Academy of Art & Design	925	$36,927,807	
Hillsdale Elementary	460	$8,517,966	
Las Palmas was Johnson 2.0/Noralto	1385	$23,586,990	
Johnson, Harmon Elementary, Old (demolished lot)	0	$0	
Joyce, Frederick C. Elementary	605	$7,794,432	
Keema High School	0	$7,538,637	
King, Jr, Martin Luther Technology Academy	365	$26,848,314	
Kohler Elementary	510	$8,791,281	
Madison Elementary	680	$9,601,208	

Name of Asset	Occupancy	Replacement Value	Which Hazards Pose Risk
Maint./Food/Transp. - Taft Street	15	$3,421,071,	
Maint./Oper./Transp. - Rio Linda	75	$1,453,205	
Morey Avenue Pre K - K	30	$4,930,529	
Murchison Center	0	$4,812,052	
Northwood Elementary	535	$11,684,220	
Norwood Jr. High	405	$17,883,487	
Nutrition - I Street Rio Linda	0	$1,453,205	
Oakdale Elementary	555	$7,255,223	
Orchard Elementary	255	$11,799,457	
Orchard Elementary	255	$0	
Pacific Career & Technology High	150	$8,131,581	
Pioneer Elementary	695	$8,715,550	
Regency Park Elementary	915	$14,367,957	
Richmond, Miles P. School	60	$3,527,456	
Ridgepoint Elementary	745	$8,671,283	
Rio Linda Elementary	0	$9,072,988	
Rio Linda High	1,930	$48,726,398	
Rio Linda High Stadium	0	N/A	
Rio Linda Prep Academy	500	$14,430,530	
Rio Tierra Jr. High	625	$19,693,026	
Sierra View Elementary	505	$8,046,391	
Smythe, Alethea B. Charter (7-8)	455	$8,707,534	
Smythe, Alethea B. Charter (K-6)	665	$9,026,714	
Strauch, Hazel Elementary	600	$9,017,816	
TR Police Admin Offices	55	$12,516,727	
Transportation - Grand Ave.	60	$2,542,809	
United Cerebral Palsy (leased out)	190	$6,684,217	
Village Elementary	645	$9,080,015	
Vineland (Pre) / Pathways (Alt.)	55	$7,362,893	
Vista Nueva Career & Tech High/NOVA	185	$6,962,473	
Westside Elementary	585	$8,355,629	
Winona Admin Center	105	$34,714,679	
Woodlake Elementary	480	$7,487,253	
Woodridge Elementary	515	$11,095,553	
Total		**$471,236,556**	

Source: TRUSD

Natural Resources

TRUSD is located in an area with a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan. While these species are not necessarily on the existing school grounds, they do exist in undeveloped areas nearby and within District boundaries.

Historic and Cultural Resources

TRUSD is located in an area a variety of historic and cultural resources of value to the District. The Planning Team for the District noted that there are sites that originated in the 1930's and 1940's, but they are not currently on the historical registry.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Development since 2016

No District facilities have been constructed since 2016. As such, a change in vulnerability is unlikely.

Future Development

The District noted the Greenbriar project is expected to begin construction 2021-2022. The District has no control over future development in areas the District services. Future development in these areas parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

R.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table R-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan. The District note that these are minimal periodic events. However, there is insufficient backup and the District must wait for local energy companies to resolve the issues.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

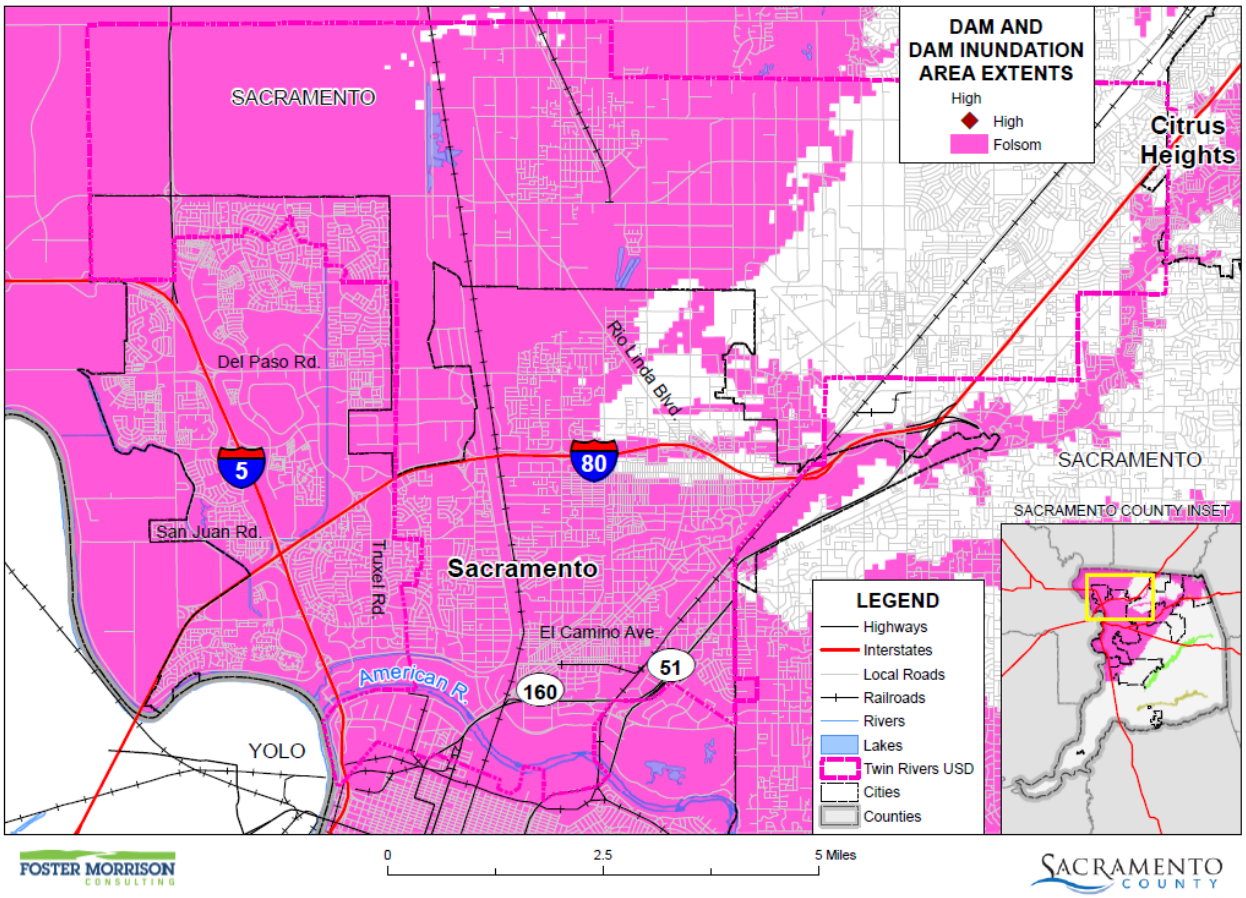
Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

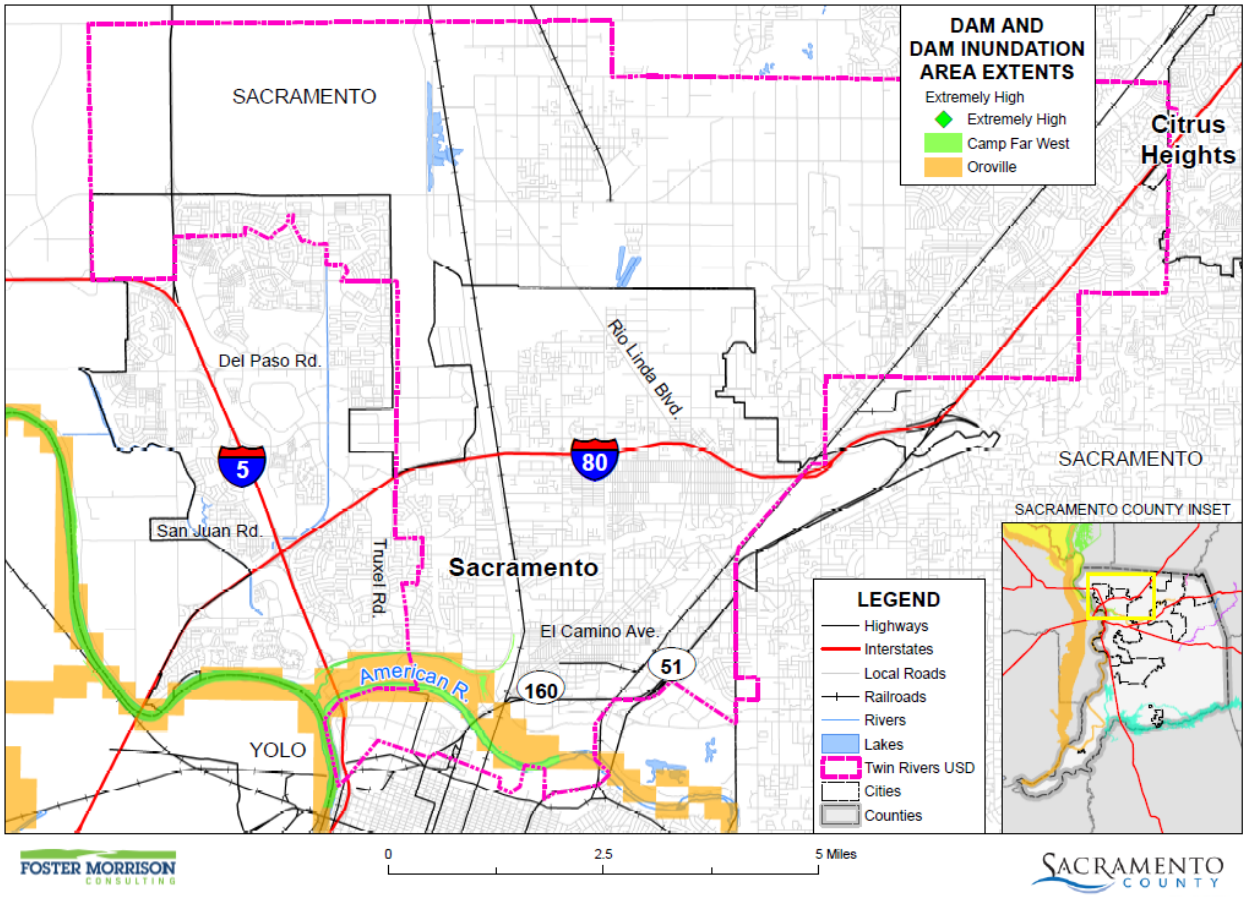
Based on dam inundation data obtained from CA DWR and Cal OES the was discussed in Section 4.3.7 of the Base Plan, dams inside the County that can affect the District can be seen on Figure R-2. Dams outside the County that can affect the District can be seen on Figure R-3. Portions of the District lie in the dam inundation areas from the Folsom 235,000 cfs scenario. These are shown on Figure R-4. While Figure R-2 and Figure R-3 illustrate dam inundation areas from an actual dam failure, Figure R-4, the Folsom 235,000 cfs scenario reflects the likely inundation area associated with a possible "super" release of water from Folsom. This updated Folsom scenario reflects the Folsom dam improvements which make a dam failure unlikely, with any resulting downstream inundation from Folsom associated with an intentional release of water from the dam. It is anticipated that the worst case scenario would be a 235,000 cfs release, which is comparable to a 200-year flood.

Figure R-2 TRUSD – Dam Inundation Areas from Dams Inside the County



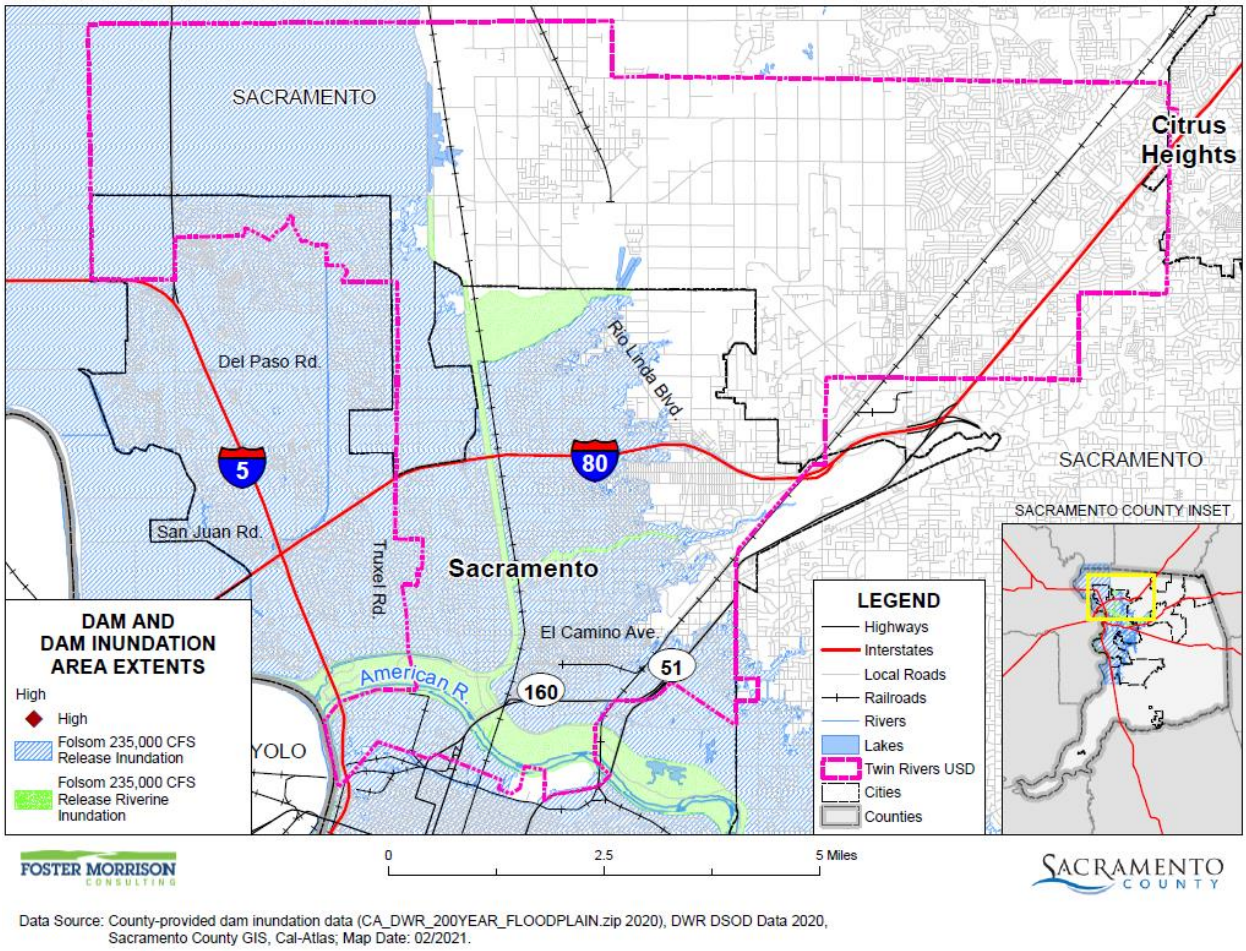
Data Source: County-provided dam inundation data (FOLSOM_DAM_INUNDATION_AREA.shp 2016), DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 2/2021.

Figure R-3 TRUSD – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Figure R-4 TRUSD – Dam Inundation from Folsom 235,000 cfs Scenario



Folsom Dam is the major dam which affects the District and the student populations in the inundation areas. Of prime concern is the Folsom Dam, which is owned by the US Bureau of Reclamation. The flood waters from the dam would affect the District.

Other dams could affect the District, but inundation zones for the following dams were not mapped for this Plan. The District noted that a Sacramento Municipal Utility District (SMUD) inundation map indicates that a failure of the Rancho Seco Dam would flow to the Laguna Creek Basin and stop approximately at Stockton Boulevard. Failure of Shasta Dam would affect populations south along the Sacramento River basin to about Knights Landing where the water would lose momentum. An Oroville Dam failure would impact populations southwest along the Feather River basin to about the Yolo Bypass.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, school closures, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations of students and staff during these times can also be difficult.

Warning ability is generally determined by the frequency of inspections for structural integrity, the flood wave arrival time (the time it takes for the flood wave to reach its maximum distance of inundation), or the ability to notify persons downstream and their ability to evacuate. The existence and frequency of updating and exercising an evacuation plan that is site-specific assists in warning and evacuation functions.

The Districts greatest concern is property damage due to flooding, as well as the evacuations that may be necessary for students, faculty, and staff.

Assets at Risk

Smythe 7-8, Woodlake, and Babcock would be at risk to dam failure.

Earthquake

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered

inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The District is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the District fall within a low to moderate shake risk, with most of the moderate risk in the Delta area of the County.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquakes or that affected the District in any meaningful way.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured buildings can be very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. There are no URM or soft story buildings in the District.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The TRUSD is within the less hazardous Zone 3.

Impacts from earthquake in the District will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

All facilities in the District are designed, approved, and built in accordance with building codes current at time of construction, Department of State Architects

Assets at Risk

No District assets from Table R-4 are at risk from this hazard.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

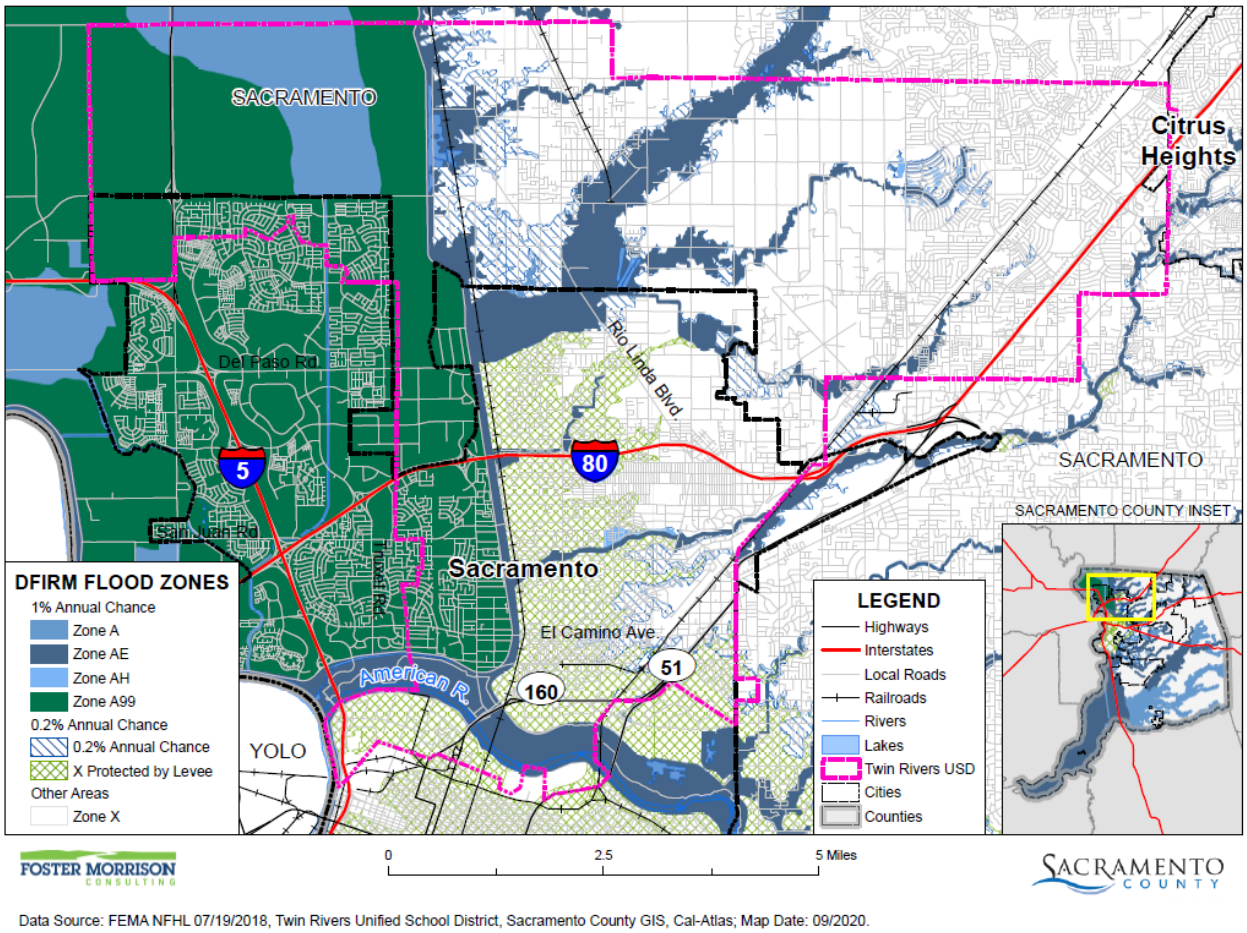
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the TRUSD have been subject to historical flooding.

Location and Extent

The TRUSD has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure R-5.

Figure R-5 TRUSD – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Twin Rivers Unified School District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table R-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table R-5 TRUSD– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	X
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	X

Flood Zone	Description	Flood Zone Present in the District
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X
X (unshaded)	Areas outside flood zones	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table R-6. These events also likely affected the District to some degree.

Table R-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Flood waters in 1986 and 1998 caused damage to roads, structures and district properties. The many creeks and tributaries are still a risk for downstream flooding, in spite of corrections to local levees and upriver dams. While some damage occurred at this time, the records indicating repairs and corrections are not available. Twin Rivers USD is the culmination of four school districts, which unified in 2008. Records prior to this time are not available.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices

and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

The District noted that Regency Park, Garden Valley, Rio Tierra, Strauch, Smythe P-6, and Smythe 7-8 are at risk from flooding.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The TRUSD is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Localized flooding also occurs throughout the Sacramento County Planning Area at various times throughout the year with several areas of primary concern unique to the District.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted the following past occurrences of localized flooding:

- Flood waters in 1986 and 1998 caused considerable damage to roads, structures and district properties. The many creeks and tributaries are still a risk for downstream flooding, in spite of corrections to local levees and upriver dams.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

The District floods easily and each year during storm season, sandbags are pulled out. These instances are only recorded by work orders carried out by the maintenance department. The District could not provide any specific data on areas of localized flooding that directly affect District properties.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Assets at Risk

No District assets from Table R-4 are at risk from this hazard.

Levee Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

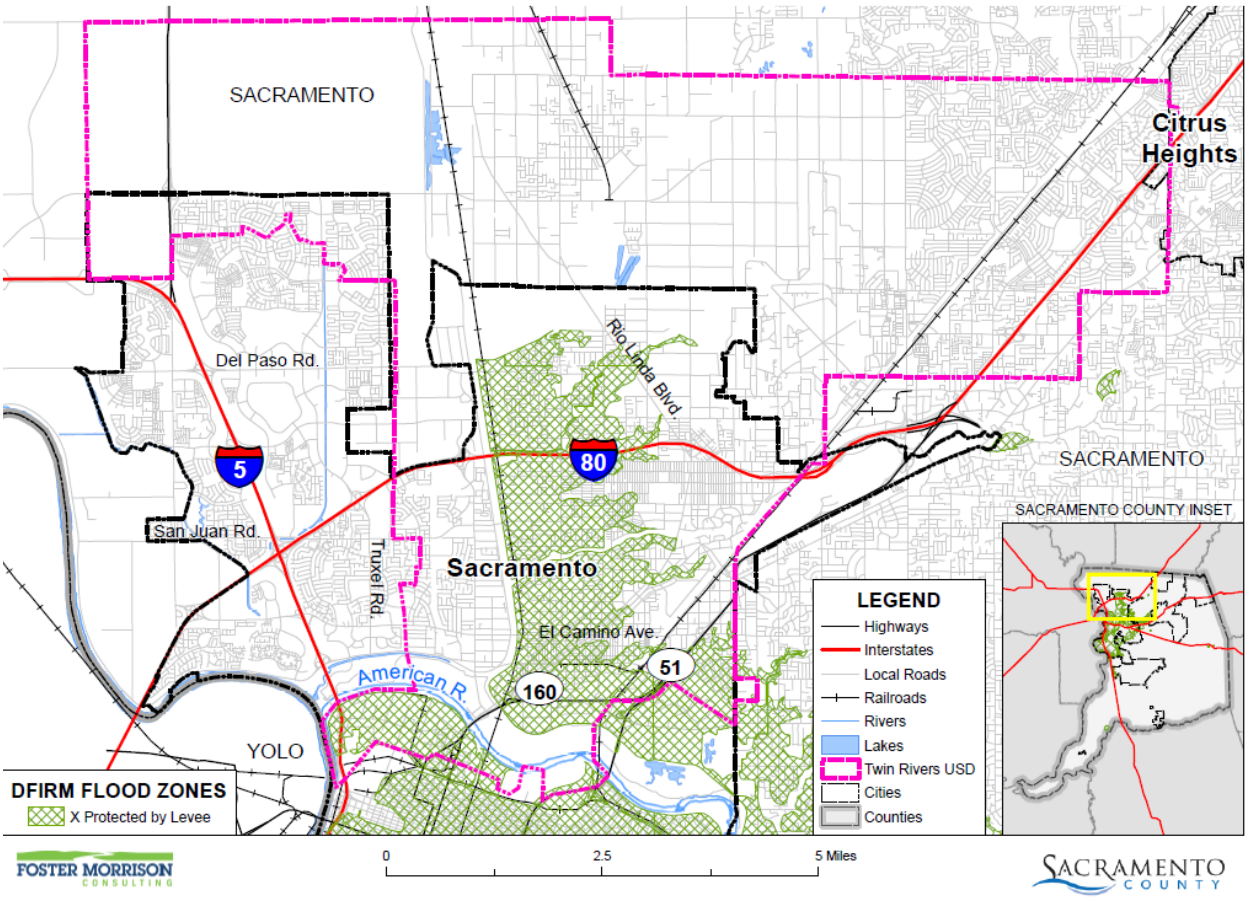
Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not

eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. The FEMA DFIRMs show areas that were protected by levees as of the 2018 DFIRM map date. The X-protected by levee flood zone reflects areas protected by levees certified as providing 100-year level of protection. These X-protected by levee zones in the District are shown on Figure R-6.

Figure R-6 TRUSD – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Twin Rivers Unified School District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Property damage is the greatest concern for the District from levee failure.

Assets at Risk

The District noted that Smythe 7-8, Woodlake, Babcock, Del Paso, Morey, Fairbanks, Las Palmas, MLK Jr., and Norwood facilities are at risk from this hazard.

Pandemic

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

According to the World Health Organization (WHO), a disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. A pandemic may occur when a new virus appears against which the human population has no immunity. A pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. This disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in a very short time. The U.S. Centers for Disease Control and Prevention has been working closely with other countries and the WHO to strengthen systems to detect outbreaks of that might cause a pandemic and to assist with pandemic planning and preparation. An especially severe a pandemic could lead to high levels of illness, death, social disruption, and economic loss.

Location and Extent

During a pandemic, the whole of the District, County, and surrounding region is at risk, as pandemic is a regional, national, and international event. The speed of onset of pandemic is usually short, while the

duration is variable, but can last for more than a year as shown in the 1918/1919 Spanish Flu. There is no scientific scale to measure the magnitude of pandemic. Pandemics are usually measured in numbers affected by the pandemic, and by number who die from complications from the pandemic.

Past Occurrences

There has been one state and federal disaster declaration due to pandemic, as shown in Table R-7.

Table R-7 Sacramento County – State and Federal Pandemic Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Pandemic	1	2020	1	2020

Source: Cal OES, FEMA

The 20th century saw three outbreaks of pandemic.

- The 1918-1919 Influenza Pandemic (H1N1)
- The February 1957-1958 Influenza Pandemic (H2N2)
- The 1968 Influenza Pandemic (H3N2)

To date, the 21st century has seen two acknowledged pandemics.

- 2009 Swine Flu (H1N1)
- 2019/2020 COVID 19

All schools were closed on March 13, 2020. All staff worked remotely from home. Students engaged in on-line learning using issued computers and online communication programs. Schools were set up for social distancing of 6', desks and other furniture were removed from classrooms and placed in storage. COVID-19 Prevention Plan was implemented, protocol posters and floor distancing decals placed strategically throughout campuses. Custodial Operations implemented cleaning and disinfecting policies and schedules. Mandatory mask wearing is practiced. Staff returned to work March 2021. Students returned under a cohort model.

Vulnerability to and Impacts from Pandemic

Pandemics have and will continue to have impacts on human health in the region. A pandemic occurs when a new virus emerges for which there is little or no immunity in the human population; the virus causes serious illness and spreads easily from person-to-person worldwide. There are several strategies that public health officials can use to combat a pandemic. Constant surveillance regarding the current pandemic, use of infection control techniques, and administration of vaccines once they become available. Citizens can help prevent the spread of a pandemic by staying home, or "self-quarantining," if they suspect they are infected. Pandemic does not affect the buildings, critical facilities, and infrastructure in the District. Pandemic can have varying levels of impact to the citizens of the District and greater County, depending on the nature of the pandemic.

Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines. Hospitalizations and deaths can occur, especially to the elderly or those with pre-existing underlying conditions. As seen with Covid-19, multiple businesses were forced to close temporarily (some permanently) and unemployment rose significantly. Supply chains for food and essentials can be interrupted. Prisons may need to release prisoners to comply with social distance standards.

All schools were closed on March 13, 2020. All staff worked remotely from home. Students engaged in on-line learning using issued computers and online communication programs. Schools were set up for social distancing of 6', desks and other furniture were removed from classrooms and placed in storage. COVID-19 Prevention Plan was implemented, protocol posters and floor distancing decals placed strategically throughout campuses. Custodial Operations implemented cleaning and disinfecting policies and schedules. Mandatory mask wearing is practiced. Staff returned to work March 2021. Students returned under a cohort model.

Assets at Risk

Pandemics do not affect District facilities, but can affect District personnel who operate District facilities.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature." Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the District, there are risk to the built environment from extreme heat. While extreme heat on its own does not usually affect structure, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat and high winds can cause power outages and PSPS events, causing issues to buildings in the District.

Location and Extent

Heat is a regional phenomenon and affects the whole of the District. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for heat. The District Planning Team noted that since extreme heat is a regional phenomenon, events that affected the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.3.

The District has had to provide fans, temporary AC units and other devices to cool classrooms during extreme heat.

Vulnerability to and Impacts from Extreme Heat

The District experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-110°F in rather extreme situations. During these times, drought conditions may worsen. Also, power outages and PSPS events may occur during these times as well. Health impacts are the primary concern with this hazard, though economic impacts are also an issue.

Days of extreme heat have been known to result in medical emergencies, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts. Extreme heat can also dry out vegetations, making it more vulnerable to wildfire ignitions.

Extreme heat conditions are likewise most pervasive during the summer months when school populations and programming are at their lowest levels. The impact on schools from extreme heat, as a consequence, are minimal when contrasted to those stemming from other natural hazards. That said, high temperatures have, with increasing frequency, served as a catalyst in hazardous air quality emergencies, which hold substantive operational impacts for schools. Extreme heat events do not typically necessitate school closures, but do require limits to outdoor activities and sometimes confining students to indoor spaces.

The District is situated on a thermal belt in a relatively flat area, as is much of the central California area, resulting in excessive heat during late spring and early fall seasons. Due the age of most schools, the HVAC equipment has long since passed its intended usage. The District continues to install new equipment, when able. This has been a very real problem in the District for years, due to the extreme temperatures, over 100 degrees in the beginning and end of the school year. In the event of extreme heat, populations with special needs such as elementary school students are of particular concern; as they are most vulnerable to extreme temperatures. Approximately 13,500 students in elementary or pre-kindergarten these would be at risk to extreme heat. The District intends, as a matter of policy, to address these issues in the hazard mitigation plan and as a matter of course for district procedure. The extreme heat has also killed many trees and planted areas.

Assets at Risk

All District assets from Table R-4 are at risk from this hazard.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

The District noted that multiple campuses and classrooms suffered rain damage caused by leaking roofs.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating

significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding in the District. More information on power outage and failure can be found in the discussion at the beginning of Section R.5.3, as well as in Section 4.3.3 of the Base Plan.

Assets at Risk

All District assets from Table R-4 are at some risk from this hazard.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can exacerbate a wildfire event and can also cause a PSPS.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers

the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages, including PSPS events
- Occasional building damage, primarily to roofs

Tornadoes need to be given serious consideration in this assessment, because if and when they do strike a school, the impact can be devastating. Tornadoes can impact the District by destroying buildings and infrastructure within seconds. Tornadoes can cause numerous human injuries or fatalities. They can create tremendous debris removal problems, overwhelm building departments, and psychologically scar students, faculty, and staff.

Assets at Risk

No District assets from Table R-4 are at possible risk from this hazard, though the risk is not high.

Wildfire

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

Hazard Profile and Problem Description

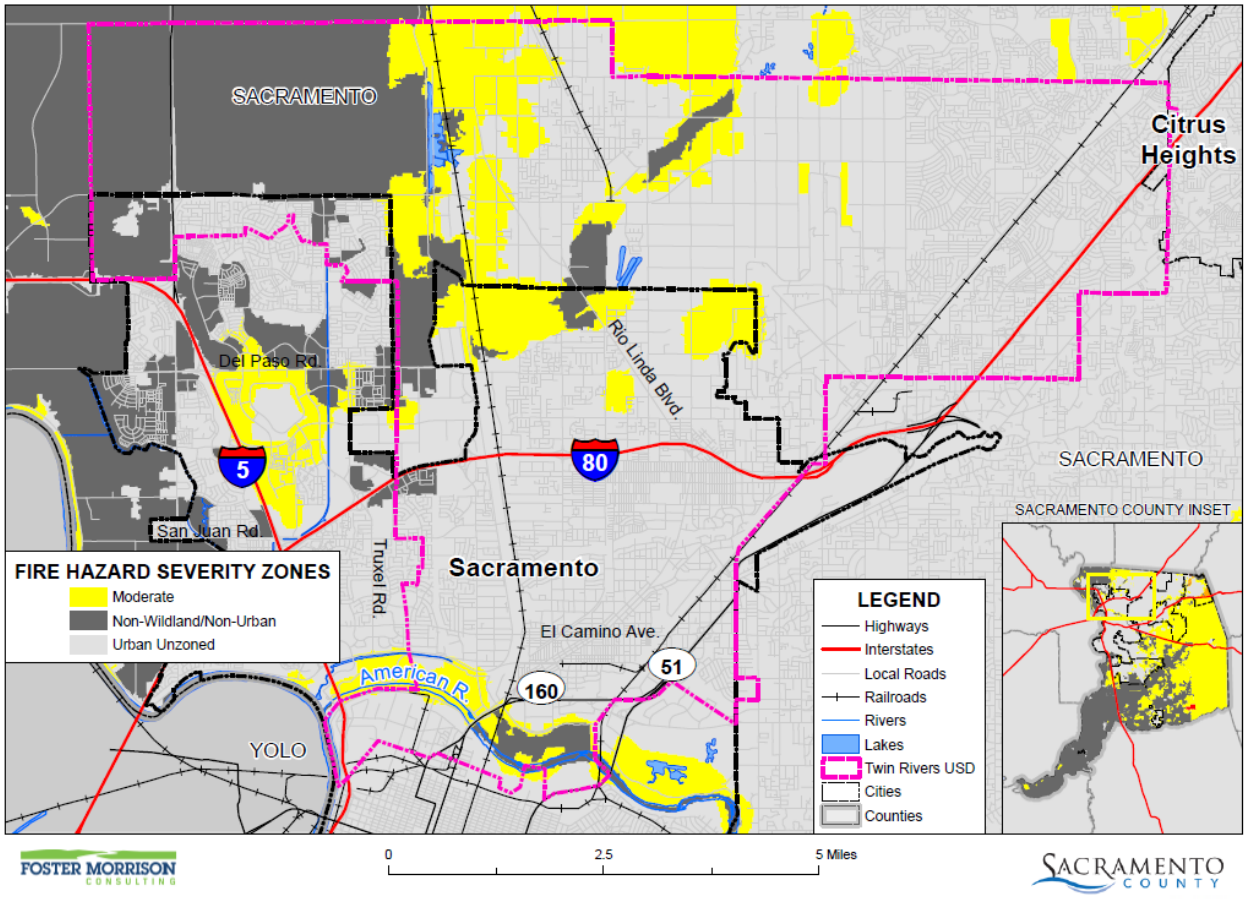
Wildland fire and the risk of a conflagration is an ongoing concern for the TRUSD. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where

there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

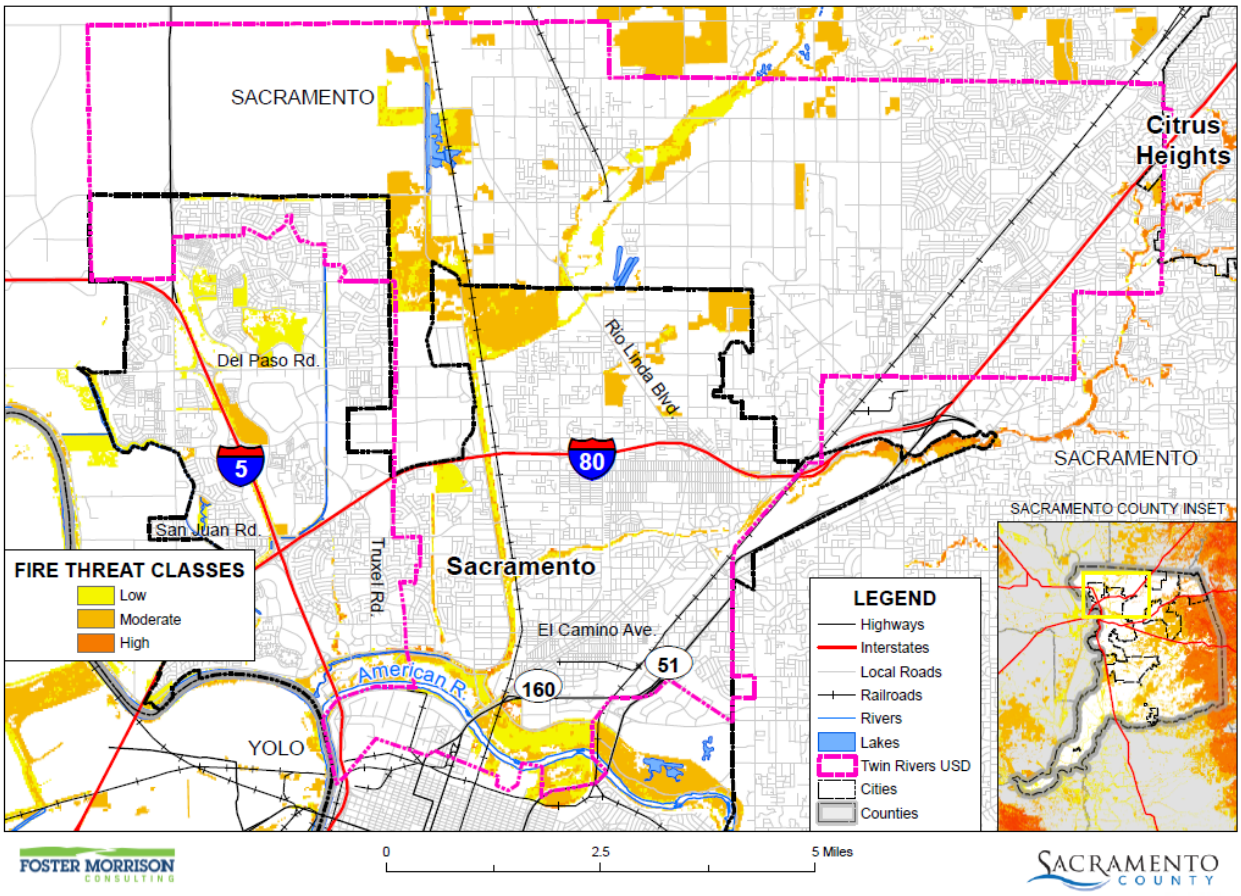
Wildfire can affect all areas of the District. CAL FIRE has estimated that the risk varies across the District and has created maps showing risk variance. Following the methodology described in Section 4.3.16 of the Base Plan, wildfire maps for the TRUSD were created. Figure R-7 shows the CAL FIRE FHSZ in the District. As shown on the maps, fire hazard severity zones within the District range from Urban Unzoned to Moderate. Figure R-8 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, fire threat within the District ranges from No Threat to High.

Figure R-7 TRUSD – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure R-8 TRUSD – Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Twin Rivers Unified School District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more.

Past Occurrences

There has been one state and no federal disaster declarations for Sacramento County from fire. It should be noted that this was from Southern Pacific Railroad Fires and Explosions (Roseville), so it was not truly a wildfire.

Table R-8 Sacramento County – State and Federal Disaster Declarations Summary 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

The District noted that the Paradise Fire had District-wide impact on air quality. Students had to remain indoors, Grounds and Maintenance staff were unable to complete work.

Vulnerability to and Impacts from Wildfire

Risk and vulnerability to the Sacramento County Planning Area and the District from wildfire is of significant concern, with some areas of the District being at greater risk than others as described further in this section. High fuel loads, combined with a large built environment and population, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and potentially catastrophic fires. During the May to October fire season, the dry vegetation and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and the District, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and loss of recreational opportunities. Wildfires can cause short-term and long-term disruption to the District. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the District by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the District; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from large fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. The threat of wildfire, combined with the potential for high winds, heat, and low humidity, can cause PG&E to initiate PSPSs which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Assets at Risk

No District assets from Table R-4 are at direct risk from this hazard.

R.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

R.6.1. Regulatory Mitigation Capabilities

Table R-9 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the TRUSD.

Table R-9 TRUSD Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2009	District Organization and Implementation Planning Process
Capital Improvements Plan	Y	Facilities master plan
Economic Development Plan	N	
Local Emergency Operations Plan	Y	Emergency Management Plan
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	Y	TRUSD SWWP-continuously updated
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	Y	Natomas Habitat Conservation Plan
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Safety Plan
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Dept. of State Architect / Title 24
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score: unknown
Fire department ISO rating:	N	Rating: unknown
Site plan review requirements	Y	By CDE as required and to verify preventative measures established. By DSA for final plan check.
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	

Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	
Other	Y	District Policy Manual
How can these capabilities be expanded and improved to reduce risk?		
District wide training on practices to include emergency response drills		

Source: TRUSD

R.6.2. Administrative/Technical Mitigation Capabilities

Table R-10 identifies the District department(s) responsible for activities related to mitigation and loss prevention in TRUSD.

Table R-10 TRUSD's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	
Mutual aid agreements	N	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	Y FT	Risk Manager
Community Planner	N	
Civil Engineer	Y FT	Facilities/Planning – Director of Facilities & Construction. Staff is adequate and trained on mitigation.
GIS Coordinator	Y	Facilities/Planning. Staff is adequate and trained on mitigation.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	IT Department
Hazard data and information	N	
Grant writing	N	
Hazus analysis	N	
Other		

How can these capabilities be expanded and improved to reduce risk?
Implement Planning Committee.

Source: TRUSD

R.6.3. Fiscal Mitigation Capabilities

Table R-11 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table R-11 TRUSD's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Used for all types of improvement projects
Authority to levy taxes for specific purposes	Y	School Impact Fees
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	Y	Developer Fees used on various projects
Storm water utility fee		
Incur debt through general obligation bonds and/or special tax bonds	Y	Bonds-for specific site improvements
Incur debt through private activities	Y	Private Loans
Community Development Block Grant	N	
Other federal funding programs	Y	Grants
State funding programs	Y	Modernization Funding
Other		
How can these capabilities be expanded and improved to reduce risk?		
District is self-insured and a member of a JPA. Working closely with JPA on risk reduction		

Source: TRUSD

In addition, there are a number of Federal sources of funding for hazard mitigation projects, including:

- Federal Emergency Management Agency (FEMA)
- Housing and Urban Development (HUD)
- US Army Corps of Engineers (USACE)
- Small Business Administration (SBA)
- US Department of Agriculture (USDA)
- Natural Resource Conservation Service (NRCS)
- National Oceanic and Atmospheric Administration (NOAA)
- Federal Homeland Security Grants
- Bureau of Land Management (BLM)
- CA Dept. of Water Resources Flood Safe Program

R.6.4. Mitigation Education, Outreach, and Partnerships

Table R-12 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table R-12 TRUSD's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Safe Schools, Energy Management; solar and water retention programs.
Natural disaster or safety related school programs	Y	In Emergency Plan
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Those listed above in table. The District will work with students and faculty to reduce risk to natural hazards.		

Source: TRUSD

R.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

The district is in the process of partnering with appropriate agencies, such as the California Department of Natural Resources, County of Sacramento, Rio Linda/Elverta Water Department, Sacramento Regional Flood Control Agency, Arcade Creek Parks and Recreation and neighborhood efforts to minimize loss of property and casualties of potential catastrophic event.

The district works closely with the local efforts to monitor ongoing efforts to provide safe levee systems. The district also works closely with neighboring water districts to minimize flooding and provide adequate drainage at sites within flood zones. The district plans to prepare and activate a community protection/assistance initiative for the area most critical.

The County of Sacramento, Rio Linda/Elverta Water Department, SAFCO, Arcade Creek Parks and Recreation and Sacramento County Libraries will become partners in mitigation efforts.

The District is in the process of implementing an assessment and protection plan based on National Clearinghouse of Educational Facilities (NCEF) guidelines. In addition to this, the District has made efforts

to compile emergency supplies such as emergency communications, power, fuel and water as a part of the Emergency Preparedness Plan.

The District is creating District Standard Construction Specifications, outlining in detail the mandatory building procedures and techniques that will be implemented in all future building. These "standards" will include raised foundations, drainage systems and detention ponds, earthen berms and other natural resource protection, structural systems designed for high winds or tornados and "safe areas" in a particular building where staff and students will collect during catastrophic events, natural or by man.

In 2007, during the construction of a new school compound known as ENEC, various mitigation efforts were implemented in the design. Detention ponds were constructed on a larger than needed scale to be included as infrastructure for surrounding areas and adjacent development.

Drainage from the building and site flowed directly into the detention ponds with overflow going directly into the County flood channels. This project was designed and constructed in partnership with SAFCA (Sacramento Area Flood Control Agency), the County of Sacramento and local developers.

R.7 Mitigation Strategy

R.7.1. Mitigation Goals and Objectives

The TRUSD adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

R.7.2. Mitigation Actions

The planning team for the TRUSD identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Dam Failure
- Earthquake
- Earthquake Liquefaction
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Pandemic
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Severe Weather: Wind and Tornado
- Wildfire

After reviewing capabilities and possible mitigation actions, the District moved the following hazards to low priority for mitigation action purposes.

- Dam Failure
- Earthquake Liquefaction
- Levee Failure
- Pandemic

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this Plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Reduce Risks to Property and Life due to Earthquake

Hazards Addressed: Earthquakes

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: There are a number of buildings within the TRUSD District boundaries that were construction prior to 1970. Those building require earthquake retrofitting or structural enhancement to make buildings safe during earthquake. It is the District's intention to assure that all buildings are safe for students, staff and visitors and to eliminate potentially disastrous property loss should an earthquake occur.

Project Description: The Facility Services Department will work closely with the Department of the State Architect to provide facility assessments and determine best cause of action for the structural and non-structural retrofitting of older buildings. The Facility Services Department will undergo a facility assessment with the use of a Structural Engineer to determine potentially dangerous buildings and areas, costs to correct and schedule action.

Other Alternatives: The Risk Management Department will verify adequate earthquake insurance and verify that emergency plans and subsequent materials are in place should an earthquake occur.

Existing Planning Mechanisms through which Action will be implemented: The Facility Services Department has been in touch with DSA to begin the process of Earthquake Retrofit. Facility Assessments once completed will be used to implement these projects

Responsible Office: Facility Services and Risk Management.

Priority (H, M, L): Medium

Cost Estimate: Unknown to $10,000,000.00

Benefits (Losses Avoided): Property and life safety.

Potential Funding: FEMA grants, Department of the State Architect, California Department of Education, California Earthquake Authority, District Funds (if available) any available grant programs.

Schedule: Corrections under way; completion within 5 years.

Action 2. Reduce Risk to Flooding of Northern Area Schools

Hazards Addressed: Flooding, Localized Flooding, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Northern area schools within the Rio Linda community and Eastern schools within the Natomas community have been designated as potential catastrophic flood zones. The District is making every effort to reduce or eliminate long-term risk to life and property from a hazardous event.

Project Description: This effort will include an assessment of vulnerable structures and areas resulting in a Mitigation Projects List for flood risk reduction identifying recommendations for policy changes, improvements/floodproofing to real property, improved outreach to agencies and neighborhoods and more comprehensive flood insurance.

Other Alternatives: The District is organizing areas of refuge and community shelters that can be utilized in the event of catastrophe.

Existing Planning Mechanisms through which Action will be implemented: The District planning and facilities department continues to adjust the Mitigation Projects List and educating personnel on how to identify potential hazards and what action to take to prevent or reduce damage and injury. The Mitigation Projects List for flood risk reduction once developed will be the implementing mechanism.

Responsible Office: Facilities Services

Priority (H, M, L): High

Cost Estimate: $5,000,000

Benefits (Losses Avoided): Increased life safety and reduction of District property losses.

Potential Funding: FEMA funding, other funding to be determined.

Schedule: The District is currently planning the improvements. Over the next five years, the District intends to have the majority of the projects completed.

Action 3. Stormdrain Upgrades/Revise and Update Districtwide Stormwater Prevention Plan

Hazards Addressed: Flooding, Localized Flooding, Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The District practices storm water prevention during construction projects as mandated by the state and federal agencies.

Project Description: The District would like to implement these same stormwater management procedures and best management practices as part of the Hazard Mitigation Plan and as a matter of policy to deter debris from drainage systems, circumvent flooding to protect land and property. This project involves reviewing flood issues and development of a plan and procedural manual to implement stormwater drainage improvements throughout the District

Other Alternatives: None

Existing Planning Mechanisms through which Action will be implemented: The Facility Services Department including Maintenance and Operations is determining the best way to create a procedural manual and implement this policy.

Responsible Office: Facilities Services with Maintenance & Operations.

Priority (H, M, L): Medium

Cost Estimate: $150,000

Benefits (Losses Avoided): Property, environment and life safety.

Potential Funding: FEMA grants, any state or other agency with grant funds.

Schedule: Implemented winter 2013-2014; completion within next 5 years

Action 4. Prevent Loss of Life or Injury due to Extreme Heat

Hazards Addressed: Extreme Heat

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The District has had an unfortunate result of the sometimes excessive heat in this area. A student, who was participating in physical education studies was overcome by heat exhaustion and died.

Project Description: It has been the District's priority to provide a full assessment of environmentally controlled buildings and determine where improvements can be made to maintain adequate cooling and heating of buildings. As with many districts, TRUSD has a host of varied mechanical equipment problems

and failures. As a priority measure, the District is making repairs where possible and is searching for financing to make further improvements.

Other Alternatives: The Facilities Services and Maintenance Departments are in the process of upgrading mechanical equipment where needed most on a unit-by-unit basis. They will continue this process as funding allows. The District will also work with energy management consultants to determine other ways to achieve their goals.

Existing Planning Mechanisms through which Action will be implemented: Facility Services and Maintenance will begin the process of equipment assessment on every school, and identify each site and area by priority. The planners will begin searching for funding from the state and other sources and will begin upgrades as funding becomes available.

Responsible Office: Facility Services and Maintenance

Priority (H, M, L): High

Cost Estimate: $10,000,000-$20,000,000 *Note: The district recently went out to bid for the HVAC replacement at Grant High School (incident location). The total cost for this project was over $3,000,000. Without funding, the district was only able to replace units in two areas. While the estimated cost may seem high, with 52 schools in this district, most of which are very old, it is likely that most sites will require some replacement equipment and reworking of systems.

Benefits (Losses Avoided): Loss of life, health and safety

Potential Funding: FEMA, CDE, SBA, OPSC and/or any available grants.

Schedule: In progress and ongoing

Action 5. Evacuation for Heavy Rains, Storms, Winds, and ALL Hazards

Hazards Addressed: Multi-hazard (Earthquake, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms, Severe Weather: Wind, Wildfire)

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Safe evacuation of students, school staff, and visitors during hazard events is a priority of TRUSD. Each school site presents different issues for evacuation and sheltering in place options and thus an updated, site specific evacuation plan is necessary to ensure the safety of students, staff, and school visitors.

Project Description: This District intends to create/update evacuation plans for the protection and safety of students, staff, parents and visitors to all District properties. To that end, the District will prepare updated maps of all school sites and administrative offices including, all buildings and out-buildings, structures, roadways and equipment areas. The maps will clearly indicate safe paths of travel for evacuation purposes,

safe gathering areas (Plan A and Plan B); will identify emergency supply locations, emergency communication equipment and any other information relative to the safety of the district.

Other Alternatives: All sites will independently update evacuation plans and submit to the main district office for approval and record.

Existing Planning Mechanisms through which Action will be implemented: Facility Services will begin updating existing site maps based on most recent capital improvements. Once that is accomplished, Facility Services will work with each site and department to coordinate best exit routes for safely transporting students and staff.

Responsible Office: Facility Services

Priority (H, M, L): High

Cost Estimate: $27,000

Benefits (Losses Avoided): Loss of life

Potential Funding: FEMA and/or any agency with available grant funding

Schedule: As soon as possible and ongoing

Action 6. Trees Trimmed/ Vegetation Removed to Minimize Impact During Fire Season

Hazards Addressed: High Winds, Flood, Wildfire

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Various schools in the District are in less densely populated areas where the threat of fire risk due to excessive vegetation is high. In addition, trees during extremely wet weather events and combined with high winds can fall onto structures and students causing damage and possible loss of life. While the District attempts to minimize this risk, it has been not been accomplished as a priority.

Project Description: It is the intention of the District to create and implement new policy and procedures and to purchase the tools and equipment necessary to minimize these concerns through identification and mitigation of problem areas. A prioritized work plan and equipment list will be developed to facilitate mitigation of priority areas.

Other Alternatives: Prepare a recurring work order that stipulates proper tree trimming and vegetation removal as part of a program and on an annual basis.

Existing Planning Mechanisms through which Action will be Implemented: The Grounds section of the Facility Services Department is preparing a work plan and equipment list to accomplish this goal.

Responsible Office: Facility Services and Grounds.

Priority (H, M, L): Medium

Cost Estimate: $75,000

Benefits (Losses Avoided): Protection of life and property

Potential Funding: FEMA, TRUSD Deferred Maintenance funds for yearly

Schedule: Annually

Annex S Delta Annex

S.1 Introduction

This Delta Annex details the hazard mitigation planning elements specific to that portion of the Sacramento-San Joaquin River Delta located within unincorporated Sacramento County. This portion of the Delta includes six (6) unincorporated communities, known as legacy communities, and the City of Isleton (also defined as a legacy community) as well as various other reclamation Districts. The purpose of this Annex is to provide an umbrella document that includes descriptions, data, and information on the Delta common to all LHMP participating jurisdictions from this region. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by all participating jurisdictions included in this Delta Annex. This Annex provides information specific to participating Delta jurisdictions, with a focus on the risk assessment and mitigation strategy for each jurisdiction.

S.2 Participating Jurisdictions

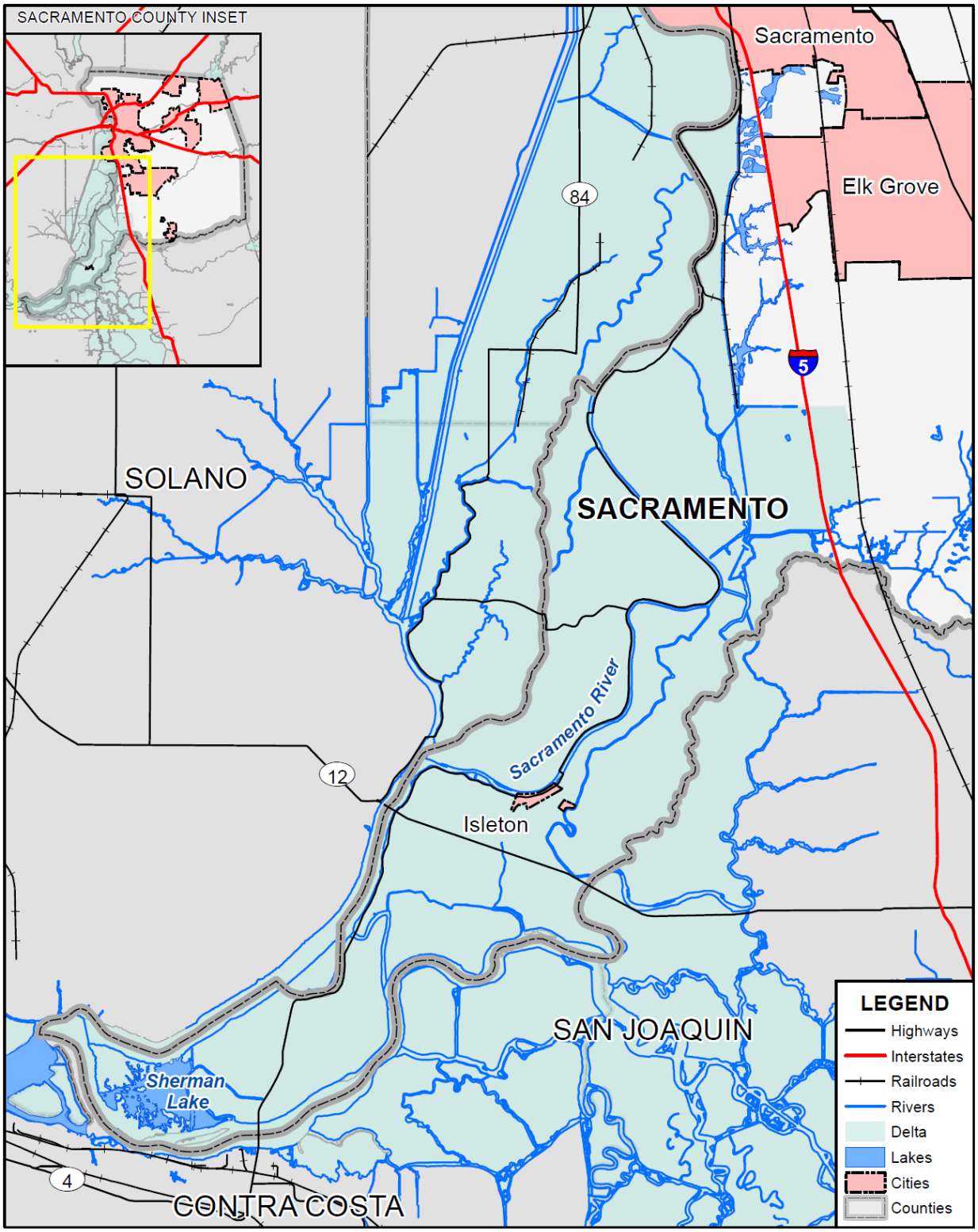
As described in the Base Plan document, the 2021 Sacramento LHMP Update is a multi-jurisdictional plan that geographically covers the entire area within Sacramento County's jurisdictional boundaries (i.e. the Sacramento County Planning Area). This Delta Annex provides a framework for the region's participating jurisdictions to this 2021 LHMP Update. The following agencies/organizations participated in the overall planning process and are seeking FEMA approval of this 2021 LHMP Update:

- City of Isleton
- Brannan Andrus Levee District (Reclamation Districts #317, #407, #2067)
- Reclamation District #3
- Reclamation District #341
- Reclamation District #349
- Reclamation District #369
- Reclamation District #551
- Reclamation District #554
- Reclamation District #556
- Reclamation District #563
- Reclamation District #1002
- Reclamation District #1601
- Reclamation District #2111

S.3 Community Profile

The community profile for the Sacramento Delta is further detailed in the following sections. Figure S-1 displays a map and the location of the Delta within Sacramento County.

Figure S-1 Sacramento County Delta Area



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

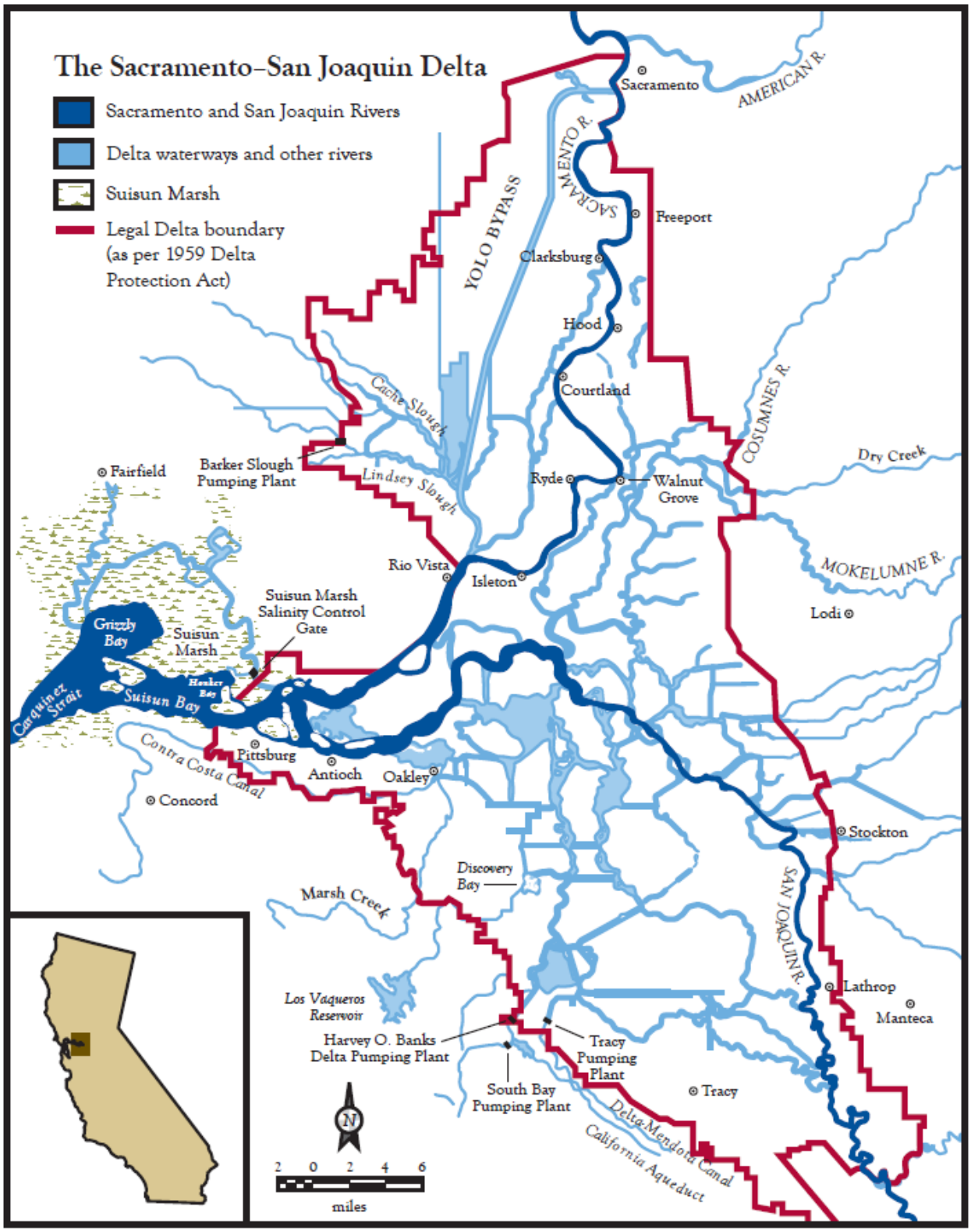
S.3.1. Geography and Climate

The Sacramento River Delta, in the southwest corner of Sacramento County, is interlaced with numerous tidal sloughs that include a number of peat islands reclaimed for agriculture by an extensive levee system. These waterways provide important fisheries and aquatic ecosystems, water for Delta farms and are important recreational areas. The climate of the Delta is much like the Mediterranean climate of Sacramento County. The Delta sits at or below sea level.

The Delta is located in Northern California, inland of the San Francisco Bay going towards Sacramento. Highways 80 and 5 run north-south, bordering the Delta and Highway 12 runs east to west crossing the Delta about midway. The Delta boundaries were legislatively defined by the Federal and State governments as part of the "New Deal" Central Valley Project after the Depression. The Primary and Secondary Zones of the legal Delta include land in six counties (although one area in Alameda County is very small), and portions of the cities of, Sacramento, West Sacramento, Stockton and Antioch along the periphery of the Delta. The smaller cities of Rio Vista and Isleton along with unincorporated communities of Byron, Ryde, Hood, Locke, Walnut Grove, Freeport, Clarksburg, and Courtland are located in the heart of the Delta. Comprising over 700,000 acres, this region includes 62 major named islands and hundreds of smaller islands. (see Figure S-2).

As described in the County's floodplain management ordinance, that portion of the Delta located within unincorporated Sacramento includes that area south of the Delta of Sacramento to the tip of Sherman Island protected from flooding by levees as bound by Reclamation District numbers: 3, 317, 341, 349, 369, 407, 551, 554, 556, 563, 744, 746, 755, 813, 1002, 1601, 2067, 2110, and 2111. This legal boundary is the Delta region used throughout this Annex.

Figure S-2 Sacramento–San Joaquin Delta Legal Boundaries



Source: Delta Protection Commission

The Delta region is one of the County's most fertile areas and accounts for much of the $470 million in agricultural production in the County. The Delta communities have a quiet rural lifestyle and is unique as a getaway from the hurried pace of much of the remainder of Sacramento County. This 162 square mile area (of Sacramento County) is crisscrossed by numerous waterways, which divide the land into distinct islands or tracts which includes the incorporated City of Isleton and the legacy communities of Locke, Ryde, Courtland, Freeport, Hood and Walnut Grove where roughly 6,000 residents live.

S.3.2. History

Originally, the Delta was a shallow wetland with water covering the area for many months of the year. Natural levees, created by deposits of sediment, allowed some islands to emerge during the dry summer months. Salinity would fluctuate, depending on the season and the amount of precipitation in any one year, and the species that comprised the Delta ecosystem had evolved and adapted to this unique, dynamic system.

The federal Swamp Land Act of 1850 set the stage for property ownership in the Delta. State legislation followed in 1861, which is approximately the same period in which the 1,000+ mile levee system began to take shape.

In 1933, the Legislature approved the California Central Valley Project Act, which relied upon the transfer of Sacramento River water south through the Delta and maintenance of a more constant salinity regime by using upstream reservoir releases of freshwater to create a hydraulic salinity barrier. As a result of the operations of state and federal water projects, the natural salinity variations in the Delta have been altered.

Fast forward to the November 2009 enactment of the Sacramento-San Joaquin Delta Reform Act. The Act resulted in a lengthy list of changes to the Delta's regulatory and governance framework and specifically identified a key statutory objective of ensuring for a safe and reliable water supply for the State, while preserving and enhancing the Delta's ecosystem. These "coequal" goals are now defined in California Water Code section 85054.

Today

The Delta, at 1,300 square miles, is the largest estuary and wetland ecosystem on the west coasts of both North and South America, and home to more than 500,000 people and 200,000 jobs. Further, the economic health of California, to the tune of $400B, is heavily reliant on existing communications, energy, and transportation facilities/infrastructure that are located in and traverse the Delta.

In spite of acknowledged water system and ecosystem degradation, the Delta remains a unique and critically important natural resource for California, as well as the entire nation. It serves as the hub of California's water supply system, which plays a vital role in supporting the basic economies of several major regions within the State, which are dependent on the ability of water exporters to access and transport water from the Delta watershed. This is evidenced by the fact that more than two-thirds of the State's residents (25 of 39 million) and more than three million acres of highly productive farmland receive water exported from the Delta watershed.

S.3.3. Current Delta Issues

As stated previously, the enactment of the 2009 Delta Reform Act resulted in a "re-set" of the Delta's regulations and governance. As an example, the Delta Stewardship Council (DSC) and the Sacramento-San Joaquin Delta Conservancy Board (SSJDCB) were created, and Delta Protection Commission (DPC) membership was reduced in size. However, without question the proposed CA WaterFix (formerly the Bay Delta Conservation Plan {BDCP]) has the greatest potential to result in immitigable and irreversible impacts to/on the Delta. The "California Water Fix" is now essentially a massive public works project. The "preferred alternative" continues to consist of an isolated water conveyance facility similar in design and operation to the "preferred alternative" described in the draft BDCP. The basic system design and operational protocol remains unchanged from the draft BDCP's preferred alternative. As a result, approval and implementation of the projects could result in a long list of significant and unavoidable impacts including, but not limited to, impacts to land use, water management and water quality, transportation, and socioeconomics.

S.4 Hazard Identification

Based on information provided by the participating jurisdictions within the Delta Area, in conjunction with input from Sacramento County, hazards that affect the Delta are summarized, including information on their frequency of occurrence, spatial extent, potential magnitude, and significance specific to the Delta Area (see Table S-1). Additional hazard information specific to each of the participating Delta jurisdictions is included in the Chapters to this Annex.

Table S-1 Sacramento County Delta —Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Significant	Likely	Significant	Medium	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Significant	Likely	Significant	Medium	High
Earthquake	Significant	Occasional	Limited	Low	Low
Earthquake Liquefaction	Limited	Occasional	Critical	High	Low
Floods: 1%/0.2% annual chance	Limited	Unlikely	Critical	High	Medium
Floods: Localized Stormwater	Significant	Likely	Critical	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Significant	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Occasional	Critical	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Critical	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Limited	Occasional	Negligible	Medium	Low
Subsidence	Significant	Likely	Critical	Medium	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	High	Limited	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

S.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the Delta's hazards and assess the Delta's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the Delta is included in this Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards ranked of medium or high significance specific to the Delta (as identified in the Significance column of Table S-1). For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

S.5.1. Hazard Profiles

The intent of this section is to profile the Delta's hazards and assess the region's vulnerability separate from that of the Planning Area as a whole, which has already been assessed in Section 4.3. of the Base Plan. Hazard profile information specific to the Delta as an area is included in this Annex (specific risks and vulnerabilities to each reclamation district and the City of Isleton can be found in their chapters to this Annex). This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards ranked from medium to high significance and also includes a vulnerability assessment to the flood, levee failure, and wildfire hazards.

S.5.2. Vulnerability Assessment and Assets at Risk

Each hazard vulnerability assessment in Section S.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard affects the Delta and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Planning Area.

This section identifies the Sacramento Delta's assets at risk, including values, populations, critical facilities and infrastructure, cultural and historic assets, and growth and development trends.

Values at Risk

The following data from the Sacramento County Assessor's Office is based on the 2020 Assessor's data. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitations are created by Proposition 13 and the Williamson Act as detailed in the Base Plan. With respect to Proposition 13, instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is most likely low and does not reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However,

depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate.

Table S-2 shows the 2020 Assessor's values (e.g., the values at risk) broken down by property type for the Delta (both the City of Isleton and unincorporated areas). Table S-3 shows the 2020 Assessor's values (e.g., the values at risk) broken down by property type for the Delta (the unincorporated area). A break down by property type for the City of Isleton is included in its Chapter to this Delta annex.

Table S-2 Sacramento Delta Total Values at Risk by Jurisdiction

Jurisdiction	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Contents Value	Total Value
Delta (Isleton)	536	338	$22,717,211	$41,268,279	$26,053,556	$90,039,044
Delta (Unincorporated)	2,681	1,735	$356,415,352	$417,944,098	$332,799,400	$1,107,158,865
Grand Delta Total	3,217	2,073	$379,132,563	$459,212,377	$358,852,956	$1,197,197,909

Source: Sacramento County 2016 Parcel/2015 Assessor's Data

Table S-3 Sacramento Delta –Total Values at Risk by Property Use

Property Use / Delta Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Delta (City of Isleton)						
Agricultural	1	0	$32,472	$0	$0	$32,472
Care / Health	0	0	$0	$0	$0	$0
Church / Welfare	8	8	$208,114	$1,009,072	$1,009,072	$2,226,258
Industrial	5	5	$2,126,988	$1,224,909	$1,837,364	$5,189,260
Miscellaneous	20	0	$884,138	$0	$0	$884,138
Office	5	4	$447,754	$693,344	$693,344	$1,834,442
Public / Utilities	28	1	$44,163	$32,966	$32,966	$110,095
Recreational	0	0	$0	$0	$0	$0
Residential	260	257	$13,055,718	$31,636,760	$15,818,384	$60,510,861
Retail / Commercial	60	58	$2,600,078	$6,662,426	$6,662,426	$15,924,930
Unknown	0	0	$0	$0	$0	$0
Vacant	149	5	$3,317,786	$8,802	$0	$3,326,588
Delta (City of Isleton) Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**
Delta (Unincorporated Sacramento County)						
Agricultural	754	493	$199,504,595	$206,511,135	$206,511,135	$612,526,865
Care / Health	3	0	$859	$0	$0	$859

Property Use / Delta Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Church / Welfare	10	6	$103,775	$475,422	$475,422	$1,054,619
Industrial	43	31	$5,113,310	$7,870,799	$11,806,197	$24,790,308
Miscellaneous	216	5	$762,047	$13,642	$13,642	$789,331
Office	19	16	$1,465,592	$2,163,860	$2,163,860	$5,793,312
Public / Utilities	72	0	$27	$0	$0	$27
Recreational	69	45	$13,195,423	$17,433,420	$17,433,420	$48,062,263
Residential	1,098	1,032	$114,578,203	$166,468,908	$83,234,454	$364,281,578
Retail / Commercial	78	73	$5,629,637	$11,161,270	$11,161,270	$27,952,177
Unknown	1	1	$36,466	$131,696	$0	$168,162
Vacant	318	33	$16,025,418	$5,713,946	$0	$21,739,364
Delta (Unincorporated Sacramento County) Total	**2,681**	**1,735**	**$356,415,352**	**$417,944,098**	**$332,799,400**	**$1,107,158,865**
Grand Total	**3,217**	**2,073**	**$379,132,563**	**$459,212,377**	**$358,852,956**	**$1,197,197,909**

Source: Sacramento County 2020 Parcel/Assessor's Data

Critical Facilities and Infrastructure

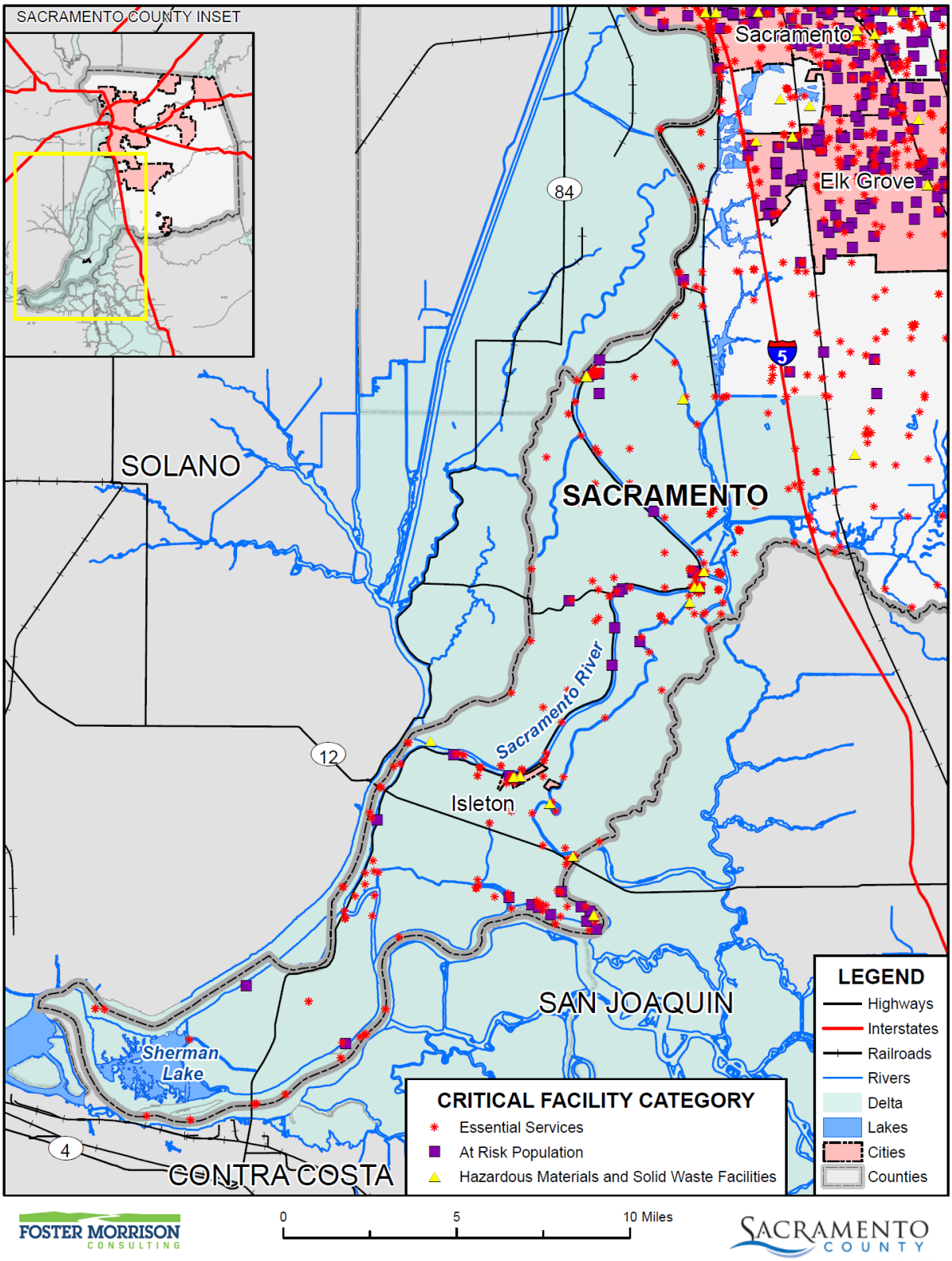
For purposes of this plan, a critical facility is defined as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

An inventory of critical facilities in the Delta from Sacramento County GIS is shown on Figure S-3. Details of critical facility definition, type, name, address, and jurisdiction by hazard zone are listed in Appendix F.

Figure S-3 Sacramento County Delta– Critical Facilities



‘ Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Natural Resources

The Delta ecosystem is the lower drainage area of the vast Central Valley of California. It is inextricably linked to the Sacramento and San Joaquin River watersheds as a recipient of flows and constituents from natural and man caused activities and events upstream. It is distinguished by various aquatic ecosystems that host rare native fish, and by several distinct terrestrial and wetland habitats that support abundant bird and animal life. These key habitats include tidal marshes, managed freshwater wetlands, in-channel fresh and brackish water habitats, open water habitats, seasonal wetlands, riparian forest, and grasslands, among others. In all of these habitats there exist both resident and migratory species of great conservation value. This means that Delta ecosystem management must consider not only localized contexts but also the way that Delta habitats fit within regional, watershed, and even continental-scale ecosystems.

Importantly, some Delta agricultural lands also provide rich seasonal wildlife habitat. Thousands of acres are shallowly flooded after harvest and provide feeding and resting areas for resident and migratory birds and other wildlife. This practice of seasonal flooding is one example of a management practice that supports both the Delta ecosystem and the economy.

The Delta is also the single most important link in California's water supply system. Two of the state's biggest water projects – the State Water Project and the federal Central Valley Project – depend on Delta waterways to convey water from Northern California rivers to pumping facilities in the southern Delta. Delta levees play a critical role in preventing salty water from San Francisco Bay from intruding into critical parts of the Delta and contaminating the fresh water that supplies communities and farms.

While the California WaterFix includes ecosystem/habitat mitigation measures for the severe environmental impacts it causes the habitat restoration component of the prior habitat conservation plan (i.e., the BDCP) has been divorced from the project. Proposed mitigation, termed "environmental commitments" in the revised documents, include 2,100 acres of habitat repair along the footprint of the conveyance project,

"California EcoRestore" now proposes the creation/enhancement of approximately 30,000 acres of habitat; significantly reduced from the 153,000 acres previously identified in the draft BDCP. As proposed, EcoRestore will restore these 30,000 acres to habitat, primarily floodplain and tidal marsh, by 2020. As part of this effort EcoRestore will develop an adaptive management program (aka: the EcoRestore Adaptive Management Program) to achieve its habitat restoration goals and increase restoration success for the benefit of the long-term health of the Sacramento-San Joaquin Delta and Suisun Marsh's native fish and wildlife species.

In addition, the California Department of Fish and Wildlife is developing the "Delta Conservation Framework" that will work in tandem with EcoRestore. As proposed, the Framework will identify a 25-year vision for Delta-wide ecosystem conservation consistent with and in the context of the Delta as a place, and act to backfill the conservation measures) lost (or significantly eroded) when BDCP morphed into the Cal WaterFix and EcoRestore.

Historic and Cultural Resources

There is rich historic and cultural heritage in the Delta. It is home to several historically significant legacy communities, including Bethel Island, Clarksburg, Courtland, Freeport, Hood, Isleton, Knightsen, Locke, Rio Vista, Ryde, and Walnut Grove. Locke, the largest remaining town built by early Chinese immigrants to the United States, is a National Historic Landmark District. More information can be found in the Base Plan, as well as in the City of Isleton's and each reclamation district's chapters of this Annex.

Growth and Development Trends

Major planning activities are occurring in the Delta by the state and federal Governments related to water supplies and environmental issues. This effort's co-equal goals are water reliability and habitat restoration while still protecting, enhancing and sustaining the unique cultural, historical, recreational, agricultural and economic values of the Delta, and addressing flood protection, continued socio-economic sustainability of agriculture and its infrastructure, and legacy communities in the Delta. The outcomes of these planning actions are likely to shape the future of the County's Delta community, including any new development in the Delta.

Future Development

The 2030 Sacramento County General Plan estimated future populations for the Delta Area of the County. These are shown below.

- 2005 – 6,109
- 2010 – 6,442
- 2015 – 6,789
- 2020 – 7,023
- 2025 – 7,250

S.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table S-1 as high or medium significance hazards. Impacts of past events and vulnerability of the Delta to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the Delta to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, populations at risk, critical facilities and infrastructure, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power shortage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power shortage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E and SMUD), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

It should be noted that to date, there have been no PSPS events in the Delta .

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the Delta, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the Delta noted that climate change is of concern, no specific impacts of climate change could be recalled. The Delta and HMPC members noted that the strength of storms does seem to be increasing and the temperatures are getting hotter.

Vulnerability to and Impacts from Climate Change

The California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the Delta and the Sacramento County Planning Area.

The 2014 California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change

- Sensitive species stress
- Increased wildfire

Future Development

The Delta could see population fluctuations as a result of climate impacts relative to those experienced in other regions, and these fluctuations are expected to impact demand for housing and other development. While there are currently no formal studies of specific migration patterns expected to impact the Delta and County region, climate-induced migration was recognized within the UNFCCC Conference of Parties Paris Agreement of 2015 and is expected to be the focus of future studies.

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the Delta, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the Delta and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There have been two state and one federal disaster declaration from drought. This can be seen in Table S-4.

Table S-4 Sacramento County – State and Federal Drought Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the Delta are the same as those for the County and includes 4 multi-year droughts since 1950. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the Delta, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users.

The vulnerability of the Delta to drought is Delta-wide, but impacts may vary and may include reduction in water supply and an increase in dry fuels. The potential for a reduction in water supply during drought conditions generally leads to both mandated and voluntary conservations measures during extended droughts. During these times, the costs of water can also increase.

Other qualitative impacts associated with drought in the Delta and Sacramento County Planning Area are those related to water intensive activities such as, municipal usage, commerce, tourism, recreation and agricultural use. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

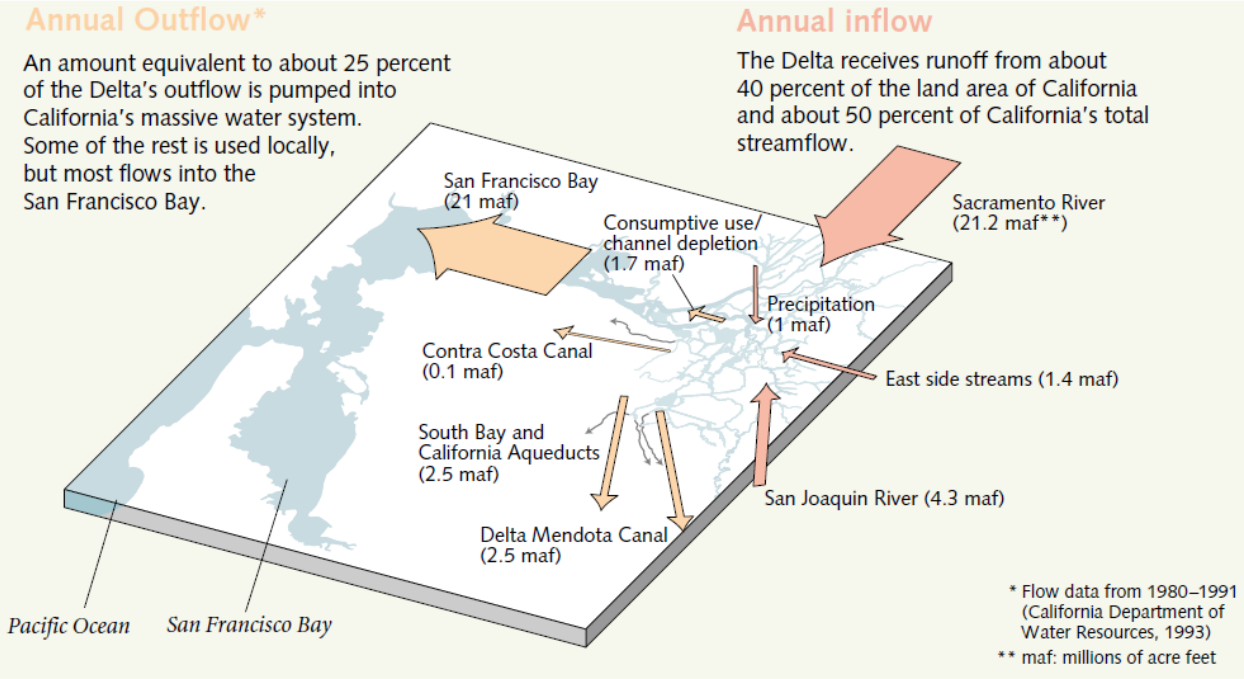
With more precipitation likely falling as rain instead of snow in the Sierra's, and warmer temperatures causing decreased snowfall to melt faster and earlier, water supply is likely to become more unreliable. In addition, drought and water shortage is predicted to become more common. This means less water available for use over the long run, and additional challenges for water supply reliability, especially during periods of extended drought.

In the Delta, drought has multiple effects. It has an economic effect on the agricultural industry, as high value crops are raised on many of the Delta islands. Prolonged drought can also exacerbate subsidence in the Delta.

There are also issues posed to the State of California from drought in the Delta. The Delta receives runoff from about 40 percent of the land area of California and about 50 percent of California's total streamflow,

as shown in Figure S-4. It is the heart of a massive north-to-south water-delivery system whose giant engineered arterials transport water southward. State and Federal contracts provide for export of up to 7.5 million acre-feet per year from two huge pumping stations in the southern Delta near the Clifton Court Forebay. About 83 percent of this water is used for agriculture and the remainder for various urban uses in central and southern California. Two-thirds of California's population (more than 20 million people) gets at least part of its drinking water from the Delta.

Figure S-4 The Delta and California's Water System



Source: USGS Publication "Sacramento-San Joaquin Delta: The Sinking Heart of the State." Report FS-005-00. Retrieved 4/30/2021

Future Development

The Delta has large amounts of surface water available. However, population growth in the County will add additional pressure to water companies during periods of drought and water shortage.

Earthquake: Liquefaction

Likelihood of Future Occurrence–Occasional
Vulnerability–Extremely High

Hazard Profile and Problem Description

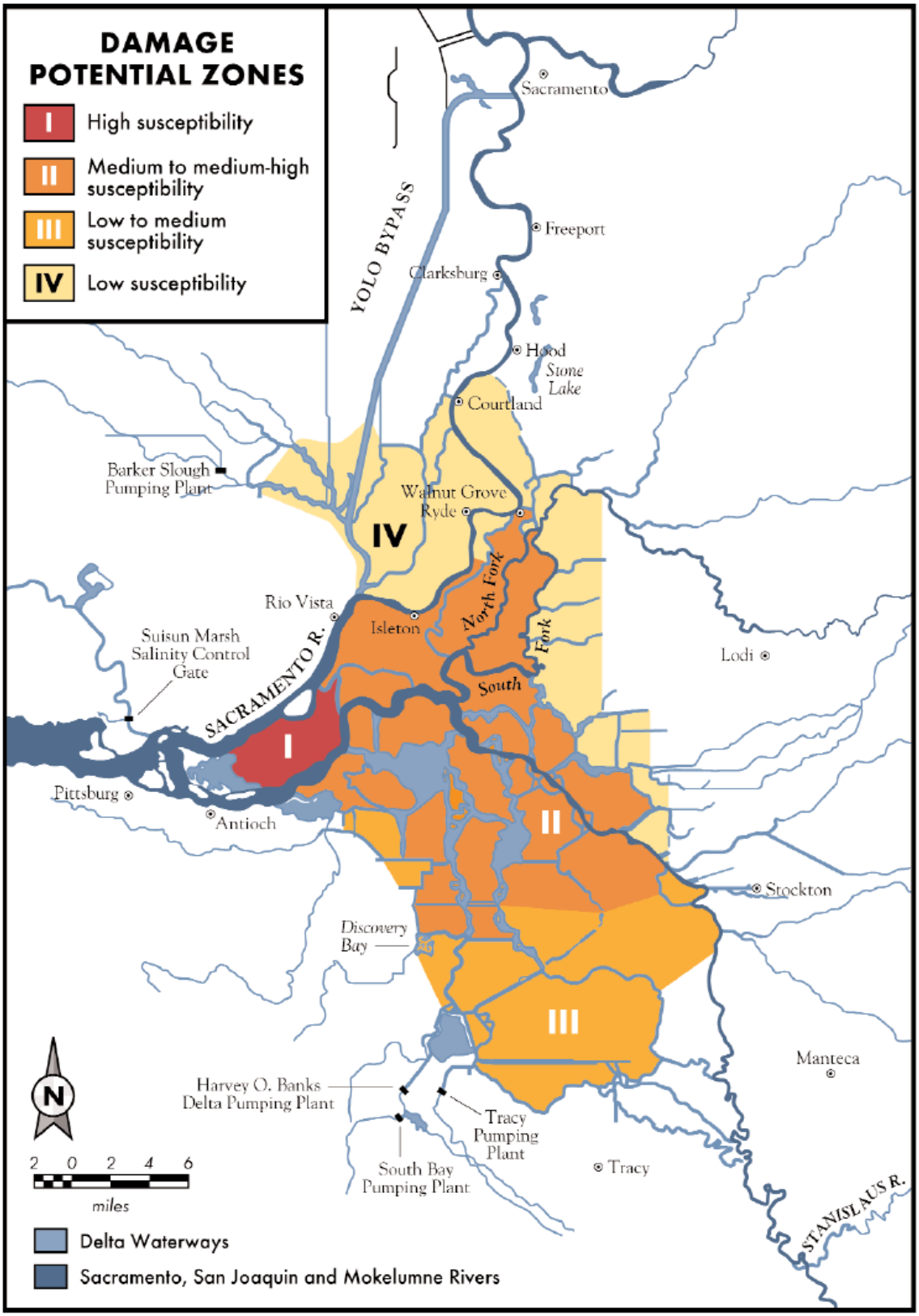
The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the

materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand and silt in the levees and their foundations indicates that liquefaction is also a possibility.

Although there have been no significant quakes in or closely adjacent to the Delta since high levees were originally constructed, there are at least five major faults within the vicinity of the Delta capable of generating peak ground acceleration values that would likely lead to levee failures.

A preliminary analysis of the risk of levee failure due to seismicity was prepared for the CALFED Levee System Integrity Program. Based on standard methods and local expertise, it estimated the magnitude and recurrence intervals of peak ground accelerations throughout the Delta. Two competing fault models were evaluated for this study, producing a wide range of potential accelerations. Then, based on local knowledge and limited geotechnical information, Damage Potential Zones were established for the Delta (Figure S-5). The zones of highest risk lie in the central and west Delta where tall levees are constructed on unstable soils that are at high risk of settling or liquefaction during an earthquake.

Figure S-5 Delta Area – Potential Damage Due to Liquefaction and Levee Collapse



Source: CALFED, 2014

This report estimated recurrence intervals for ground accelerations and the number of potential levee failures in each Damage Potential Zone. It is useful to examine their estimates of the number of failures that might occur during a 100-year event, or an event with a 0.01 probability of being equaled or exceeded in any given year. Based on their estimates, it is a roughly 50-50 chance that 5 to 20 levee segments will fail during a 100-year event in the Delta. This does not imply that 5 to 20 islands will flood, but just that 5 to 20 levee segments will fail. The loss of 5 to 20 levee segments in the Delta constitutes considerable and abrupt landscape change since island flooding is likely to be widespread and persistent for a long period of time.

In sum, liquefaction has not been observed as a result of recent seismic activity (including recent, nearby 1989 and 2014 events); however, it is recognized as a potential risk. In the event it does occur, liquefaction may pose a serious threat to levees, especially as levees are built larger and higher to deal with continuing island subsidence. Levee failure, depending on the extent, could have disastrous effects on agriculture, natural gas supply, fisheries, and saltwater intrusion of the San Francisco Bay. Water supply to California could be affected for years.

Past Occurrences

Although no historic examples of seismically induced levee failure are known in the Delta, the modern levee network has not been subjected to strong shaking. Levees were either smaller or non-existent in 1906 when the region was strongly shaken by the great San Francisco earthquake. In addition, the levees performed well during the 1989 earthquake in San Francisco and the 2014 earthquake in south Napa. Neither earthquake caused liquefaction problems to Delta levees.

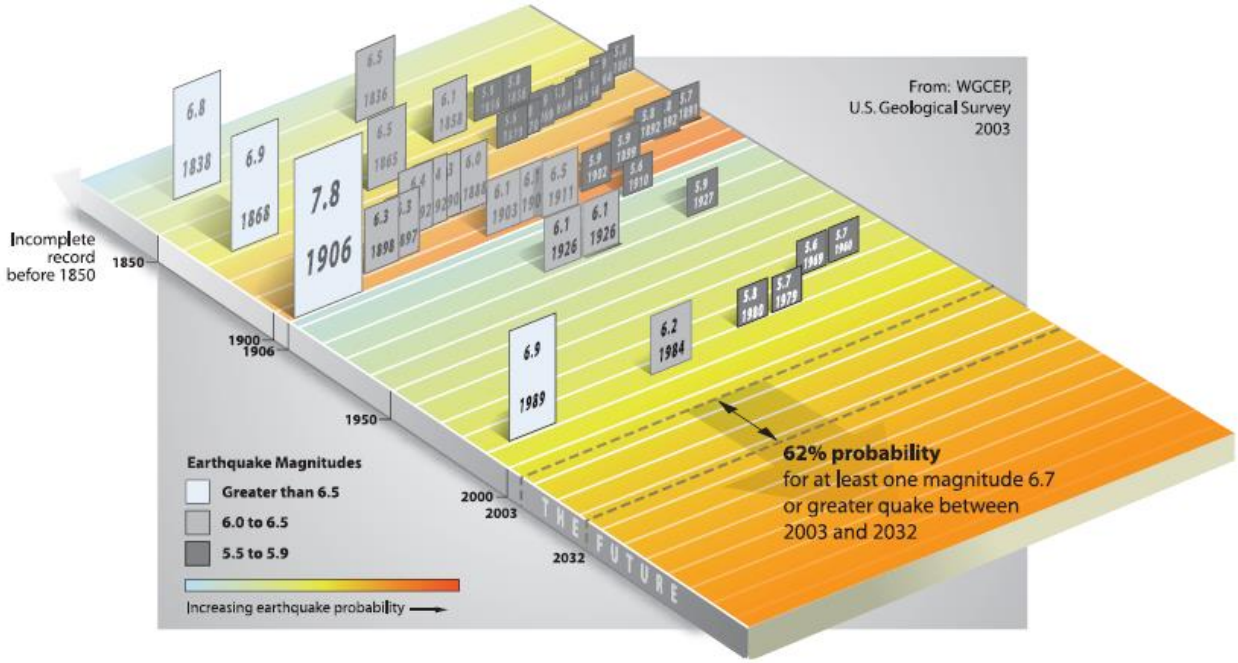
Vulnerability to Earthquake: Liquefaction

Historically, there have been 165 Delta and Suisun Marsh flood-induced levee failures leading to island inundations since 1900. Most of these failures occurred prior to 1990. Also, many of these failures were outside of Sacramento County. Since that time, there have been few levee failures due to improvements on the levee system in Sacramento as a whole.

No reports could be found to indicate that seismic shaking had ever induced significant damage or were the cause of the levee failures mentioned above. However, the lack of historical damage is not a reliable indicator that Delta levees are not vulnerable to earthquake shaking. Furthermore, the present-day Delta levees, at their current size, have not been significantly tested by moderate to high seismic shaking.

The U.S. Geological Survey estimates that an earthquake of magnitude 6.7 or greater has a 62 percent probability of occurring in the San Francisco Bay Area between 2003 and 2032 (see Figure S-6). Such an earthquake is capable of causing multiple levee failures in the Delta Region which could result in fatalities, extensive property damage and the interruption of water exports from the Delta for an extended period of time. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees.

Figure S-6 Past and Future Earthquakes in the San Francisco Bay Area and the Delta



Source: DRMS Risk Report (URS/JBA 2008c) Figure 13-8. Retrieved 4/30/2021

The largest earthquakes experienced in recent history in the region include the 1906 Great San Francisco Earthquake and the 1989 Loma Prieta Earthquake. The 1906 earthquake occurred while the levees were in their early stages of construction. They were much smaller than they are today, and were not representative of the current configuration. The epicenter of the 1989 Loma Prieta earthquake was too distant and registered levels of shaking in the Delta too small to cause perceptible damage to the levees. In 2009, the California Department of Water Resources, in their document titled Delta Risk Management Strategy, performed a special simulation analysis of the 1906 Great San Francisco Earthquake to evaluate the potential effects of that event on the current levees.

In addition to the simulation of these largest regional earthquakes, recent smaller and closer earthquakes were also evaluated. They include: the 1980 Livermore Earthquake (M 5.8) and the 1984 Morgan Hill Earthquake (M 6.2). Except for the 1906 earthquake, which would have caused deformations of some of the weakest levees, the other earthquakes were either too small or too distant to cause any significant damage to the Delta levees. These results are consistent with the seismic vulnerability prediction model developed for this study.

General seismic performance observations were:

- The areas most prone to liquefaction potential are in the northern region and the southeastern region of the Delta. The central and western regions of the Delta and Suisun Marsh show discontinuous areas of moderate to low liquefaction potential.
- The vulnerability classes 1 through 4 are the most vulnerable levees to seismic loading. These include islands with liquefiable levee fill, and peat/organic soil deposits and potentially liquefiable sand deposits in the foundation. Such islands include but are not limited to Sherman, Brannan-Andrus, Twitchel, Webb, Venice, Bouldin, and many others.

- The majority of the islands have at least one levee reach in vulnerability classes 1 to 4,
- Levees composed of liquefiable fill are likely to undergo extensive damage as a result of a moderate to large earthquake in the region.
- The median probabilities of failure for classes with no liquefiable foundation sand and no liquefiable levee fill increase with peat thickness under the levee. When peat is absent, generally the probabilities of failure are small (less than 22 percent) for the largest ground motions of 0.5g. However, the probabilities of failure at the locations of the thickest peat (more than 25 feet) range from 30 percent to 60 percent for a PGA of 0.5g.
- Levees founded on liquefiable foundations are expected to experience large deformations (in excess of 10 feet) under a moderate to large earthquake in the region.

Flooding Risk

A major earthquake can cause extensive damage to large sections of levees on multiple islands at the same time. As a result, many islands could be flooded simultaneously. For example, the DRMS report indicated that there is a 40 percent probability of a major earthquake causing 27 or more islands to flood at the same time in the 25-year period from 2005 to 2030. It is not specified which islands in Sacramento County would be included in this flooding.

The duration and cost of levee repairs increases with the number of islands that are flooded due to an earthquake, as shown in Table S-5. This is not only due to the extensive amount of repairs required, but also to the availability of labor and materials to make the repairs. These numbers from the DRMS report are applicable to Sacramento County.

Table S-5 Duration and Cost of Repairs for Earthquake-Induced Levee Failures

Number of flooded islands	Estimated range of cost of repair and dewatering	Estimated range of time to repair breaches and dewater [days]
1	$43,000,000 – $240,000,000	136 – 276
3	$204,000,000 – $490,000,000	270 – 466
10	$620,000,000 – $1,260,000,000	460 – 700
20	$1,400,000,000 – $2,300,000,000	750 – 1,020
30	$3,000,000,000 – $4,200,000,000	1,240 – 1,660

Source: DRMS Risk Report 2009

In addition to dewatering costs, the Delta contains improved parcels at risk to flooding.

Water Quality Risk

Earthquake damage to levees and to the islands they protect could take years to repair following a major earthquake. One significant impact of levee failures would be to the state's water supply. For example, if 20 islands were flooded as a result of a major earthquake, the export of fresh water from the Delta could be interrupted for about a year and a half. Water supply losses of up to 8 million acre-feet would be incurred by State and federal water contractors and local water districts.

If subsided Delta islands are flooded due to levee breaches, significant amounts of dissolved organic carbon [DOC] would be released into Delta waters from the highly organic peat soils on these islands. Disinfectants used during the drinking water treatment process react with DOC to produce disinfection byproducts in treated water. Many of these chemical byproducts can increase cancer risks or cause other health effects.

Other water quality problems resulting from island flooding include increased algae blooms. Algae blooms can complicate drinking water treatment processes and can adversely affect some aquatic species.

Some soils in the Delta Region contain moderate levels of mercury due, among other things, to historical gold mining activities that occurred upstream of the Delta during the Gold Rush. Mercury in soils can, under certain circumstances, be converted to the highly toxic methylated form when islands are flooded. Methylated mercury can accumulate in the food chain potentially affecting fish. Humans and animals that consume fish contaminated with methylated mercury are at risk of poisoning.

Natural Resources at Risk

In all seismic levee failure scenarios, the area of vegetation impacted increases with the area flooded. The degree of impact depends on the type of vegetation flooded. Results of the DRMS Project indicate potential losses of up to 39 percent of herbaceous wetland, seasonal grasses and low-lying vegetation, 29 percent of non-native trees, and 24 percent of shrub wetland due to an event where multiple islands are flooded. In addition, in Sacramento County, the Delta Area at risk to liquefaction contains highly productive farmland. Should a levee fail, loss of crops would have a large economic impact. Information specific to the losses in Sacramento County were not available.

Population at Risk

The Delta levees most likely to fail due to earthquakes and earthquake liquefaction are generally located in the central-west area of the Delta, some of which is likely to be in the Sacramento County portion of the Delta. Their failure will cause rapid flooding and leave little time for evacuation.

The greatest immediate public safety concern is for the people working and living on Delta islands, and for people traveling through the Delta on various roads and highways. According to the DRMS report, there is a 40 percent probability of 90 or more fatalities in the Delta from levee failures due to a seismic event in the 25-year period from 2005 through 2030. The expected fatalities from earthquake-related island flooding are high due to the lack of warning for earthquakes and because of the rapid rate of flooding likely to occur after an earthquake. It should be noted that these fatality figures are for the Delta as a whole, and not limited to those areas of the Delta lying within Sacramento County.

Future Development

The consequences of a major earthquake in the Delta Region will also increase with time. Because of increasing water demand and the state's growing population and economy, the economic consequences of an interruption in Delta water supply operations due to an earthquake will increase. Consequences to the Delta Region will also increase due to additional development. According to the DRMS report, total expected economic losses are anticipated to increase by about 200 percent by 2050 and by about 500 percent

by 2100. The risk of fatalities is expected to increase, on average, by about 250 percent from 2005 to 2050. It should be noted that these economic figures are for the Delta as a whole, and not limited to those areas of the Delta lying within Sacramento County.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–Extremely High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the Delta, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the Delta. Historically, the Delta has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

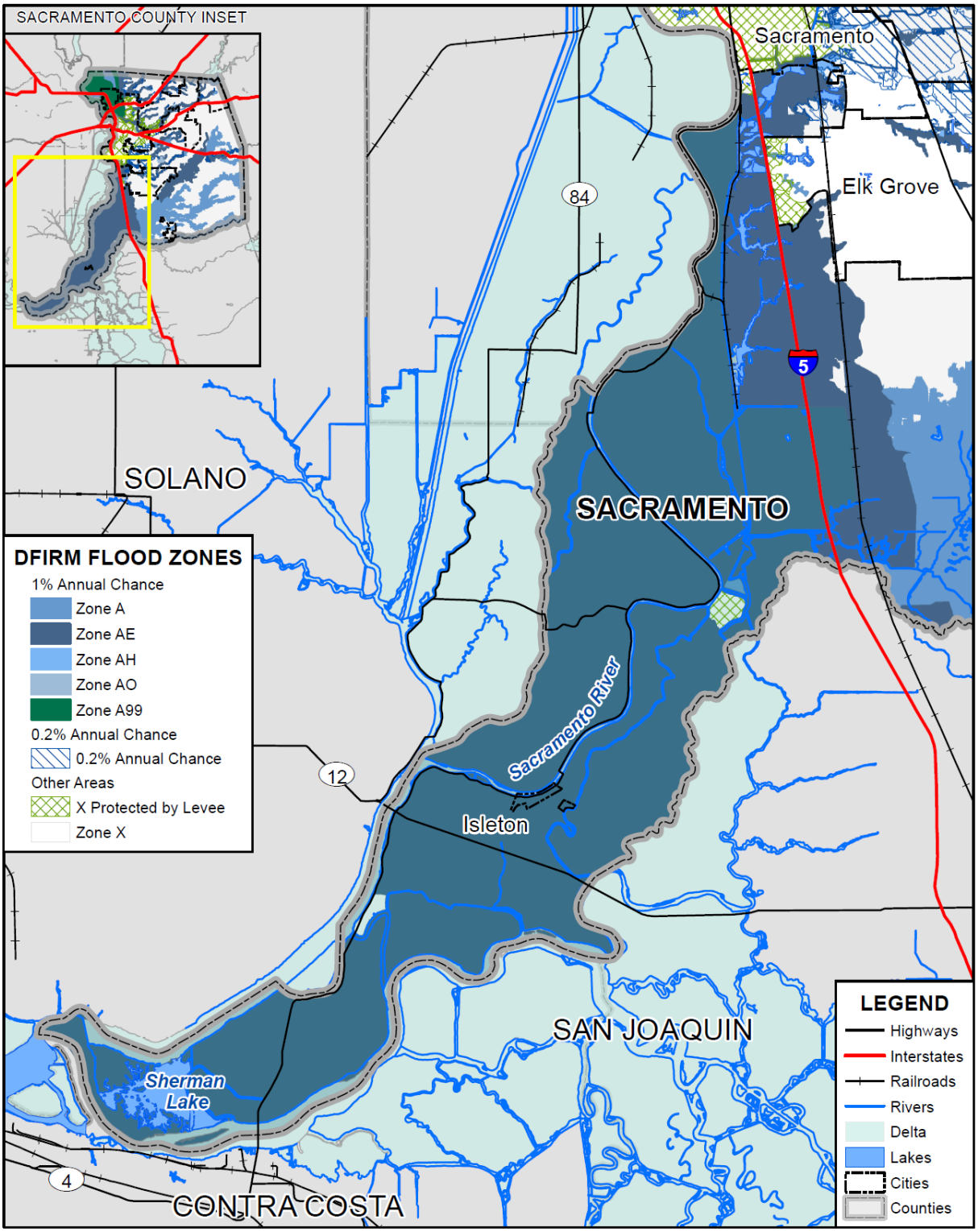
As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the Delta have been subject to historical flooding.

Location and Extent

The Delta Region lies within a floodplain and is faced with a major flooding problem because of an aging levee system and issues associated with subsidence, seepage, erosion and seismicity. Flooding has occurred in some parts of the Delta on the average of once every three and one-half to four years. While construction of upstream reservoirs has reduced the threat of overtopping, Delta levee failures continue to be a serious problem. Since 1950, levee failures have been twice as likely to be caused by foundation or levee instability than by overtopping. The condition of Delta levees has been deteriorating over time and flooding frequency increasing. Although there are currently efforts to improve, flood protection is generally inadequate except for those areas protected by federally built or "project" levees.

The Delta has areas located in the 1% and 0.2% annual chance flood zones. This is seen in Figure S-7.

Figure S-7 Sacramento County Delta – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table S-6 details the DFIRM mapped flood zones located within the Delta.

Table S-6 Sacramento County Delta– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the Delta
A	1% annual chance flooding: No base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AE	1% annual chance flooding: Base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood. Flood insurance is not mandatory but is available.	X
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	X
X (unshaded)	No flood hazard	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the Delta vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the Delta tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the Delta tends to have a shorter speed of onset, due to the amount of water that flows through the Delta.

Geographical flood extents for the Delta from the FEMA DFIRMs are shown in Table S-7.

Table S-7 Sacramento County Delta – Geographical DFIRM Flood Zone Extents

Delta Area/ Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Delta (City of Isleton)						
1% Annual Chance Flood Hazard	224	96.24%	61	93.26%	163	97.41%
0.2% Annual Chance Flood Hazard	0	0.00%	0	0.00%	0	0.00%
Other Areas	9	3.76%	4	6.74%	4	2.59%
Delta (City of Isleton) Total	**233**	**100.00%**	**66**	**100.00%**	**168**	**100.00%**
Delta (Unincorporated Sacramento County)						
1% Annual Chance Flood Hazard	85,415	99.01%	45,710	99.19%	39,705	98.81%
0.2% Annual Chance Flood Hazard	465	0.54%	373	0.81%	93	0.23%
Other Areas	387	0.45%	2	0.00%	385	0.96%
Delta (Unincorporated Sacramento County) Total	**86,267**	**100.00%**	**46,085**	**100.00%**	**40,183**	**100.00%**
Grand Total	**86,500**	**100.00%**	**46,150**	**100.00%**	**40,350**	**100.00%**

Source: FEMA DFIRM 11/2/2018

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table S-8. These events also likely affected the Delta to some degree.

Table S-8 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Due to the levees in the Delta Area, flooding past occurrences are discussed in the Past Occurrence section in Levee Failure section below.

Vulnerability to and Impacts from Flood

Floods have been a part of the Delta's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

The 2018 Flood Insurance Study (FIS) noted that the lower reaches/Delta of the Sacramento and San Joaquin Rivers are under the influence of the tides. The most severe flood conditions in the Delta would result when very high tides and large volume of stream outflow occur coincidentally, and strong onshore winds generate wave action. It should be noted that precipitation over the Delta does not materially affect local flood conditions.

Assets at Risk

Based on the vulnerability of the Delta to the flood hazard, the sections that follow describes significant assets at risk in the Delta. This section includes the values at risk, flooded acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the Delta. The methodology described in Section 4.3.12 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table S-9 is a summary table for the Delta. Parcel counts, values, estimated contents, and total values in the Delta are shown for the 1% and 0.2% annual chance flood zones, as well as for those properties that fall outside of the mapped FEMA DFIRM flood

zones. Table S-10 breaks down Table S-9 and shows the property use, improved parcel count, improved values, estimated contents, and total values that fall by datafile flood zones in the Delta.

Table S-9 Sacramento County Delta – Count and Value of Parcels at Risk in Summary DFIRM Flood Zones

Delta Area/ Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Delta (City of Isleton)						
1% Annual Chance Flood Hazard	515	329	$21,145,419	$39,144,051	$24,482,767	$84,772,235
0.2% Annual Chance Flood Hazard	0	0	$0	$0	$0	$0
Other Areas	21	9	$1,571,792	$2,124,228	$1,570,789	$5,266,809
Delta (City of Isleton) Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**
Delta (Unincorporated Sacramento County)						
1% Annual Chance Flood Hazard	2,418	1,550	$343,040,982	$395,607,129	$316,128,972	$1,054,777,092
0.2% Annual Chance Flood Hazard	258	183	$13,167,271	$22,153,220	$16,524,002	$51,844,499
Other Areas	5	2	$207,099	$183,749	$146,426	$537,274
Delta (Unincorporated Sacramento County) Total	**2,681**	**1,735**	**$356,415,352**	**$417,944,098**	**$332,799,400**	**$1,107,158,865**
Grand Total	**3,217**	**2,073**	**$379,132,563**	**$459,212,377**	**$358,852,956**	**$1,197,197,909**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table S-10 Sacramento County Delta – Count and Values of Parcels at Risk by Detailed Flood Zone and Property Use

Flood Zone / Property Use / Delta Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Delta (City of Isleton)						
1% Annual Chance Flood Hazard						
Zone AE						

Flood Zone / Property Use / Delta Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	1	0	$32,472	$0	$0	$32,472
Care / Health	0	0	$0	$0	$0	$0
Church / Welfare	8	8	$208,114	$1,009,072	$1,009,072	$2,226,258
Industrial	5	5	$2,126,988	$1,224,909	$1,837,364	$5,189,260
Miscellaneous	17	0	$851,679	$0	$0	$851,679
Office	4	3	$188,095	$374,669	$374,669	$937,433
Public / Utilities	26	1	$43,974	$32,966	$32,966	$109,906
Recreational	0	0	$0	$0	$0	$0
Residential	257	254	$12,279,026	$30,529,882	$15,264,945	$58,073,852
Retail / Commercial	55	53	$2,190,276	$5,963,751	$5,963,751	$14,117,778
Unknown	0	0	$0	$0	$0	$0
Vacant	142	5	$3,224,795	$8,802	$0	$3,233,597
Zone AE Total	***515***	***329***	***$21,145,419***	***$39,144,051***	***$24,482,767***	***$84,772,235***
1% Annual Chance Flood Hazard Total	**515**	**329**	**$21,145,419**	**$39,144,051**	**$24,482,767**	**$84,772,235**
Other Areas						
Zone X						
Agricultural	0	0	$0	$0	$0	$0
Care / Health	0	0	$0	$0	$0	$0
Church / Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	3	0	$32,459	$0	$0	$32,459
Office	1	1	$259,659	$318,675	$318,675	$897,009
Public / Utilities	2	0	$189	$0	$0	$189
Recreational	0	0	$0	$0	$0	$0
Residential	3	3	$776,692	$1,106,878	$553,439	$2,437,009
Retail / Commercial	5	5	$409,802	$698,675	$698,675	$1,807,152
Unknown	0	0	$0	$0	$0	$0
Vacant	7	0	$92,991	$0	$0	$92,991
Zone X Total	***21***	***9***	***$1,571,792***	***$2,124,228***	***$1,570,789***	***$5,266,809***
Other Areas Total	**21**	**9**	**$1,571,792**	**$2,124,228**	**$1,570,789**	**$5,266,809**
Delta (City of Isleton) Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**
Delta (Unincorporated Sacramento County)						

Flood Zone / Property Use / Delta Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard						
Zone A						
Agricultural	0	0	$0	$0	$0	$0
Care / Health	0	0	$0	$0	$0	$0
Church / Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	9	0	$0	$0	$0	$0
Office	0	0	$0	$0	$0	$0
Public / Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	0	0	$0	$0	$0	$0
Retail / Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	0	0	$0	$0	$0	$0
Zone A Total	***9***	***0***	***$0***	***$0***	***$0***	***$0***
Zone AE						
Agricultural	748	487	$197,732,742	$204,664,960	$204,664,960	$607,062,662
Care / Health	0	0	$0	$0	$0	$0
Church / Welfare	7	4	$57,949	$456,002	$456,002	$969,953
Industrial	34	23	$4,382,875	$6,831,692	$10,247,538	$21,462,105
Miscellaneous	189	5	$747,449	$13,642	$13,642	$774,733
Office	6	5	$639,776	$355,385	$355,385	$1,350,546
Public / Utilities	69	0	$27	$0	$0	$27
Recreational	66	43	$13,047,953	$16,714,813	$16,714,813	$46,477,579
Residential	969	910	$108,774,073	$154,124,012	$77,062,007	$339,960,101
Retail / Commercial	46	43	$3,520,666	$6,614,625	$6,614,625	$16,749,916
Unknown	1	1	$36,466	$131,696	$0	$168,162
Vacant	274	29	$14,101,006	$5,700,302	$0	$19,801,308
Zone AE Total	***2,409***	***1,550***	***$343,040,982***	***$395,607,129***	***$316,128,972***	***$1,054,777,092***
1% Annual Chance Flood Hazard Total	**2,418**	**1,550**	**$343,040,982**	**$395,607,129**	**$316,128,972**	**$1,054,777,092**
0.2% Annual Chance Flood Hazard						
X Protected by Levee						
Agricultural	6	6	$1,771,853	$1,846,175	$1,846,175	$5,464,203

Flood Zone / Property Use / Delta Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Care / Health	3	0	$859	$0	$0	$859
Church / Welfare	3	2	$45,826	$19,420	$19,420	$84,666
Industrial	9	8	$730,435	$1,039,107	$1,558,659	$3,328,203
Miscellaneous	17	0	$14,598	$0	$0	$14,598
Office	12	10	$728,197	$1,699,371	$1,699,371	$4,126,939
Public / Utilities	2	0	$0	$0	$0	$0
Recreational	3	2	$147,470	$718,607	$718,607	$1,584,684
Residential	127	121	$5,694,650	$12,270,251	$6,135,125	$24,100,030
Retail / Commercial	32	30	$2,108,971	$4,546,645	$4,546,645	$11,202,261
Unknown	0	0	$0	$0	$0	$0
Vacant	44	4	$1,924,412	$13,644	$0	$1,938,056
X Protected by Levee Total	***258***	***183***	***$13,167,271***	***$22,153,220***	***$16,524,002***	***$51,844,499***
0.2% Annual Chance Flood Hazard Total	**258**	**183**	**$13,167,271**	**$22,153,220**	**$16,524,002**	**$51,844,499**
Other Areas						
Zone X						
Agricultural	0	0	$0	$0	$0	$0
Care / Health	0	0	$0	$0	$0	$0
Church / Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	1	0	$0	$0	$0	$0
Office	1	1	$97,619	$109,104	$109,104	$315,827
Public / Utilities	1	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	2	1	$109,480	$74,645	$37,322	$221,447
Retail / Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	0	0	$0	$0	$0	$0
Zone X Total	***5***	***2***	***$207,099***	***$183,749***	***$146,426***	***$537,274***
Other Areas Total	**5**	**2**	**$207,099**	**$183,749**	**$146,426**	**$537,274**
Delta (Unincorporated Sacramento County) Total	**2,681**	**1,735**	**$356,415,352**	**$417,944,098**	**$332,799,400**	**$1,107,158,865**

Flood Zone / Property Use / Delta Area	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Grand Total	**3,217**	**2,073**	**$379,132,563**	**$459,212,377**	**$358,852,956**	**$1,197,197,909**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table S-11 summarizes Table S-10 above and shows Sacramento County Delta loss estimates and improved values at risk by FEMA 1% and 0.2% annual chance flood zones.

Table S-11 Sacramento County Delta – Flood Loss Estimates

Flood Zone / Delta Area	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
Delta (City of Isleton)							
1% Annual Chance Flood Hazard	515	329	$39,144,051	$24,482,767	$63,626,818	$12,725,364	1.52%
0.2% Annual Chance Flood Hazard	0	0	$0	$0	$0	$0	0.00%
Delta (City of Isleton) Total	**515**	**329**	**$39,144,051**	**$24,482,767**	**$63,626,818**	**$12,725,364**	**1.61%**
Delta (Unincorporated Sacramento County)							
1% Annual Chance Flood Hazard	2,418	1,550	$395,607,129	$316,128,972	$711,736,101	$142,347,220	16.98%
0.2% Annual Chance Flood Hazard	258	183	$22,153,220	$16,524,002	$38,677,222	$7,735,444	0.92%
Delta (Unincorporated Sacramento County) Total	**2,676**	**1,733**	**$417,760,349**	**$332,652,974**	**$750,413,323**	**$150,082,664**	**17.90%**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table S-10 and Table S-11, the Sacramento County Delta area has 1,879 improved parcels and $774 million of structure and contents values or values in the 1% annual chance flood zone, and 183 improved parcels and $38.7 million of structure and contents values in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described

in Section 4.3.11 of the Base Plan, there is a 1% chance in any given year of a flood event causing $155 million in damage and a 0.2% chance in any given year of a flood event causing $7.7million in damage in the Sacramento County Delta. The loss ratio of 18.50% and 0.92% indicates that flood losses for 1% and 0.2% annual chance flooding, respectively, may be overwhelming and difficult to recover from.

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the Delta in comparison to total area within the Delta limits. The same methodology, as discussed in Section 4.3.12 of the Base Plan, was used for the Sacramento County Delta as well as for the County as a whole. Table S-12 represents a detailed and summary analysis of total acres for each FEMA DFIRM flood zone in the Delta.

Table S-12 Sacramento County Delta – Flooded Acres by Flood Zone

Flood Zone / Delta Area	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Delta (City of Isleton)						
1% Annual Chance Flood Hazard	224	96.24%	61	93.26%	163	97.41%
0.2% Annual Chance Flood Hazard	0	0.00%	0	0.00%	0	0.00%
Other Areas	9	3.76%	4	6.74%	4	2.59%
Delta (City of Isleton) Total	**233**	**100.00%**	**66**	**100.00%**	**168**	**100.00%**
Delta (Unincorporated Sacramento County)						
1% Annual Chance Flood Hazard	85,415	99.01%	45,710	99.19%	39,705	98.81%
0.2% Annual Chance Flood Hazard	465	0.54%	373	0.81%	93	0.23%
Other Areas	387	0.45%	2	0.00%	385	0.96%
Delta (Unincorporated Sacramento County) Total	**86,267**	**100.00%**	**46,085**	**100.00%**	**40,183**	**100.00%**
Grand Total	**86,500**	**100.00%**	**46,150**	**100.00%**	**40,350**	**100.00%**

Source: FEMA 11/2/2018 DFIRM

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Isleton and the unincorporated County. According to this analysis, there is a total population of 2,292 and 334 residents of the Delta at risk to flooding in the 1% and 0.2% annual chance floodplains, respectively. This is shown in Table S-13.

Table S-13 Sacramento County Delta – Count of Improved Residential Parcels and Population by Flood Zone

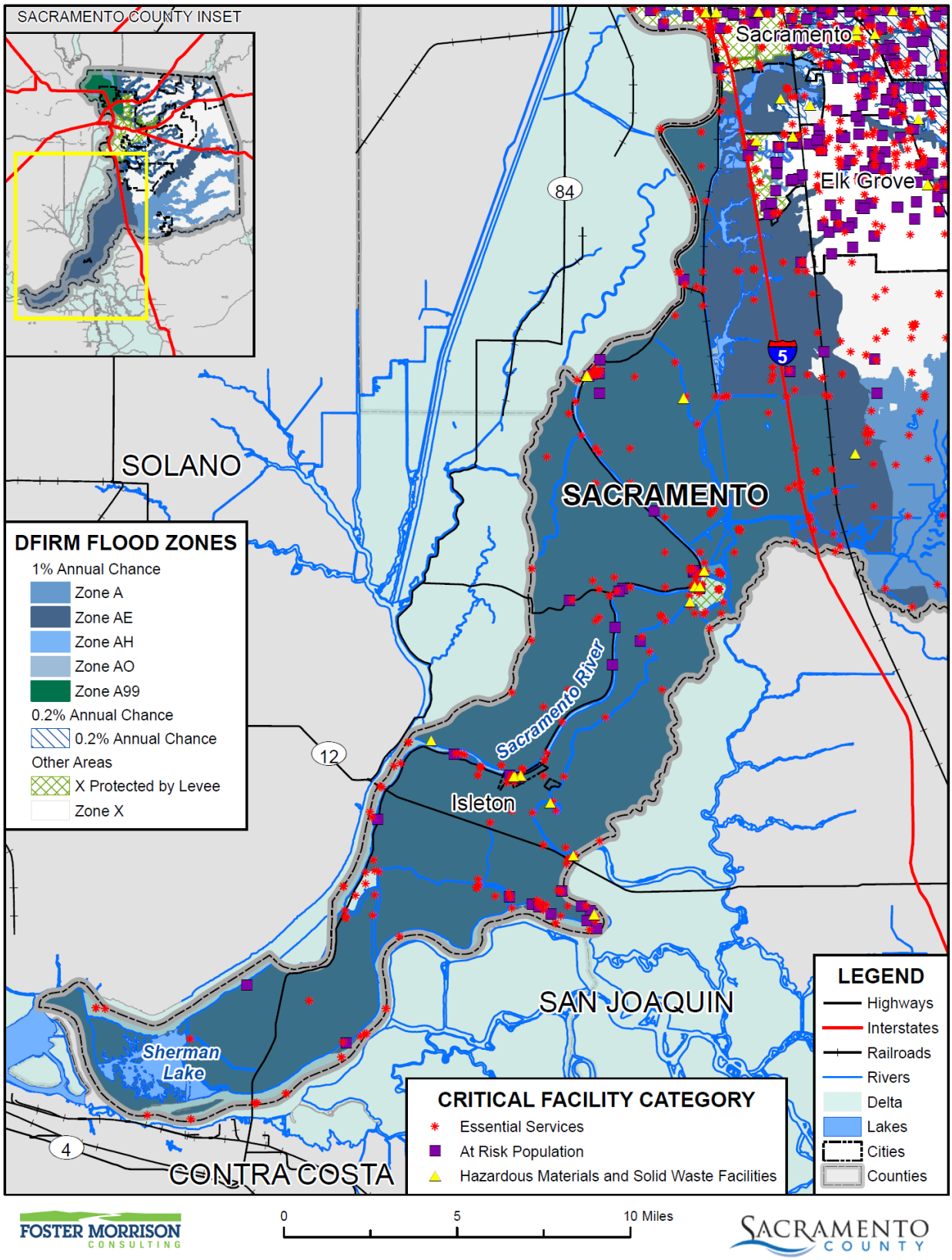
Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Isleton	254	686	0	0
Unincorporated Delta	810	2,236	121	334
Total	**1,064**	**2,922**	**121**	**334**

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau Average Household Sizes: Isleton (2.7), and unincorporated Sacramento County (2.76)

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Citrus Heights in DFIRM flood zones. GIS was used to determine whether the critical facility locations intersect a DFIRM flood zone. Details of critical facilities in mapped dam inundation areas in the Delta are shown in Figure A 8. Details of critical facility definition, type, name and address and jurisdiction by dam inundation area are listed in Appendix F.

Figure S-8 Sacramento Delta – Critical Facilities in DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

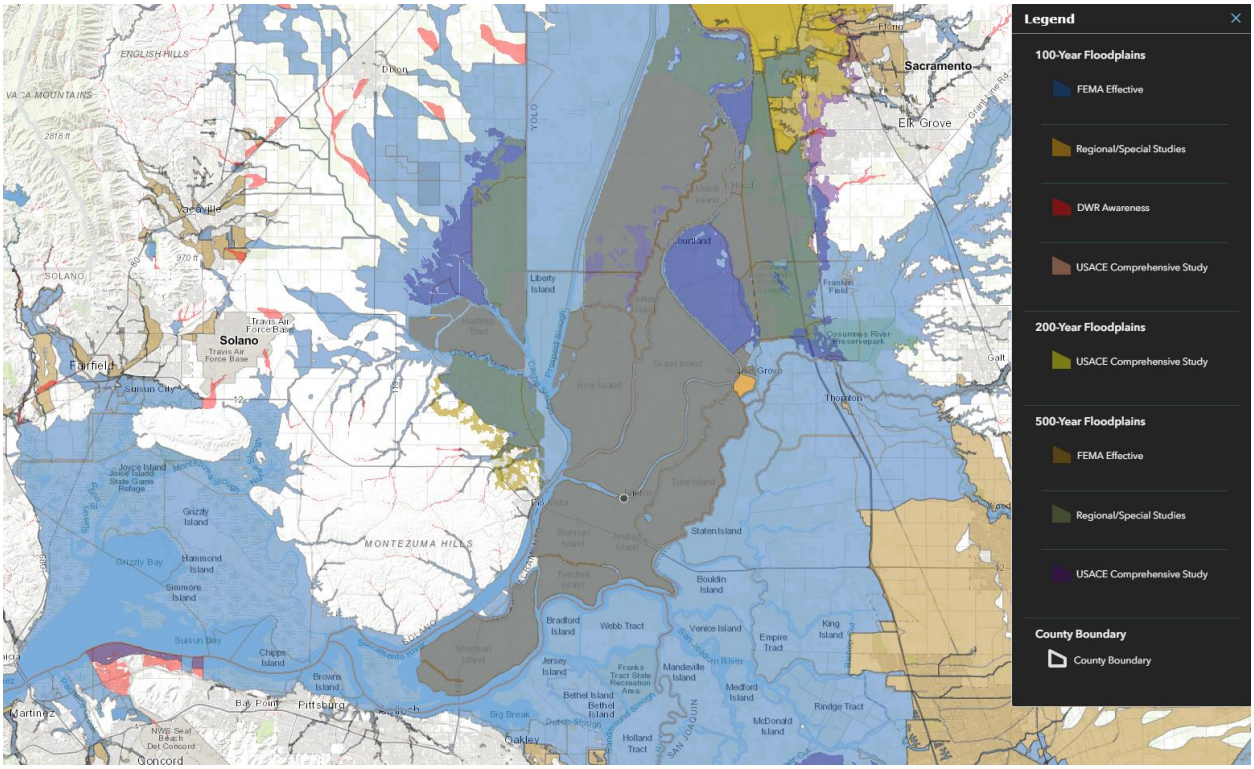
California Department of Water Resources Best Available Maps (BAM)

The FEMA regulatory maps provide just one perspective on flood risks in Sacramento County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Nevada-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-(as applicable), and 500-year event risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the Delta than that provided in the FEMA DFIRMs. The BAM map for the Delta is shown in Figure S-9.

Figure S-9 Sacramento County Delta – Best Available Map



Source: California DWR, retrieve 5/19/2021

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1%r (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan

– FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2% (2002 Sac and San Joaquin River Basins Comp Study).

Future Development

The potential for flooding may increase as floodwaters are channeled due to land development. Such changes can exacerbate flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning for future development should be based on build out property use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the overall floodplain.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The Sacramento County Delta is subject to localized flooding throughout the area. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the Delta vary by location. Flood durations in the Delta tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the Delta tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

Past occurrences to localized flooding varies by area. Specific past occurrences for Isleton and the reclamation districts can be found in their Chapters to this annex.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the Delta and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Future Development

The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized flooding. Mitigating the causes of the localized stormwater flooding will reduce future risks of losses.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Extremely High

Hazard Profile and Problem Description

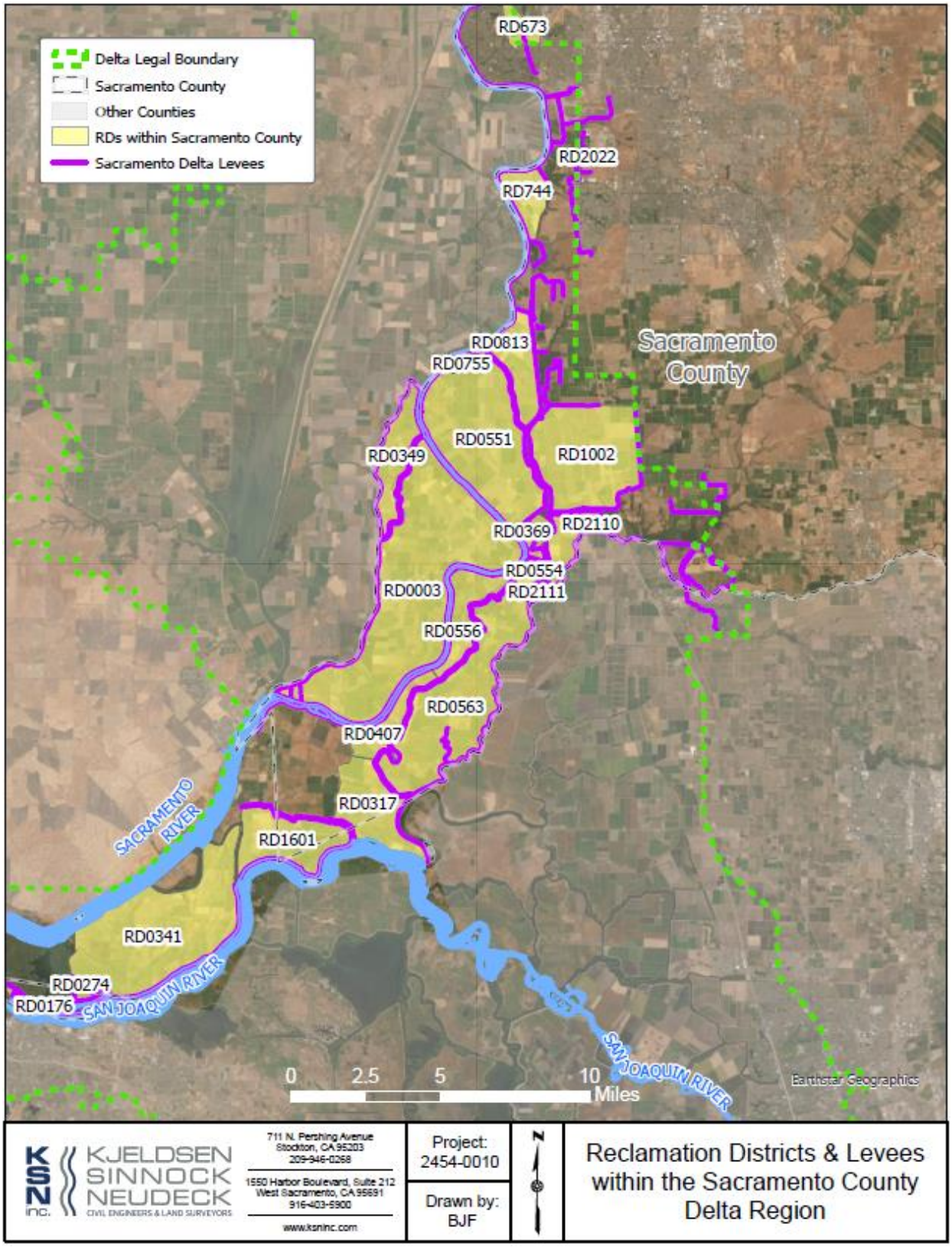
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main channel of a stream. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the Delta are not known. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. The HMPC noted that when northern California reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the Delta are shown on Figure S-10.

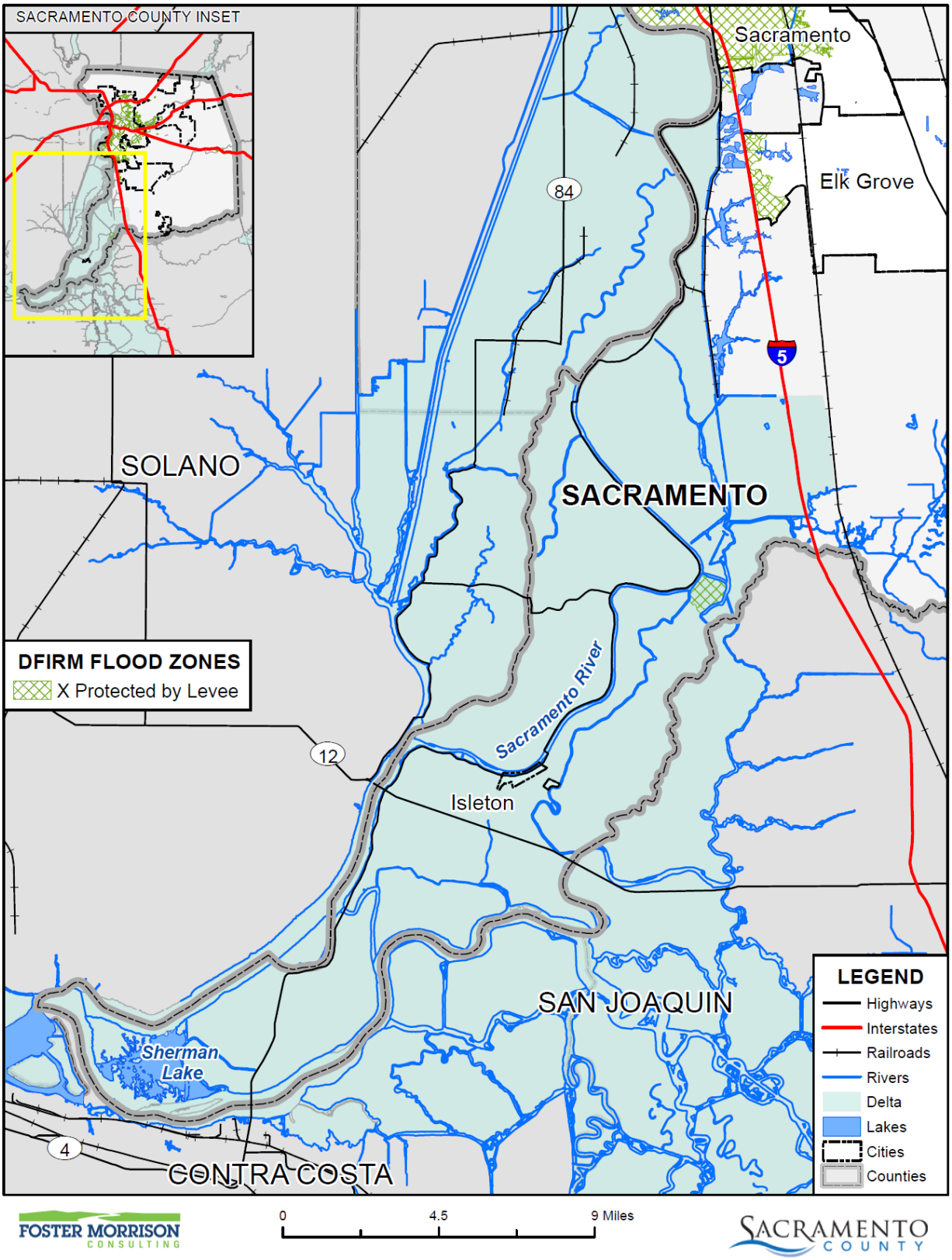
Figure S-10 Delta Levees



Source: KSN

Figure S-11 shows the FEMA DFIRM X Protected by Levee areas in the Delta. X Protected by Levee areas are those which FEMA has determined (in 2018) that the levee meets the standards for providing protection from the 1% Annual Chance Flood. Other levees exist that are not yet certified as providing protection against the 1% annual chance flood. Geographical levee failure flood extent for the Delta from the FEMA DFIRM X Protected by Levee Zone is shown in Table S-14. It should be noted that this flood extent is that which is protected, as defined by FEMA, from the 1% annual chance flood. Much of the rest of the Delta falls in the area not protected from the 1% annual chance flood.

Figure S-11 Sacramento County Delta – DFIRM X Protected by Levee Areas



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table S-14 Sacramento County Delta – Geographical Levee Failure Extents

X Protected by Levee/ Jurisdiction	Total Acres	% of Total Acres*	Improved Acres	% of Total Improved Acres*	Unimproved Acres	% of Total Unimproved Acres*
City of Isleton	0	0.00%	0	0.00%	0	0.00%
Unincorporated Delta	465	0.54%	373	0.81%	93	0.23%

Source: FEMA DFIRM 7/19/2018

*Percentage of total acres is the percent of total acres of the entire County Planning Area, not the total acres of the jurisdiction

Approximately 1,115 miles of levees in the Delta and 230 miles of levees in Suisun Marsh define the configuration of the waterways and landforms of the area. Most of these levees hold back water (i.e., prevent water from flowing onto the adjacent land) for 365 days per year, not just during floods. Over the years, many state and federal agencies and stakeholders have voiced concern over the condition of the Delta and Suisun Marsh levees and the consequences should they fail.

Past Occurrences

There have been two state and two federal disaster declaration from levee failure. This can be seen in Table S-15.

Table S-15 Sacramento County – State and Federal Levee Failure Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Levee Break	2	1972, 1980	2	1972, 1980

Source: Cal OES, FEMA

The two failures resulting in disaster declarations were:

- 1980 Delta Levee Break (Disaster EM-3078 declared on 1/23/1980)
- 1972 Andrus Island Levee Break (Disaster DR-342 declared on 6/21/1972)

Due to the numerous levee systems located throughout the Delta area, the flood and levee failure issues are intertwined; levee failures lead to extensive flooding. Thus, the following sections discuss both the levee failure events and major historic flooding within the Delta region.

The 2018 FIS noted that the Sacramento-San Joaquin Delta area has a long history of flooding. Since construction of levees started in the early 1860s, every island has been flooded at least once due to levee overtopping or failure. Prior to 1950, most of the failures were due to levee overtopping. However, since the construction of many upstream dams, that flood factor has been reduced and now the major cause of flooding is levee instability. Approximately 12 levee failures have occurred since 1980. Andrus, Brannan and Twitchell Islands, have all experienced historical floods. Large areas of the Delta were inundated during floods, and it is probable that the City of Isleton was damaged or seriously threatened.

Past flooding in the City of Isleton area has been due to levee failures caused by the separate or coincidental occurrence of very high tides and high stream outflow through the Delta region, or from unexplained levee failures apparently not related from high tides and/or high stream outflow can reasonably be expected, such failures cannot be reliably predicted. A detailed field inspection of levees protecting Andrus, Brannan and Twitchell Islands, was made to determine levee conditions insofar as it is possible to do so without subsurface exploration. The report on the inspection identifies problem areas susceptible to failure and requires exploratory borings and testing of core materials to definitively determine levee stability (USACE, 1976). Because 2-percent annual chance flooding would overtop levees, stability analysis was deemed unnecessary, and this study is concerned only with levee overtopping and disintegration of levee sections subsequent to overtoppings.

The 1950 and 1955 floods were outstanding in peak outflows through the Delta and several islands were flooded. The City of Isleton, however, was not affected. In December 1965 and January 1965, the coincidental occurrence of very high tides and heavy inflow resulted in unusually high stages on all Delta waterways. Concurrent strong onshore winds generated high waves that created very perilous conditions for many islands. Levees protecting Twitchell Island were seriously threatened by erosion and overtopping, but a massive flood fighting effort prevented overflow, destruction of levees and inundation of the City of Isleton. Several hundred acres were flooded and damages, mainly flood fighting and repair of levees and levee roads, were a little less than $1 million. In January and February 1969, high tides and adverse wave action in the Delta, combined with large river inflow and rain-soaked levees, caused the flooding of several islands and the endangerment of many other islands. Approximately 11,400 acres were inundated and flood damages amounted to about $9.2 million. The levee separating Andrus Island and the San Joaquin River failed from unknown causes in June 1972, resulting in the flooding of Andrus and Brannan Islands (including the City of Isleton). High winds had occurred prior to the break, but there had been no antecedent rainfall and the tidal cycle was not on the higher side. About 15,000 acres were inundated and flood damages for the event approximated $30 million.

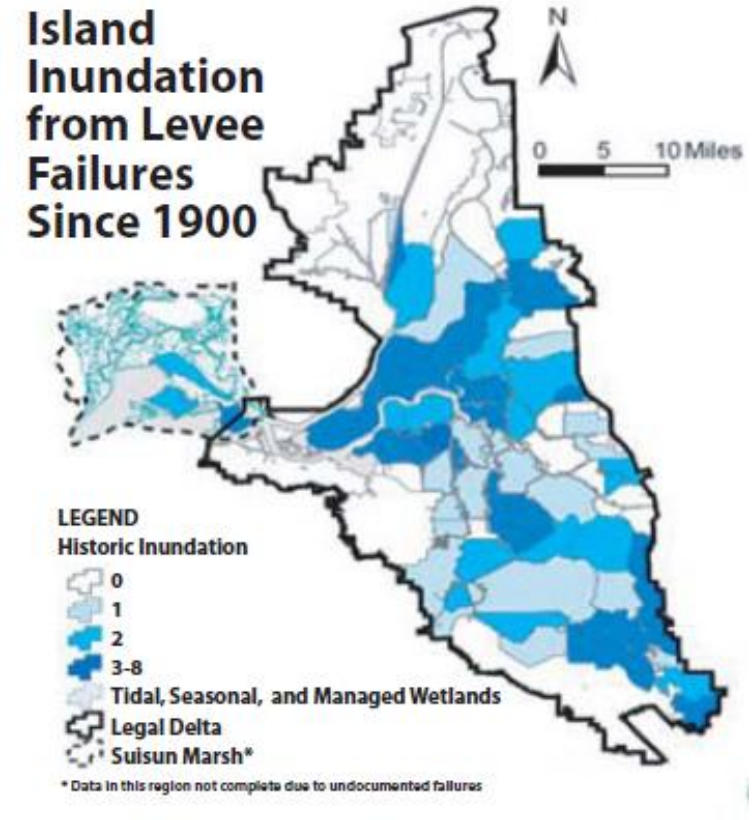
The most devastating flooding of the City of Isleton resulted from failure of a levee at the southern end of Andrus Island. The levee failed from unknown causes during the night of June 21, 1972. There had not been any antecedent rainfall and the tidal cycle was not on the higher side, but high winds had been occurring prior to the break. Approximately 200,000 acre-feet of water from the San Joaquin River inundated Andrus and Brannan Islands. Activities to fight floods to protect the City of Isleton proved to be a losing battle, and almost all of the city was flooded. The entire population was evacuated, with some residents not being able to return to their homes for 4 months. Approximately one-half of the housing units in the city were damaged or destroyed. Damage from the flood event on the islands and in the City of Isleton totaled approximately $30 million.

Due to the size of the Delta region, and the complexity of its stream and tidal regimen, flood frequency varies from location to location. In general, the 1950, 1955 and 1964 tidal stages in the central Delta, had frequencies of 10, 30 and 5 years, respectively. Stage during the 1955 and 1964 flood periods was strongly influenced by onshore winds. The 1972 flood event cannot be assigned a frequency because the levee failure that caused the flooding cannot be attributed to tidal stage or streamflow conditions.

There have been about 100 levee failures and 163 levee breaches since the early 1900. However, most of these failures occurred in the Delta Area and are not specific to portions of the Delta located inside of

Sacramento County. Due to overall improvements in the levee systems throughout the Delta, only 17 failures and 20 breaches occurred since 1990. These historic numbers are not representative of future occurrences within the County. Figure S-12 shows the levee failures since 1900.

Figure S-12 Island Inundation from Levee Failures from 1900-Present



Source: DRMS

Some islands have been flooded and recovered multiple times. A few islands, such as Franks Tract in San Joaquin County, have never been recovered. Some of the more major levee breaks in Sacramento County are further detailed below.

June 21, 1972 – A levee in the Brannan-Andrus Levee Maintenance District broke. 35% of the City of Isleton was inundated. A national disaster was declared June 27, and the breach was closed on July 26. Estimated damages in 2011 dollars were $234 million. The USACE repaired the break.

In **mid-January 1980**, severe rainstorms over central California precipitated high river outflow through the Delta, which, coinciding with gale force winds over the Delta and high tides, resulted in the levee failure and flooding of two tracts (placing approximately 9,600 acres under water). Continued high inflow to the Delta and wind-generated waves increased erosion on all Delta levees, necessitating intensive flood fighting and the temporary curtailment of boat traffic.

In late **February 1980**, three islands at the lower end of the Yolo Bypass and one additional tract were inundated.

1982/1983 – Heavy inflow and strong winds caused by a major storm over California in late November 1982, in combination with high tides, resulted in widespread levee erosion and overtopping in the Delta and the flooding of an island and a tract. A succession of intense storms continued to batter the State until March 1983, establishing rainfall records for the Delta and tributary regions. Upstream reservoir releases were larger and sooner than anticipated due to the heavy rainfall and a deep snowpack, worsening an already critical levee situation. Concurrently, extremely high tides prevailed in the Delta along with wind-driven waves. Several levee failures occurred and eight islands/tracts were under water by late March 1983. More than 16,000 acres were flooded and the estimated associated damages amounted to more than $20 million.

February 19, 1986 – Heavy rains and flooding affected Sacramento County and the surrounding area. 6 months of precipitation fell in 10 days in mid-February. High water content caused multiple levee failures. Two levee breaks in the same general area occurred on the 8,800 acre Tyler Island in Sacramento County. These two levee breaks were approximately 300 feet in length (see Figure S-13). A FEMA disaster declaration was declared on February 21. The approximate cost to repair the breaks was $6 million in 2011 dollars. Details on damages to structures and crops on the islands was not available.

Figure S-13 1986 Tyler Island Levee Breach

Source: California Department of Water Resources

December 1996 was one of the wettest Decembers on Record. Watersheds in the Sierra Nevada were already saturated by the time three subtropical storms added more than 30 inches of rain in late December 1996 and Early January 1997. The third and most severe of these storms lasted from December 31, 1996, through January 2, 1997. Rain in the Sierra Nevada caused record flows that stressed the flood management system to capacity in the Sacramento River Basin and overwhelmed the system in the San Joaquin River Basin. Levee failures due to breaks or overtopping in the Sacramento River Basin resulted in extensive damages. In the San Joaquin River Basin, dozens of levees failed throughout the river system and produced widespread flooding. The Sacramento-San Joaquin River Delta also experienced several levee breaks and levee overtopping. Affected Delta islands within Sacramento County included McCormack-Williamson Tract, Dead Horse Island and Glanville Tract.

January 11, 2017 – After atmospheric river rains struck Sacramento County and the surrounding area, flooding occurred. Independent reports from San Joaquin and Sacramento County Sheriff Deputies identified a breach in the Mokelumne River. A private levee failure within San Joaquin County continued to cause flooding to New Hope Road (in Sacramento County) through March 2017.

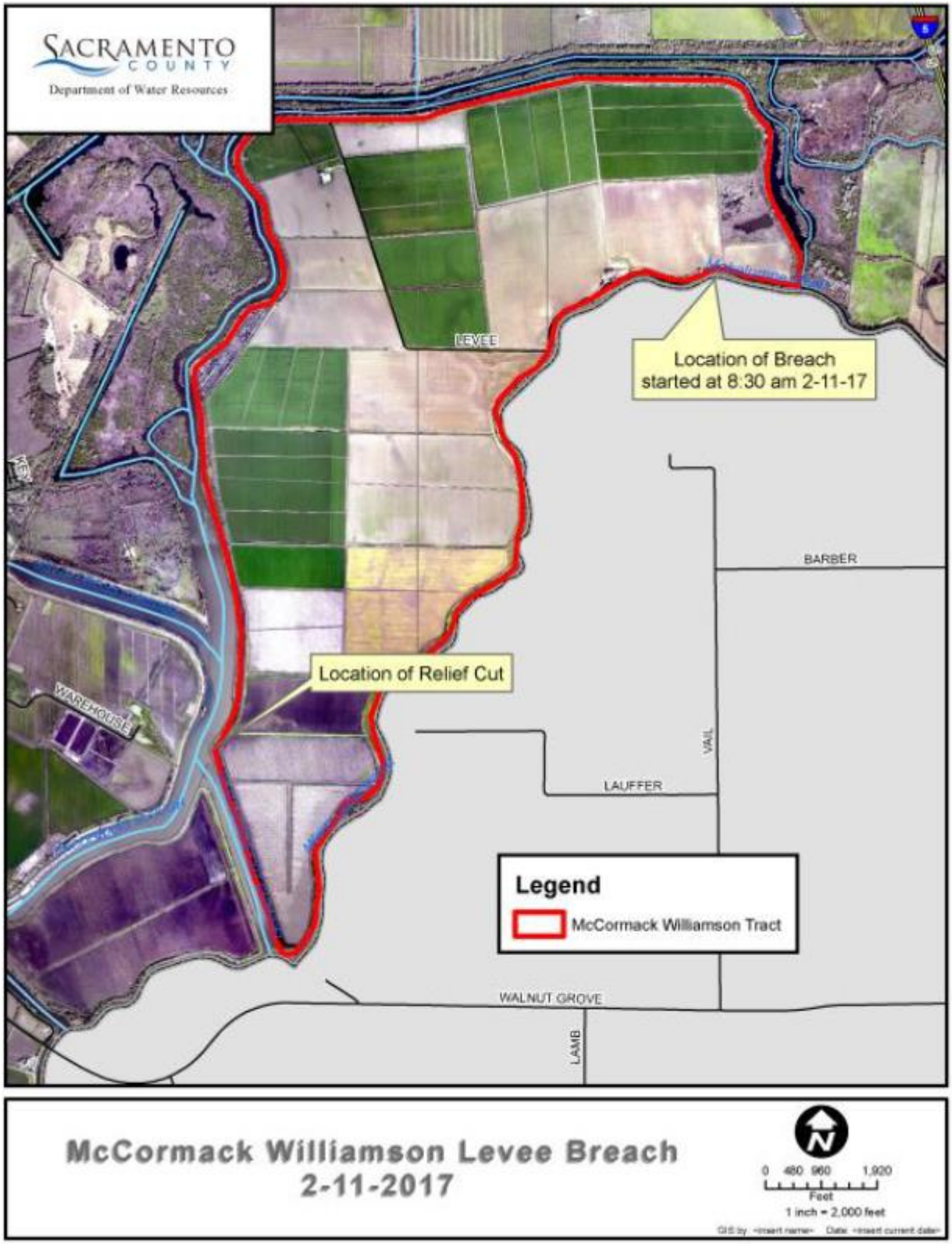
Figure S-14 New Hope Levee Break

Source: 2017 January Winter Storms After Action Report

February 11, 2017 – The McCormack Williamson Tract levee overtopped and failed starting at 8:30 am. The levee failed at River Mile 28 near the northeast section of the tract (see Figure S-15). According to the RD, at the time, it could have taken at least 9 hours for the Island to fill. The RD was planning to helicopter in equipment to construct a relief cut at the southwest end of the Island. The relief cut was intended to mitigate a surge of water into the Mokelumne River/ Snodgrass Slough that would result when the downstream levee breaks. A surge had the potential to impact several of the levees in the area that protect Tyler Island, Dead Horse Island and East Walnut Grove. The RDs had staged equipment and supplies in the event of a flood fight. Tyler Island RD monitored a small levee seepage problem along the North Fork of the Mokelumne at Sta 46000. The RD had planned to work on the repair starting that Monday when the

tides were lower and all repair equipment/ material was in place. Beyond that, Tyler Island was experiencing higher waters due to the McCormack Williamson relief cut and had continuous levee patrols.

Figure S-15 Sacramento County – McCormack Williamson Levee Breach



Source: 2017 February Winter Storm After Action Report from Sacramento County OES

February 12, 2017 – Road closures included 21 distinct areas throughout the southern portion of the county. RD800 reported significant damage to their levees and were able to conduct damage assessments. Results of those assessments were provided to the EOC along with any other resource requests. SMUD also reported that they had 6 homes without power in Point Pleasant area. Power was de-energized to those homes due to flooding. The Snodgrass Slough Levee was inspected for seepage and water continued to overtop Lambert Road flowing north toward Point Pleasant.

February 13, 2017 – Mandatory evacuations were ordered due to a compromised levee at Tyler Island Bridge Road. Land between Mokelumne and Georgiana Slough had been evacuated; 645 contacts within the Sacramento Alert system. Walnut Grove was under an advisory for the possibility of an evacuation and rock was brought in by barge crane to begin repairs on the levee. Advance plans for a relief cut were identified should the levee have failed.

February 18, 2017 – The United States Coast Guard Auxiliary provided photos of a levee with scouring in the Pearson Tract. Contacts to MBK Engineers were made regarding identifying the issue and making the necessary repair.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Generally, overtopping can be predicted based on river stages and the warning given depending on the source of the flood waters. On the Sacramento River system, depending on which dams are releasing the flows, advance warning of river stages may be as much as 24 hours.

The 2018 FIS noted that a fundamental flood problem in the Delta results from the fact that for every square mile of land reclaimed, there is one square mile less of floodplain to contain the volume of the rising tide and outflow from the rivers of the Central Valley. Furthermore, the substructure of much of the Delta is overlain by a 20- to 50-foot thick layer of peat soil, which is ideal for agriculture but very poor as foundation or building material for levees. Peat soil dried out and exposed to air constantly oxidizes and subsides. As islands subside, water pressure in adjoining channels may become too great for levees to withstand and a section may fail. Also, levees are continually being eroded by stream outflow, tidal flow, and wave wash from winds and boat wakes. Increasing levee fill creates compression that may force underlying materials to rupture into the adjoining waterway or toward the land side of the levee. If one island is flooded and its levees are lost, the levees protecting an adjacent island becomes more vulnerable to the forces of waves and wind.

Assets at Risk

Based on the vulnerability of the Delta to the levee failure hazard, the sections that follow describes significant assets at risk in the Sacramento County Delta. This section includes the values at risk, population at risk, and critical facilities at risk. It should be noted that the X Protected by Levee Zone shows only those areas protected by levees from the 1% annual chance flood. There are large areas of the Delta at risk to flooding outside of the X Protected by Levee areas.

Values at Risk

GIS was used to determine the possible impacts of levee failure flooding within the Sacramento County Delta. The methodology described in Section 4.3.14 of the Base Plan was followed in determining structures and values at risk to the levee failure flooding. Table S-16 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in FEMA X Protected by Levee flood zones in the Delta. As shown, no X Protected by Levee areas fall in the City of Isleton.

Table S-16 Sacramento County Delta – Count and Values of Parcels at Risk in X Protected by Levee Flood Zone and Property Use

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unincorporated Sacramento Delta						
X Protected by Levee						
Agricultural	6	6	$1,771,853	$1,846,175	$1,846,175	$5,464,203
Care / Health	3	0	$859			$859
Church / Welfare	3	2	$45,826	$19,420	$19,420	$84,666
Industrial	9	8	$730,435	$1,039,107	$1,558,659	$3,328,203
Miscellaneous	17	0	$14,598			$14,598
Office	12	10	$728,197	$1,699,371	$1,699,371	$4,126,939
Public / Utilities	2	0				
Recreational	3	2	$147,470	$718,607	$718,607	$1,584,684
Residential	127	121	$5,694,650	$12,270,251	$6,135,125	$24,100,030
Retail / Commercial	32	30	$2,108,971	$4,546,645	$4,546,645	$11,202,261
Unknown	0	0	$0	$0	$0	$0
Vacant	44	4	$1,924,412	$13,644	$0	$1,938,056
X Protected by Levee Total	**258**	**183**	**$13,167,271**	**$22,153,220**	**$16,524,002**	**$51,844,499**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table S-17 shows Sacramento County Delta levee failure flood loss estimates and improved values at risk by FEMA X Protected by Levee flood zones. As shown in the table above, these flood loss estimates from X Protected by Levee areas are for the unincorporated Delta only, as no X Protected by Levee areas currently exist in the City of Isleton.

Table S-17 Sacramento County Delta – X Protected by Levee Flood Loss Estimates

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
X Protected by Levee	258	183	$22,153,220	$16,524,002	$38,677,222	$7,735,444	0.92%

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table S-17, the Sacramento County Delta area has 183 parcels and $38.7 million of structure and contents values or values in the X Protected by Levee flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.11 of the Base Plan, two feet of flooding would cause $7.7 million in flood damages in the Delta.

Structures protected by levees that fail are often total losses. The analysis above assumes all levees in the Delta break at one time, which is unlikely. The extent and depth of actual flooding and associated damage will vary depending on the location, nature, depth, and extent of any levee break.

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the levee failure flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Isleton and the unincorporated County. According to this analysis, there is a total population of 334 residents of the Delta at risk to levee failure flooding. This is shown in Table S-13.

Table S-18 Sacramento County Delta – Count of Improved Residential Parcels and Population by Flood Zone

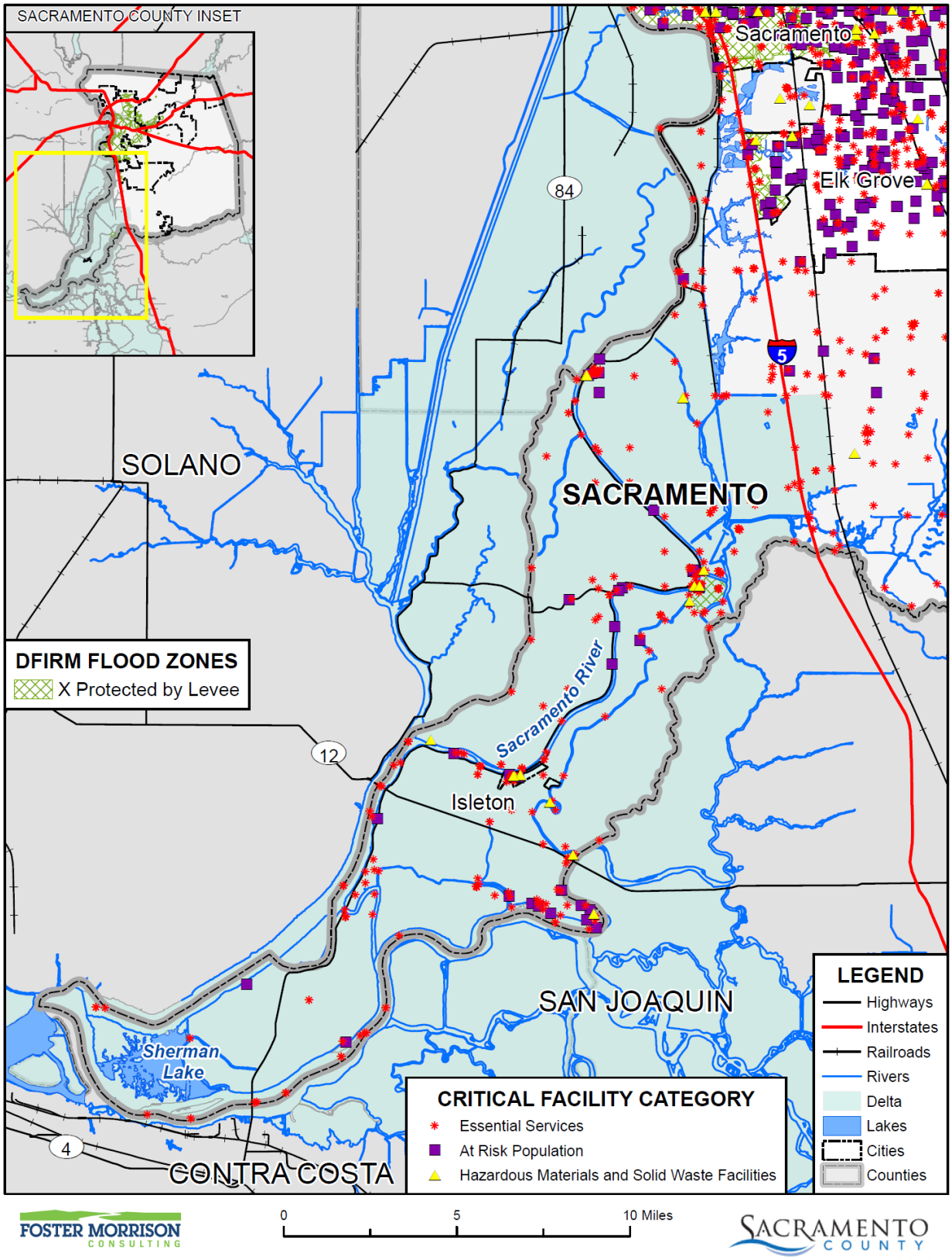
Jurisdiction	X Protected by Levee	
	Improved Residential Parcels	Population at Risk
Isleton	0	0
Unincorporated Delta	121	334
Total	**121**	**334**

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau Average Household Sizes: Isleton (2.7), and unincorporated Sacramento County (2.76)

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in the Delta in DFIRM X Protected by Levee flood zones. GIS was used to determine whether the critical facility locations intersect an X Protected by Levee Zone. Details of critical facilities in mapped dam inundation areas in the Delta are shown in Figure S-16. Details of critical facility definition, type, name and address and jurisdiction by dam inundation area are listed in Appendix F.

Figure S-16 Sacramento Delta – Critical Facilities in DFIRM X Protected by Levee Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Future Development

The Delta serves as a saltwater barrier to maintain the State's drinking water supply, provides for rich agricultural production, natural gas fields, recreational facilities, legacy Delta Communities, all provide an economic base from which the public benefits in the form of jobs, tax revenues, and other economic benefits.

According to the Delta Protection Commission's "Economic Sustainability Plan for the Sacramento-San Joaquin Delta," nearly eighty percent of the Delta is classified as Prime Farmland, the California Farmland Mapping and Monitoring Program's highest designated tier, meaning that it meets the most stringent requirements for good farmland, including various water measurements, soil temperature, soil acid-alkali balance, erodibility, and more. The remainder of farmland in the Delta is classified as Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance, and is divided nearly evenly between those classifications. These are the top four tiers available for agricultural land classification, out of nine possible land classifications. This indicates that every reclamation district in the Delta with any agricultural production protects a portion of the most valuable farmland in the State of California, regardless of the crops planted at any given time. While the cost of land might be less than that of urban lands, the continued usability of the land for agricultural production is critical to agricultural output of the State, regardless of the amount of land protected by any given Delta island.

New development should take levee failure areas into account during the construction of new homes and commercial properties. The County will continue to enforce the zoning, subdivision, and development ordinances in the unincorporated Delta Area. The City of Isleton will also enforce the development ordinances that exist in the City.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the Delta occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the Delta falls mainly in the fall, winter, and spring months. Wind often accompanies these storms; hail and lightning are rare in the Delta.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the Delta. All portions of the Delta are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Hail and lightning

are rare in the Delta and Sacramento County. Duration of severe storms in California, Sacramento County, and the Delta can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the Delta. This is the cause of many of the federal disaster declarations related to flooding. Past occurrences for the County were discussed in Section 4.3.4 of the Base Plan and in the Levee Failure section above. Events that had larger effects on individual Delta Reclamation Districts can be found in their respective Chapters of this Delta Annex.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the Delta. These events can cause significant and localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the Delta, but also can cause damage, with lightning occasionally igniting wildfires.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Power outages may also occur. Heavy rains and storms often result in flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

Future Development

Building codes in the Delta ensure that new development is built to current building standards, which should reduce the risk to future development in the Delta from heavy rains and storms. New critical facilities such as communications towers and others should be built to withstand hail damage, lightning, and thunderstorm winds. With adherence to development standards, future losses to new development should be minimal.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire Delta is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

The Delta Breeze is the local name for a wind coming from the southwest, off of the Delta of the Sacramento River and San Joaquin River. This wind carries with it cooler, more humid air from off of the Pacific Ocean. The effects of this wind are very noticeable during the summer, as this sea breeze can cool the air by more than 10°F. According to the National Weather Service, the wind is primarily driven by a sea breeze circulation, which can often become coupled with a mountain breeze to form one large (mesoscale) circulation of air from the Farallon Islands up into the Sierra Nevada.

Tornadoes, while rare, can occur at any location in the County and Delta. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

Winds events, especially those accompanying severe thunderstorms, are generally larger events. As such, events that affected the County have affected the Delta. Past occurrences for the County are detailed in Section 4.3.5 of the Base Plan. Often the more significant issue related to high winds within the Delta are related to increase wave action on the levees. Events that had larger effects on individual Delta Reclamation Districts and the City of Isleton can be found in their respective Chapters of this Delta Annex.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the Delta throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High

winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly. During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County; although these are unlikely to occur in the Delta area where the wildfire risk is low. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the Delta will vary. Future losses from straight line winds include:

- Downed trees
- Increased power outage events
- Power line impacts and economic losses from power outages
- Occasional building damage, primarily to roofs

In the Delta, levees are vulnerable to wave action from both thunderstorm winds and from the Delta Breeze that causes excess erosion, and can threaten the levee integrity in each Reclamation District. Wind action, especially when coupled with high water events, leads to scour and high bank erosion, which creates wave induced erosion at the levee toe.

Future Development

New critical facilities should be built to withstand thunderstorm winds. While minimal damages have occurred to critical facilities in the past due to high winds and tornadoes, there still remains future risk. With development occurring in the region, future losses to new development may occur. Reclamation Districts will need to continue to armor levees against wind induced wave action that causes excess erosion. New critical facilities should also consider adding generators for times of power outages.

Subsidence

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Subsidence is the gradual settling or sinking of the earth's surface over manmade or natural underground voids with little or no horizontal motion. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. Subsidence is worsened when groundwater drawdown exceeds the ability of the ground to naturally recharge. This is more common during periods of drought.

Location and Extent

There is no scientific scale to measure subsidence. Subsidence is measured in inches or feet of elevation change over time. Subsidence has a long speed of onset, as it occurs over many years. The duration of subsidence is long, as it is rare for subsidence to be reversed. In Sacramento County, the Delta in the southeast portion of the County is highly at risk to subsidence. In the Delta, subsidence affects the islands as well as the levees.

Past Occurrences

Subsidence has occurred over the years throughout the Delta area. Past occurrences for subsidence in Isleton or the reclamation districts are detailed in their respective Chapters to this Annex.

Vulnerability to and Impacts from Subsidence

Historically, the County has been at risk from subsidence. Vulnerability in the County from subsidence comes from several different causes:

- Compaction of Unconsolidated Soils by Earthquake Shaking (Liquefaction)
- Compaction by Heavy Structures
- The Erosion of Peat Soils
- Fluid Withdrawal

These were discussed in detail in Section 4.3.16 of the Base Plan.

As noted, subsidence has historically been a significant issue in the Delta; although more recently the rate of subsidence has been decreasing. Sacramento costs of levee construction and maintenance are generally borne by the State of California and the Federal government, as well as by local reclamation districts. These costs also increase as subsidence progresses, forcing levees to be built higher and stronger. In 1981 to 1986 the total amount spent on emergency levee repairs related to flooding was about $97 million, and in 1981 to 1991 the amount spent on routine levee maintenance was about $63 million. Thus the annual cost of repair and maintenance of Delta levees in the 1980s, from subsidence and other factors, averaged about $20 million per year. Note that these costs reflect the larger Delta Area. Repair and maintenance costs for the Delta Area located in Sacramento County would be proportionately less.

Much larger costs might be incurred if land subsidence indirectly affects the north-to-south water-transfer system, which is predicated on acceptable water quality in the southern Delta. The western Delta islands, in particular, are believed to effectively inhibit the inland migration of the salinity interface between Bay and Delta. If these are flooded, the water available to the massive pumping facilities near the Clifton Court Forebay might become too saline to use.

The statewide water-transfer system in California is so interdependent that decreased water quality in the Delta might lead to accelerated subsidence in areas discussed elsewhere in this document. Both the Santa Clara and San Joaquin Valleys rely, in part, on imported water from the Delta to augment local supplies and thereby reduce local ground-water pumpage and arrest or slow subsidence. Degradation of the Delta source water could well lead to increased ground-water use, and renewed subsidence, in these and other areas in California.

The management issues raised by land subsidence range in scale from those faced by individual farmers to the possible global-scale issue posed by the carbon-dioxide flux, with its possible link to climate change. At the most local level, individual farmers or reclamation districts must maintain drainage networks on the islands and pump the agricultural drainage back into waterways. These costs increase gradually as subsidence progresses.

Members of the HMPC did note that although tremendous subsidence of islands has occurred since their original reclamation, recent LiDAR survey data indicates that very few areas of the Delta are actively subsiding. In addition, surveys and geotechnical evaluations show that subsidence rarely occurs close enough to a levee to cause instability. In the few areas that this may be a problem, the "toe berm" design, used to meet the Federal PL 84-99 and State Bulletin 192-82, caps the peat and effectively stops subsidence.

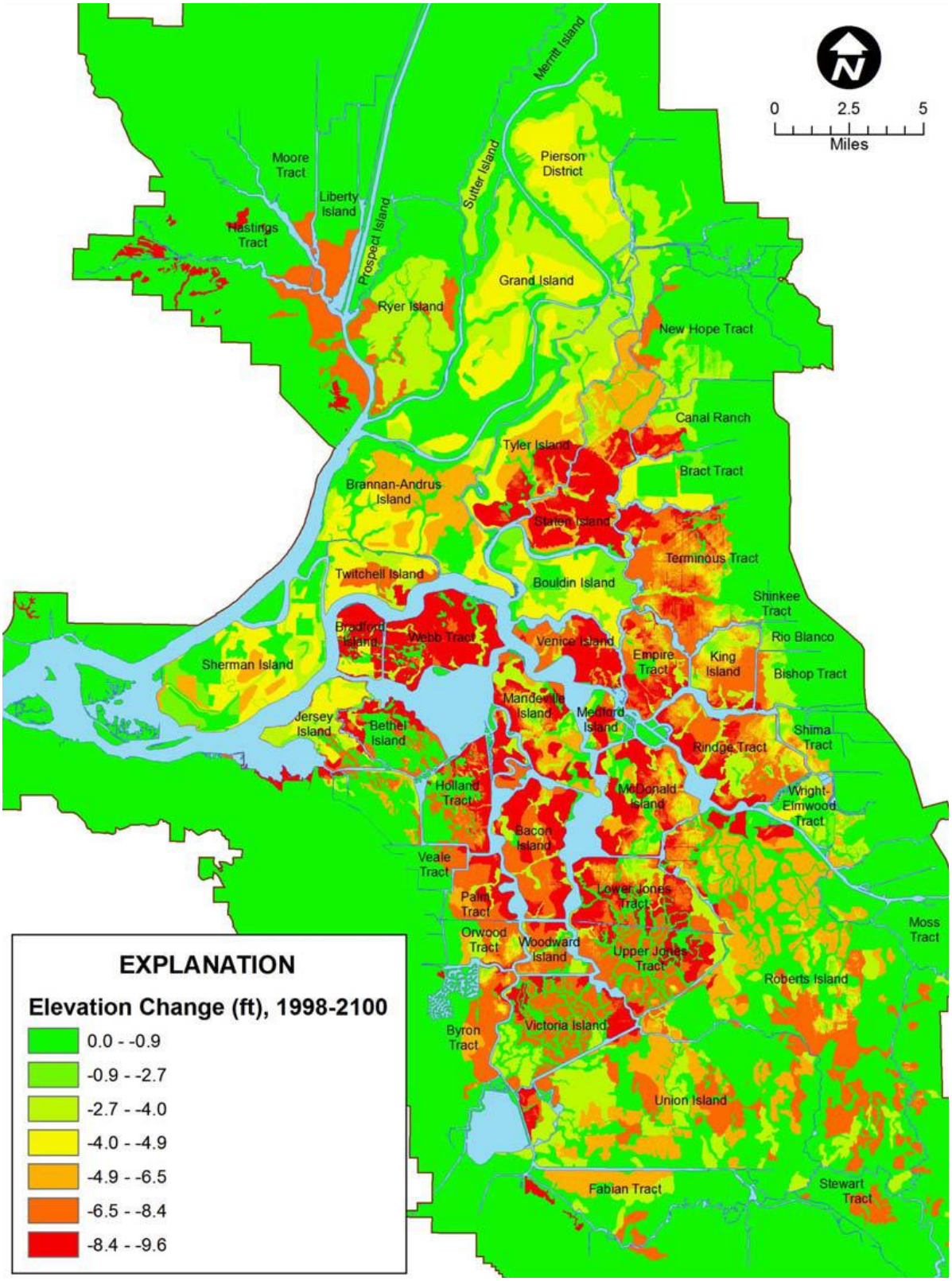
Local farmers have changed farming practices to help limit and mitigate the issues related to subsidence. This is especially true in the Delta Area.

Subsidence of Delta lands has been reported to be a major risk to Delta levees, however, subsidence is limited or non-existent under and adjacent to the levees as those areas have consolidated over the last fifty years and oxidation of the peat foundations is limited because it is not farmed.

Future Development

As subsidence progresses (see Figure S-17), the levee system will likely become increasingly vulnerable to catastrophic failure during floods and earthquakes. Areas for future development will become more limited. The interrelated issues of Delta land subsidence, water quality, and wildlife habitat will continue to pose a major dilemma for California water managers.

Figure S-17 Additional Expected Subsidence from 1998 to 2100



Source: Delta Risk Management Strategy, 2009

S.6 Delta Annex Chapters

S.6.1. Introduction

This Delta Annex contains separate Chapters that presents data specifically related to each Delta Area entity – the Delta of Isleton or each reclamation district that is a participating jurisdiction to this LHMP Update. Each Delta Annex Chapter is structured with the same format. The intent of the Chapters is to demonstrate how the risk varies across the Delta and specific to each participating jurisdiction, beyond that provided above in this umbrella Delta Annex. The following is an explanation of the format and what each data set represents.

Planning Team

This section begins with a list of each City/District Planning Team members that participated in the planning process. A table of names, positions, and how each person participated are included in each Chapter.

Community Profile

A general description, overview, background, and history for each Delta Area jurisdiction. Maps of each jurisdiction's location in the Delta are included, if available.

Hazard Identification and Summary

Each participating jurisdiction identified the hazards that affect their jurisdiction and summarized their geographic extent. frequency of occurrence, special extent, and significance specific to Isleton or the Reclamation District. This information is presented in a table in each Chapter.

Hazard Profile and Vulnerability Assessment

The intent of this section is to assess each entity's risk and vulnerability separate from that of the Planning Area as a whole, which has already been assessed in Section 4.3 of the Base Plan and also within this Delta Annex. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area. Each hazard contains the following items, to the extent data is available:

- Past Occurrences
- Assets at Risk
- Populations at Risk
- Critical Facilities at Risk

Capability Assessment

The purpose of this section of the planning process is to determine what policies, programs, regulations, and other mechanisms Isleton or the reclamation districts, already have in place that either contribute to, or hinder the ability to mitigate the effects of natural hazards.

Mitigation Strategy and Actions

The final section of each Chapter acknowledges concurrence with the overall 2021 LHMP Goals and Objectives and puts forth the recommended actions of all participating Delta jurisdictions: Isleton and Reclamation Districts.

Delta Annex Chapter 1 City of Isleton

1.1 Introduction

This Annex details the hazard mitigation planning elements specific to the City of Isleton, a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the City. This Annex provides additional information specific to Isleton, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

1.2 Planning Process

As described above, the City followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the City formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 1-1. Additional details on plan participation and City representatives are included in Appendix A.

Table 1-1 City of Isleton – Planning Team

Name	Position/Title	How Participated
Charles Bergson	City Manager	Attended planning meetings, public hearings, review, comment
James Gates	Assistant City Planner	Attended planning meetings, public hearings, review, comment
Planning Commission	Planning Commission	Held public hearings, review, comment

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the City integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the City incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 1-2.

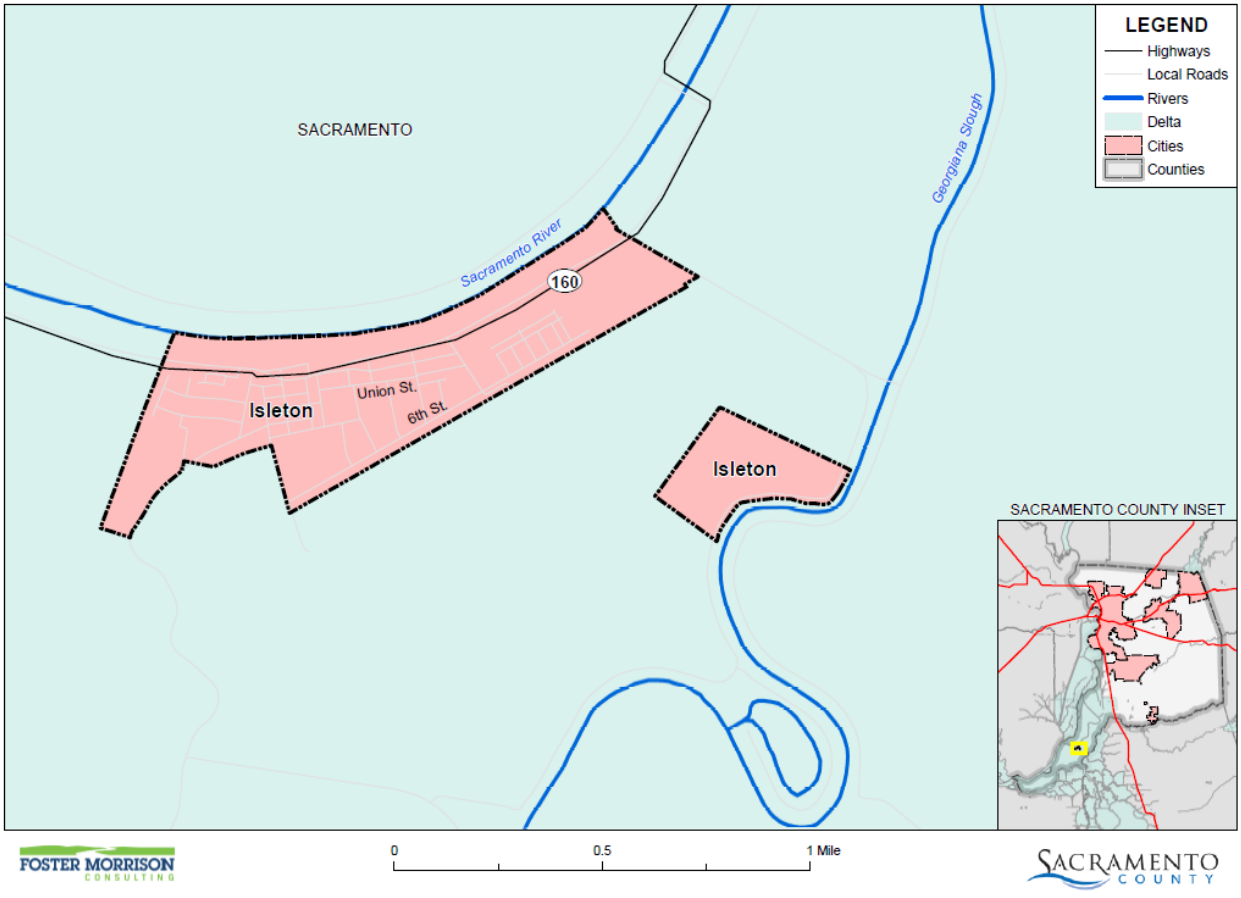
Table 1-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
None	No other mitigation mechanisms have been developed since 2016

1.3 Community Profile

The City profile for the City of Isleton is detailed in the following sections. Figure 1-1 displays a map and the location of the City within Sacramento County.

Figure 1-1 City of Isleton



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

1.3.1. Geography and Climate

The City of Isleton is located in the southwestern corner of Sacramento County in the Sacramento- San Joaquin Delta (Delta), adjacent to the Sacramento River. Once a great marsh, the Delta now is a network of channels and sunken "islands" that cover—together with Suisun Marsh—about 1,300 square miles. These islands and channels have been built over with the infrastructure of a 21st century economy: water supply conduits; major arteries of the state's electrical grid; natural gas fields, storage facilities, and pipelines; highways and railways; and shipping channels, all surrounded by an increasingly urban landscape. Water from the vast Delta watershed, spanning over 45,000 square miles (30 million acres), fuels both local economies and those in export areas hundreds of miles away.

According to the United States Census Bureau, the City has a total area of 0.5 square miles, of which, 0.4 square miles of it is land and 0.05 square miles of it is water. According to the Köppen Climate Classification system, Isleton has a warm-summer Mediterranean climate.

1.3.2. History

The small town on Isleton is located in southern Sacramento County in the Delta Region along the banks of the Sacramento River. The Delta is a land of rivers, agriculture, boating, fishing, and rich history. Isleton was once referred to as the "Little Paris on the Delta."

Josiah Pool founded Isleton in 1874. Isleton, like many other communities in Sacramento County, benefited from gold fever. Its location on the river brought commerce and trade since the river was the primary source of transport. Improving the waterways for deeper channels that would permit year round travel brought about levee construction. The levees remain though the town has since dwindled from its boom days.

Isleton's resident population is currently 820. The town hosts several festivals, including the Spam Contest, which originated as a direct result of the floods of 1996. Displaced families during the flood were given shelter at the Hotel Del Rio, owned by Ralph and Charli Hand. When people visited their homes, they remarked that the labels on the Spam cans were the only labels that survived. Charli decided to make some fun of it and the Spam Contest was created. Contestants cook Spam, carve Spam, dress up in Spam costumes and even appoint a "Captain Spam."

1.3.3. Economy and Tax Base

US Census estimates show economic characteristics for the City of Isleton. These are shown in Table 1-3 and Table 1-4. Mean household income in the City was $47,773. Median household income in the City was $36,875.

Table 1-3 City of Isleton Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Agriculture, forestry, fishing and hunting, and mining	24	8.3%
Construction	60	20.8%
Manufacturing	13	4.5%
Wholesale trade	6	2.1%
Retail trade	18	6.2%
Transportation and warehousing, and utilities	11	3.8%
Information	0	0.0%
Finance and insurance, and real estate and rental and leasing	0	0.0%
Professional, scientific, and management, and administrative and waste management services	51	17.6%
Educational services, and health care and social assistance	44	15.2%
Arts, entertainment, and recreation, and accommodation and food services	49	17.0%

Industry	Estimated Employment	Percent
Other services, except public administration	7	2.4%
Public administration	6	2.1%

Source: US Census Bureau American Community Survey 2019 Estimates

Table 1-4 City of Isleton Income and Benefits

Income Bracket	Percent
>$10,000	15.4%
$10,000 – $14,999	0.8%
$15,000 - $24,9999	8.5%
$25,000 – $34,999	20.8%
$35,000 – $49,999	15.0%
$50,000 – $74,999	18.5%
$75,000 – $99,999	12.7%
$100,000 – $149,999	7.7%
$150,000 – $199,999	0.0%
$200,000 or more	0.8%

Source: US Census Bureau, 2019

1.3.4. Population

The California Department of Finance estimated the January 1, 2020 total population for the City of Isleton was 828.

1.4 Hazard Identification

City of Isleton identified the hazards that affect the City and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to City (see Table 1-5).

Table 1-5 City of Isleton—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Significant	Likely	Limited	Medium	–
Dam Failure	Extensive	Unlikely	Limited	Low	Medium
Drought & Water Shortage	Extensive	Likely	Limited	High	High
Earthquake	Extensive	Unlikely	Limited	Low	Low
Earthquake Liquefaction	Extensive	Unlikely	Limited	Low	Low
Floods: 1%/0.2% annual chance	Significant	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Limited	Highly Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Occasional	Negligible	Low	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Significant	Highly Likely	Critical	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Low	Low
Subsidence	Significant	Highly Likely	Limited	Low	Medium
Volcano	Limited	Unlikely	Limited	Low	Low
Wildfire	Limited	Unlikely	Limited	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

1.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile Isleton's hazards and assess the City's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the City is included in this Annex. This vulnerability assessment analyzes the property, population, critical facilities, and other assets at risk to hazards ranked of medium or high significance specific to the City (as identified in the Significance column of Table 1-5) and also includes a vulnerability assessment to the three primary hazards to the State of California: earthquake, flood, and wildfire. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

1.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 0, includes a hazard profile/problem description as to how each medium or high significant hazard affects the City and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Planning Area.

1.5.2. Vulnerability Assessment and Assets at Risk

This section identifies Isleton's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the community. This data is not hazard specific, but is representative of total assets at risk within the community.

Values at Risk

The following data from the Sacramento County Assessor's Office is based on the 2020 Assessor's data. The methodology used to derive property values is the same as in Section 4.3.1 of the Base Plan. This data should only be used as a guideline to overall values in the County, as the information has some limitations. The most significant limitations are created by Proposition 13 and the Williamson Act as detailed in the Base Plan. With respect to Proposition 13, instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is most likely low and does not reflect current market value of properties within the County. It is also important to note, in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. However, depending on the type of hazard and impact of any given hazard event, land values may be adversely affected; thus, land values are included as appropriate. Table 1-6 shows the 2020 Assessor's values and content replacement values (e.g., the values at risk) broken down by property use for the City.

Table 1-6 City of Isleton – Total Values at Risk by Property Use

Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Agricultural	1	0	$32,472	$0	$0	$32,472
Care/Health	0	0	$0	$0	$0	
Church/Welfare	8	8	$208,114	$1,009,072	$1,009,072	$2,226,258
Industrial	5	5	$2,126,988	$1,224,909	$1,837,364	$5,189,260
Miscellaneous	20	0	$884,138	$0	$0	$884,138
Office	5	4	$447,754	$693,344	$693,344	$1,834,442
Public/Utilities	28	1	$44,163	$32,966	$32,966	$110,095
Recreational	0	0	$0	$0	$0	$0
Residential	260	257	$13,055,718	$31,636,760	$15,818,384	$60,510,861
Retail/ Commercial	60	58	$2,600,078	$6,662,426	$6,662,426	$15,924,930
Unknown	0	0	$0	$0	$0	$0
Vacant	149	5	$3,317,786	$8,802	$0	$3,326,588
Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**

Source: Sacramento County 2020 Parcel/Assessor's Data

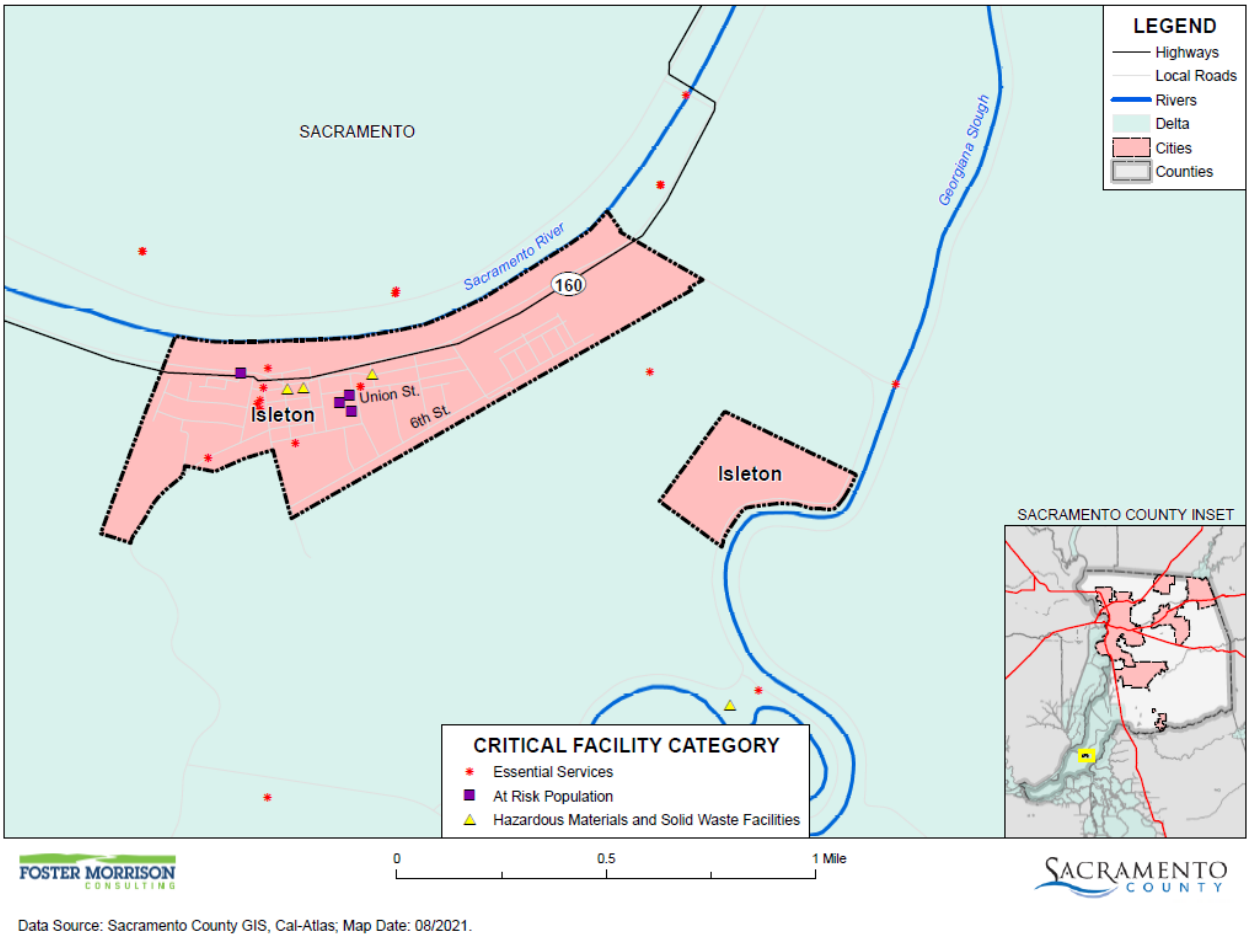
Critical Facilities and Infrastructure

Critical facilities and infrastructure are those buildings and infrastructure that are crucial to a community. Should these be damaged, it makes it more difficult for the community to respond to and recover from a disaster. For purposes of this Plan, a critical facility is defined as:

> *Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.*

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities. These facilities for the City of Isleton are shown on Figure 1-2, and detailed in .

Figure 1-2 City of Isleton – Critical Facilities



Data Source: Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 1-7 City of Isleton – Critical Facilities by Facility Category and Type

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
Essential Services Facilities	Emergency Evacuation Center	1
	EMS Stations	1
	Fire Station	2
	Law Enforcement	1
	Microwave Service Towers	2
	Water Well	2
	Total	**9**
At Risk Population Facilities	Day Care Center	1
	Mobile Home Parks	1
	School	2
	Total	**4**
	Leaky Underground Storage Tank	3

Jurisdiction/Critical Facility Category	Critical Facility Type	Facility Count
Hazardous Materials and Solid Waste Facilities	**Total**	**3**
Isleton Total		**16**

Source: City of Isleton

Natural Resources

Natural resources are unique to each area and are difficult to replace. Should a natural disaster occur, these species and locations are at risk. There are ample natural resources in and around the City of Isleton.

Vegetation occurring throughout the urban areas includes nonnative annual grasses such as Italian ryegrass, Ripgut brome, and Bermuda grass. Nonnative herbaceous species such as Yellow star-thistle, Wild radish, Field mustard, Peppergrass, and Pampas grass are also present. Stands of Northern California black walnut are located along Hwy. 160, on the east side of the Sacramento River.

A number of irrigation canals occur within the agricultural lands and are vegetated with species adapted to wet habitats (e.g. Cattail, Bulrush, Cocklebur, and Waterpepper).

Riparian woodland vegetation occurs along the Sacramento River. The riparian corridors are dominated by Valley and Coast live oaks, Narrow-leaved willow, Fremont cottonwood, California buckeye, and Himalayan blackberry. Jackson Slough serves as an agricultural drainage canal within the area. Vegetation along the slough includes Narrow-leaved willow, Valley and Coast live oak, Himalayan blackberry, Giant reed, and emergent vegetation such as cattails. Several clumps of Blue elderberry shrubs were observed on the banks of the slough on the east side of Jackson Slough Road.

Wildlife habitats provide foraging and/or breeding habitat for wildlife species including amphibians, reptiles, birds, and mammals. Amphibian species that could occur in the City include bullfrog, Pacific treefrog, and Western toad. Reptile species that may occur in the study area include Western terrestrial garter snake *(Thamnophis elegans*), Western fence lizard (*Sceloporus occidentalis*), and Western pond turtle (*Clemmys mannorata mannorata*). Habitat for Giant garter snakes (Thamnophis gigas) occurs in Jackson Slough.

The riparian habitats along the Sacramento River and Jackson Slough provide nesting and foraging habitat for numerous bird species. The agricultural lands provide foraging habitat for bird species such as Brewer's blackbird (*Euphagus cyanocephalus*), brown-headed cowbird (*Molothrus ater*), killdeer (*Charadrius vociferus*), and Western meadowlark (*Sturnella neglecta*). Raptors (birds of prey) known to forage in the vicinity of the Plan area include blackshouldered kite, Northern hanier (*Circus cyaneus*), and Swainson's hawk (*Buteo swainsoni*). Birds species that could forage in agricultural ditches and sloughs include American coot (*Fulica americana*), mallard (*Anas platyrhynchos*), and red-winged blackbird (*Agelaius phoeniceus*).

Small terrestrial mammals that could inhabit the area include Botta' s pocket gopher (*Thomomys bottae*) and various species of mice, rats, and squirrels. Larger terrestrial mammals that could inhabit or transit through the area include Beaver, Opossum, Skunk, Raccoon, and River otter. Several species of bats could

occur within the Plan area. These species forage on insects over open fields, above tree canopies, and over open water. Bats could use man-made structures and spaces under bark of large trees for day roosts.

Invertebrate species of concern in the plan area include the Valley elderberry longhorn beetle *(Desmocerus californicus dimorphus*). The Valley elderberry longhorn beetle is a federally listed threatened species dependent on elderberry shrubs for its life cycle. Blue elderberry shrubs were observed along Jackson Slough near Jackson Slough Road. The Antioch dunes anthicid beetle and the Sacramento anthicid beetle require loose, sandy soils. Potential habitat for anthicid beetles in the plan area is very marginal and limited to small patches of sandy soils along the Sacramento River levee.

The Sacramento River supports important sport and commercial fisheries. Warmwater game fish found in the Sacramento River include channel *(Ictalurus punctatus*) and white catfish *(lctalurus catus*); largemouth, smallmouth, and spotted bass (*Micropterus salmonides, Micropterus dolomieui,* and *Micropterus punctulatus*); carp and various sunfishes (*Centrarchidae*). Native freshwater fish occurring in the Sacramento River include Sacramento perch, Sacramento roach, River lamprey, etc., as well as special-status species such as Delta smelt, Longfin smelt, Sacramento splittail, chinook salmon, and green sturgeon. The Delta smelt is a resident fish in the Delta around the City as well.

Historic and Cultural Resources

Historic and cultural resources are difficult to replace. Should a natural disaster occur, these properties and locations can be at risk.

The City of Isleton has a stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from a number of sources. The California Department of Parks and Recreation Office of Historic Preservation (OHP) was the primary source of information. OHP administers the National Register of Historic Places, the California Register of Historical Resources, California Historical Landmarks, and the California Points of Historical Interest programs. Each program has different eligibility criteria and procedural requirements. These requirements are detailed in Section 4.3.1 of the Base Plan. Table 1-8 lists the historical buildings in the City.

Table 1-8 City of Isleton – Historical Resources

Name (Landmark Plaque Number)	National Register	State Landmark	California Register	Point of Interest	Date Listed	City/Area
Isleton Chinese And Japanese Commercial Districts (N1674)	X				3/14/1991	Isleton

Source: California Department of Parks and Recreation Office of Historic Preservation, http://ohp.parks.ca.gov/

It should be noted that these lists may not be complete, as they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by CEQA and NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

The City has an historic district which has been preserved in order to typify the region's unique history. An aspect of Isleton's distinctive history is its connection to Chinese and Japanese immigrant communities. There was a mass migration of Chinese immigrants to Isleton and the Delta in the latter half of the 19th century due to an availability in occupation regarding railroad construction, levee construction, and in agriculture. The two blocks of Main Street, which were Isleton's original Chinatown and Japantown, were placed on the National Register for Historic Places in 1991. The metal siding that is present on these historic buildings today was constructed following the fire in 1926 that destroyed these two blocks. Chinese and Japanese communities quickly rebuilt Main Street following the fire and covered the buildings in metal siding to slow the spread of future fires. Today, Isleton's residential areas are in the western portion of the City, passed City Hall and the Fire Station, and south of downtown surrounding Isleton Elementary School. The Isleton Trailer Park is located off of River Road to the west of Delta Avenue. The age of Isleton's housing structures can be dated to the median year that Isleton's homes were built, which is 1959. The greatest proportion of Isleton's homes were built in 1939 or earlier at approximately 33 percent of all existing homes.

Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability over time. Information from the City of Isleton General Plan Housing Element, the California Department of Finance, the US Census Bureau form the basis of this discussion.

Historic Population Trends and Current Population

Population growth can increase the number of people living in hazard prone areas. Isleton has generally seen small fluctuations in population since 1970. Isleton has seen growth rates as shown in Table 1-9.

Table 1-9 City of Isleton – Population Changes Since 1970

Year	Population	Change	% Change
1970	909	–	–
1980	910	1	0.1%
1990	850	-60	-6.6%
2000	828	-22	-2.6%
2010[1]	804	-24	-2.9%
2020[2]	828	24	2.9%

Source: [1]US Census Bureau, [2]California Department of Finance

Special Populations and Disadvantaged Communities

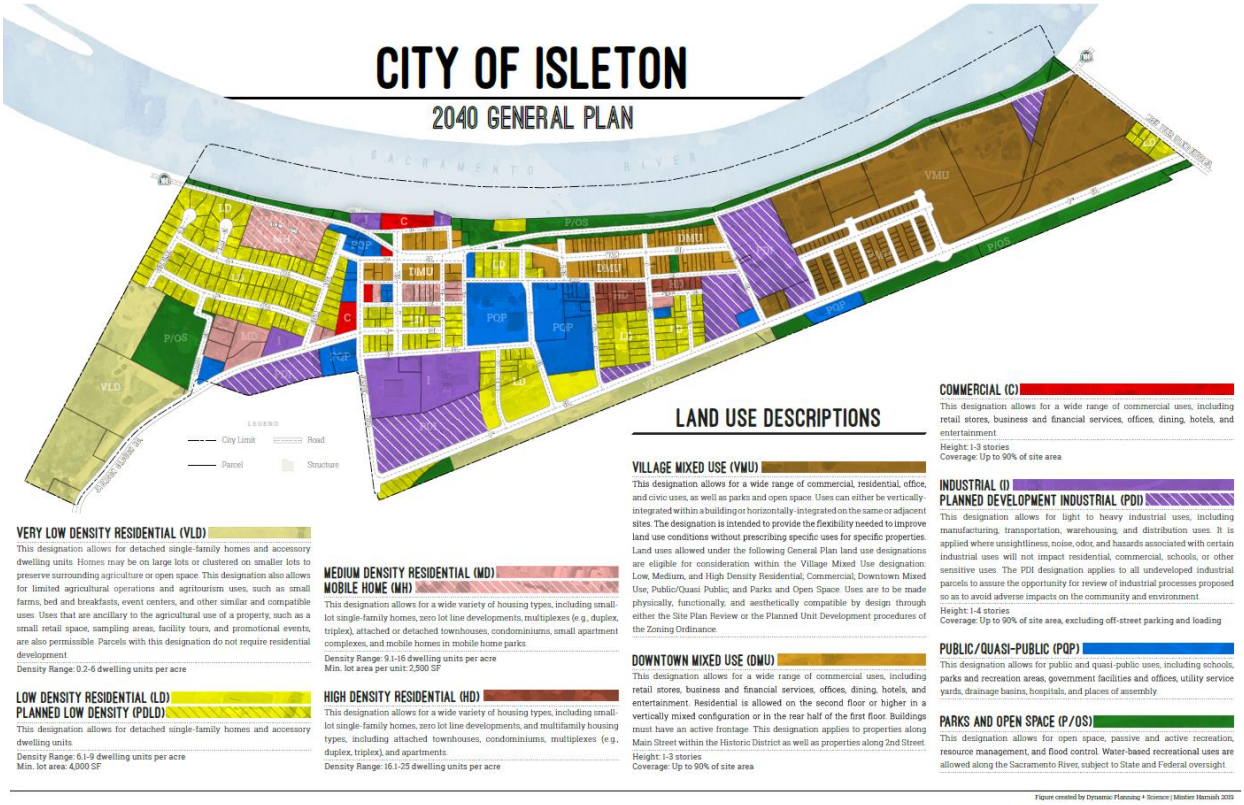
Under the State guidelines the City is considered a low – income community. Under SACOG's environmental justice definition the city falls into the Disadvantage Census tract area. The City has 19.1% persons in poverty, 18.2% person without health insurance, the median male income is $31,063, the median

female income is $25,300, and the median household income is $36,875. These populations abilities to meet the fiscal demands of hazards are restricted.

Land Use

State planning law requires that the land use element of a general plan include a statement of the standard population density, building intensity, and allowed uses for the various land use designations in the plan (Government Code Section 65302(a)). The City's land use designations are generally described below and mapped on the Land Use Diagram. The Isleton Municipal Code provides detailed land use and development standards for development. The Land Use map from the 2040 City of Isleton General Plan is shown on Figure 1-3.

Figure 1-3 City of Isleton – Land Use



Source: 2040 City of Isleton General Plan

The environmental setting of the Isleton General Plan Planning Area is dominated by the Sacramento River on the north, Georgiana Slough on the south and agricultural lands which border the City on the south, east, and west. The primary land use (108.6 acres) in the City is developed (urban and residential) land in the City of Isleton. Urban land covers most of the City. Urban habitat is concentrated along Tyler Island Bridge Road. Agricultural lands exist within the western part of the community immediately south of the City limits, and between the community and Georgiana Slough to the southeast and State Route 12 to the south and southwest. The first location involves approximately 37 acres all north of the extended westerly alignment of 6th Street. The second location involves several thousand acres outside of the City in

productive agricultural use and with much of the acreage under Williamson Act contracts with Sacramento County. Riparian woodland vegetation occurs along the Sacramento River.

Isleton is a historical community, founded in 1874 by John Poole and incorporated May 23, 1923. Many of the buildings within the City's old town are on the National Historical register, but are in need of repair. A new housing development area began construction in 2009, but has not been completed due to the recession and change of ownership hands. There are currently two city parks, a Central Park in old town and a softball complex and park on the Northwest side of town, both are in need of repair. There is an elementary school in Isleton. After elementary school, the children of Isleton are bussed to Walnut Grove. A privately owned trailer park within the City limits primarily houses elderly and very low-income persons. Agriculture, blue-collar service workers and food service are the primary industry; however, tourism is a significant economic driver for the community due to the location on the Delta loop and proximity to the waterways between Sacramento and the Pacific Ocean. There are many artists, writers and musicians within the Isleton community.

Development since 2016 Plan

As discussed in Section 4.3.1 of the Base Plan, future development has occurred in the Ciy since the last plan. Some of this has occurred in hazard prone areas. The City Building Department tracked total building permits issued since 2016 for the City. These are tracked by total development, property use type, and hazard risk area. These are shown in Table 1-10 and Table 1-11.

Table 1-10 City of Isleton – Total Development Since 2016

Property Use	2016	2017	2018	2019	2020
Agricultural	0	0	0	0	0
Commercial	0	0	0	4	1
Industrial	0	0	0	0	1
Residential	1	0	7	0	0
Unknown	0	0	1	0	0
Total	**1**	**0**	**8**	**4**	**2**

Source: City of Isleton Building Department

Table 1-11 City of Isleton – Development in Hazard Areas since 2016

Property Use	1% Annual Chance Flood	Levee Protected Area	Wildfire Risk Area[1]	Other
Agricultural	0	0	0	0
Commercial	0	0	0	0
Industrial	0	0	0	0
Residential	14	14	0	0
Unknown	0	0	0	0
Total	**14**	**14**	**0**	**0**

Source: City of Isleton Building Department

[1]Moderate or higher wildfire risk area

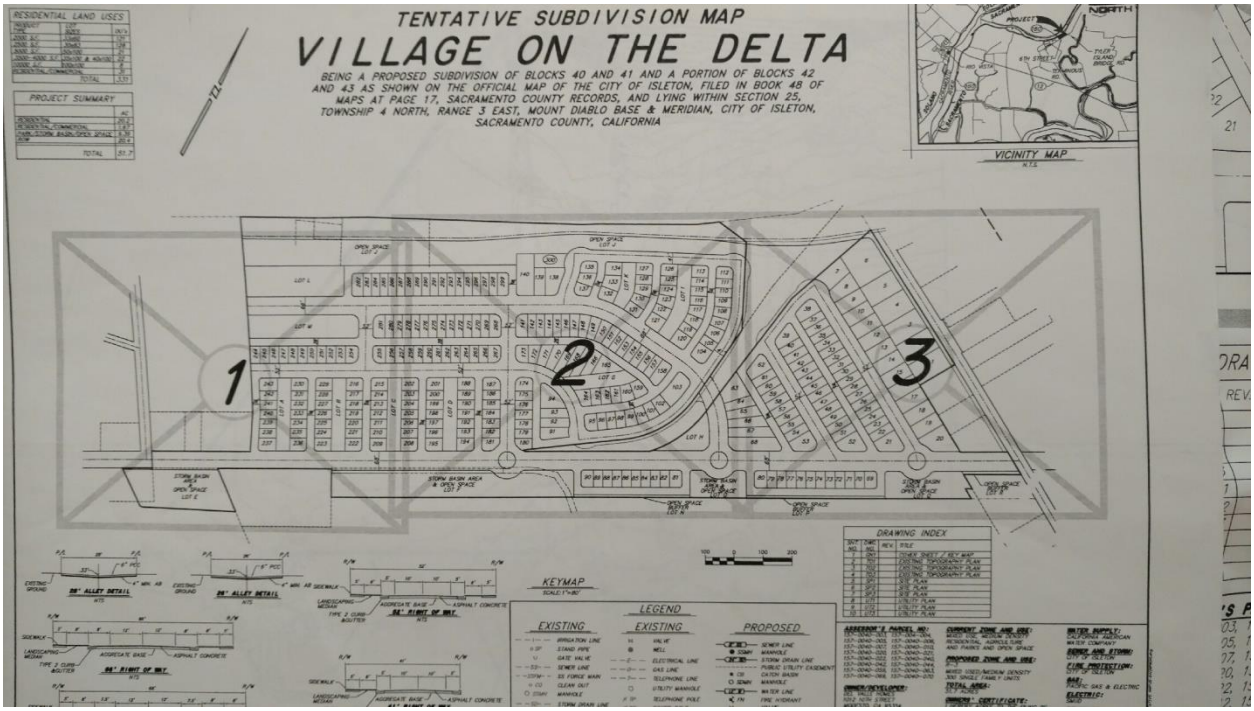
In Isleton, development occurred in the flood and levee risk areas. While the data shows changes in development in the City since the 2016, including development in mapped hazard areas, all development is subject to current building standards to include any requirements for building in hazard areas which act to mitigate hazard exposure. Further development in hazard areas is only one factor of many that contribute to an overall change in hazard vulnerability. Based on these considerations, it cannot be definitively stated as to whether the development or even lack of development contributed to an increase or decrease in vulnerability for Isleton.

Future Development

The Sacramento Council on Governments (SACOG) modeled population projections for the City of Isleton and other areas of the region in 2012 for a Metropolitan Transportation Plan/Sustainable Communities Strategy report. This forecast uses a 2008 base year estimate with projections to 2020 and 2035 for population, housing units, households and employment. SACOG estimated the City population in 2020 and 2035 to be 730 and 894 respectively. Recent planning studies note that the population has increased 5.4% over the past five years. City is forecasting a population of 1,400 in twenty years.

There is a new development that has been in the works since 2005. This development is called Village on the Delta. There is a proposed mixed used/medium density 300 single family units. The total area of the project is 51.7 acres. The Village on the Delta development is planning to add about 4 more units in the coming year. This development has indicated that it wants to continue to build after this addition. The City has also been approached, collectively among three developments, about developing up to 30 high density apartment units. The City does have a vacant storefront analysis of Main Street.

Figure 1-4 Village on the Delta Subdivision Map



Source: City of Isleton

GIS Analysis

The City of Isleton provided a list of projects that the City is seeing be developed. Using GIS, the following methodology was used in determining parcel counts and acreages with future development projects in the City of Isleton. Future development areas in the City were provided in mapped format by the City. 6 areas were provided. Using the GIS parcel spatial file for each of these areas, the 6 areas associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure 1-5 shows the locations of future development areas the City is planning to develop. Table 1-12 shows the summary of parcels and acreages of each future development area in the City.

Figure 1-5 City of Isleton – Future Development Areas

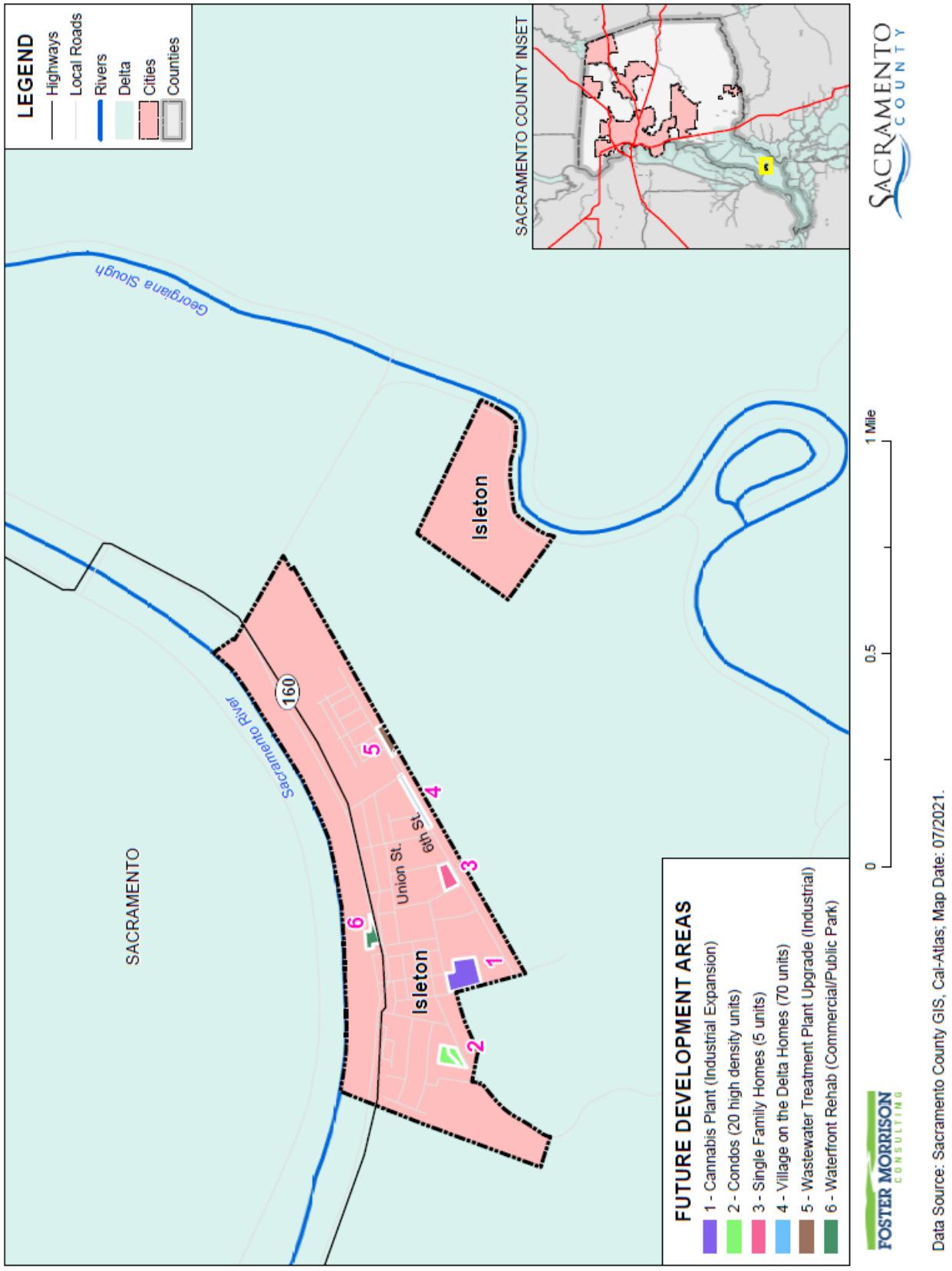


Table 1-12 City of Isleton – Summary of Future Development Area Parcels and Acres

Future Development Status	Total Parcel Count	Improved Parcel Count	Total Acres
Cannabis Plant (Industrial Expansion)	1	1	3.00
Condos (20 high density units)	2	0	1.42
Single Family Homes (5 units)	1	0	1.15
Village on the Delta Homes (70 units)	1	0	1.03
Wastewater Treatment Plant Upgrade (Industrial)	1	0	0.90
Waterfront Rehab (Commercial/Public Park)	1	0	0.96
Grand Total	**7**	**1**	**8.47**

Source: City of Elk Grove GIS

1.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 1-5 as high or medium significance hazards. Impacts of past events and vulnerability of the City to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the City to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, populations at risk, critical facilities and infrastructure, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power shortage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

The power service in Isleton is not dependable. Over the past nine months the City endured about thirty power failures. It is not known if these power failures are related to public safety power shutoffs. The City did not receive notice prior to these power failures.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the City, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the City noted that climate change is of concern, no specific impacts of climate change could be recalled. The City and HMPC members noted that the strength of storms does seem to be increasing and the temperatures are getting hotter.

Vulnerability to and Impacts from Climate Change

The 2012 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the City and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

The City's population, resources, and economy are vulnerable to climate change impacts, particularly those associated with flooding and extreme heat. Without reduction strategies in place, county-wide greenhouse gases (GHG) emissions are anticipated to increase based on the Sacramento County Planning Area's anticipated growth.

Future Development

The City could see population fluctuations as a result of climate impacts relative to those experienced in other regions, and these fluctuations are expected to impact demand for housing and other development. While there are currently no formal studies of specific migration patterns expected to impact the City and County region, climate-induced migration was recognized within the UNFCCC Conference of Parties Paris Agreement of 2015 and is expected to be the focus of future studies.

The City of Isleton is committed to meeting State standards for the reduction of greenhouse gas emissions to achieve sustainable land use. The City will evaluate the use of sustainable land use and growth principals when considering future development.

Dam Failure

Though considered a low significance hazard by the City, due to its significance in the County and in the State of California, dam failure is profiled and a vulnerability analysis has been performed here. It remains a low significance hazard for mitigation strategy and action purposes.

Likelihood of Future Occurrence–Unlikely
Vulnerability–Low

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

Location and Extent

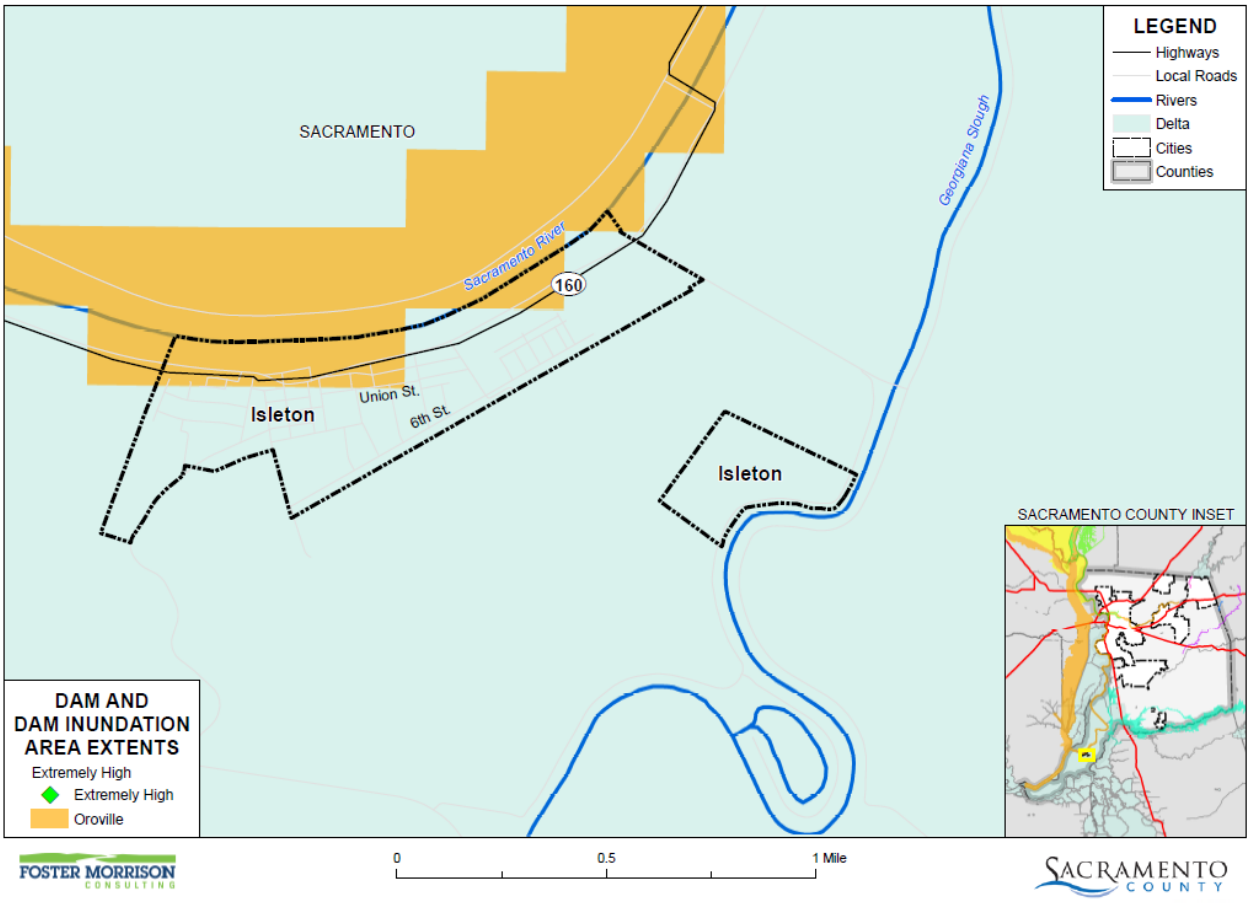
Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The City would be affected for as long as the flood waters from the dam failure took to drain downstream.

Based on available data, the City falls within the inundation areas of the Oroville dam, which is an Extremely High Hazard dam located outside the County. The City falls outside in the Folsom Dam 235,000 cfs scenario, as discussed in Section 4.3.7 of the Base Plan and falls outside of dam inundation areas from dams inside the County. Geographic flood extent from the DWR DSOD and Cal OES dam inundation areas is shown on Figure 1-6 for dams outside the County and summarized for all these dams in Table 1-13.

Note: the Cal OES and DSOD dam inundation data did not include inundation mapping of all dams that could affect the Sacramento County Planning Area and the City; thus, the below analysis reflects information based on available data. Other dams may be identified as a concern to the City.

Figure 1-6 City of Isleton – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Table 1-13 City of Isleton – Geographical Dam Inundation Extents

Dam Inundation Areas	Jurisdiction	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Extremely High Hazard Dams Outside the County							
Oroville	Isleton	23.87	10.23%	12.61	19.26%	11.25	6.71%

Source: Cal OES, DSOD

Past Occurrences

There has been no state or federal disaster declarations for dam failure in the County. The City noted no other dam failure occurrences that have affected the City.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Warning ability is generally determined by the frequency of inspections for structural integrity, the flood wave arrival time (the time it takes for the flood wave to reach its maximum distance of inundation), or the ability to notify persons downstream and their ability to evacuate. The existence and frequency of updating and exercising an evacuation plan that is site-specific assists in warning and evacuation functions. A failure of the Folsom Dam would leave little time for evacuation of the City of Isleton.

Impacts to the City from a dam failure flood include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

The City effectively exists and operates at a level below the adjacent Sacramento River the surrounding sloughs. All of these bodies of water are potential catastrophic hazards to the City meaning that the City is operating at a heightened level of danger.

Assets at Risk

Based on the vulnerability of Isleton to the dam failure hazard, the sections that follow describes significant assets at risk in the City of Isleton. This section includes the values at risk, inundated acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Isleton. The methodology described in Section 4.3.9 of the Base Plan was followed in determining structures and values at risk to dam failure. Table 1-14 shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in dam inundation areas in the City.

Table 1-14 City of Isleton – Count and Values of Parcels at Risk by Dam Inundation Area and Property Use

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Oroville Dam – Extremely High Hazard Dam Outside the County						
Miscellaneous	4	0	$51,075	$0	$0	$51,075
Office	3	2	$304,492	$419,553	$419,553	$1,143,598

Dam Inundation Area/ Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Public / Utilities	10	1	$43,974	$32,966	$32,966	$109,906
Residential	51	51	$3,721,608	$7,704,512	$3,852,256	$15,278,378
Retail / Commercial	30	29	$1,107,741	$2,798,204	$2,798,204	$6,704,149
Vacant	13	**0**	$318,175	$0	$0	$318,175
Isleton Total	**111**	**83**	**$5,547,065**	**$10,955,235**	**$7,102,979**	**$23,605,281**

Source: CAL OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data

Population at Risk

The DSOD and Cal OES dam inundation areas were overlayed on the parcel layer. Those residential parcel centroids that intersect the dam inundation areas were counted and multiplied by the Census Bureau average household factors for Isleton – 2.70. This is shown in Table 1-27.

Table 1-15 City of Isleton – Count of Improved Residential Parcels and Population by Dam Inundation Area

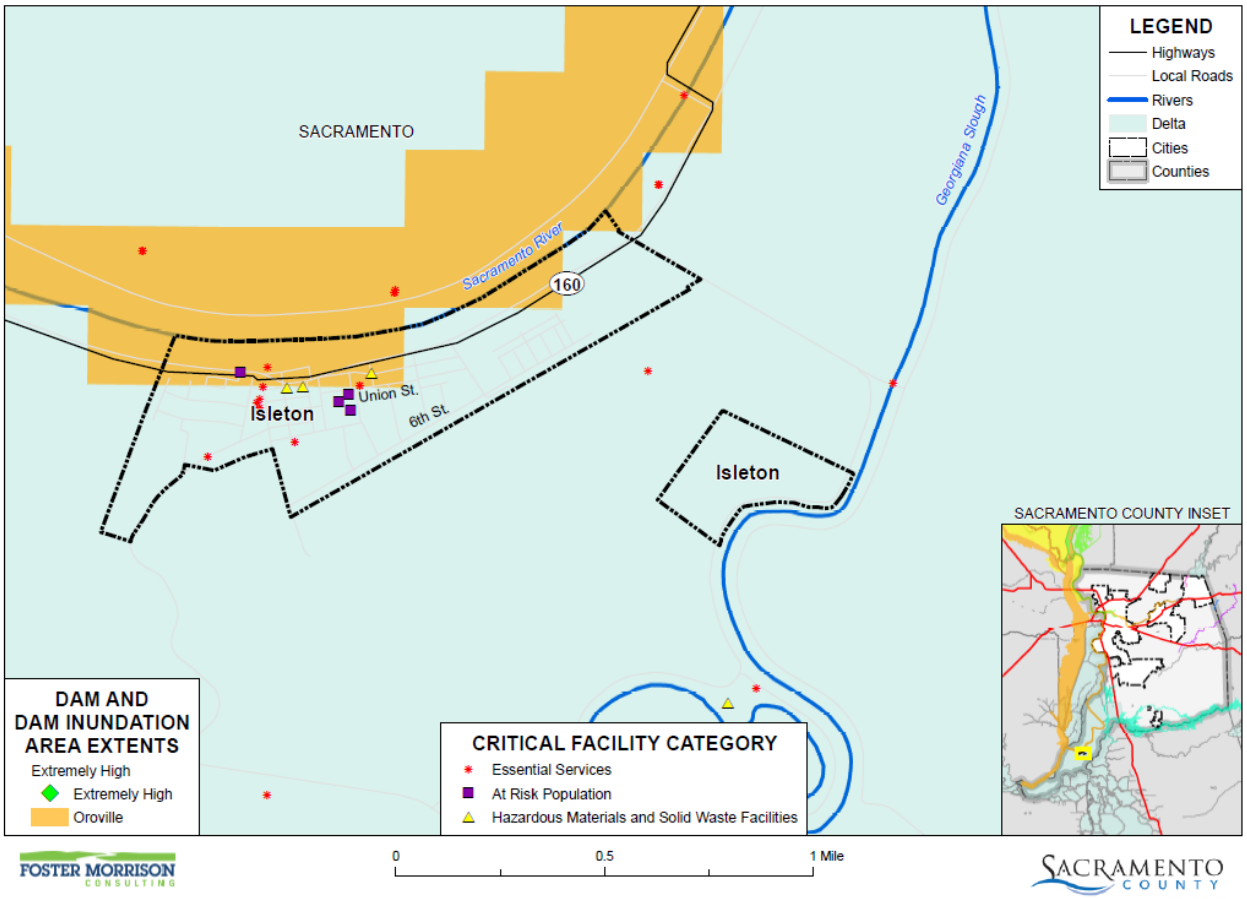
	Oroville Dam Inundation Area	
Jurisdiction	Improved Residential Parcels	Population
Isleton		

Source: Cal OES, DSOD, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Isleton in identified dam inundation areas. GIS was used to determine whether the critical facility locations intersect a DSOD or Cal OES dam inundation area. Details of critical facilities in mapped dam inundation areas in the City of Isleton are shown in Figure 1-7 and detailed in Table 1-16. Details of critical facility definition, type, name and address and jurisdiction by dam inundation area are listed in Appendix F.

Figure 1-7 City of Isleton – Critical Facilities in Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 1-16 City of Isleton – Critical Facilities in Dam Inundation Areas by Category and Type

Dam Inundation Areas/Critical Facility Category	Critical Facility Type	Facility Count
Oroville Dam (Extremely High Hazard Dam Outside the County)		
Essential Services Facilities	Microwave Service Towers	2
	Water Well	1
	Total	**3**
At Risk Population Facilities	Mobile Home Park	1
	Total	**1**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	1
	Total	**1**
Oroville Dam Total		**5**

Source: Cal OES, DSOD, Sacramento County GIS

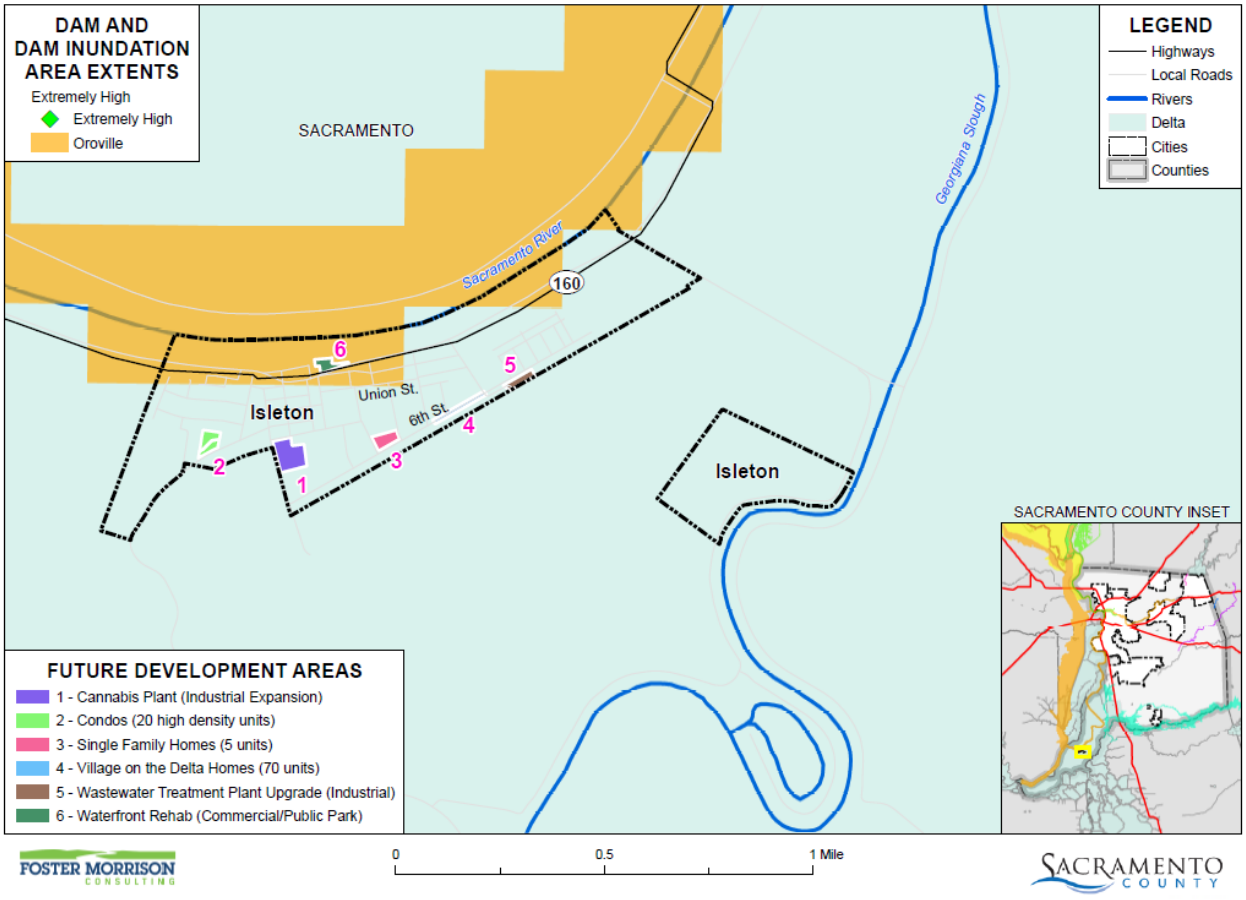
Future Development

Future dam failures are considered unlikely. The City enforces it floodplain ordinance, which helps to reduce risk to flooding by requiring structures in the 1% annual chance floodplains to be above the base flood elevation, which depending on inundation depths and affected areas may provide some relief. Siting of future development areas should take dam failure flooding into account.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure 1-8 shows the locations of future development areas the City is planning to develop on the dam inundation zones from dams inside the County. Table 1-17 shows the parcels and acreages of each future development area in the City in the dam inundation areas inside the County.

Figure 1-8 City of Isleton – Future Development in Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Table 1-17 City of Isleton – Future Development Parcels and Acres in Dam Inundation Areas from Dams Outside the County

Dam Inundation Are/ Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
Oroville			
Waterfront Rehab (Commercial/Public Park)	1	0	0.96
Oroville Total	**1**	**0**	**0.96**

Source: City of Isleton, Cal OES, DSOD

Drought & Water Shortage

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Drought is a complex issue involving many factors—it occurs when a normal amount of precipitation and snow is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects. Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue and is critical for agriculture, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so will the demand for water.

Location and Extent

Drought and water shortage are regional phenomenon. The whole of the County, as well as the whole of the City, is at risk. The US Drought Monitor categorizes drought conditions with the following scale:

- None
- D0 – Abnormally dry
- D1 – Moderate Drought
- D2 – Severe Drought
- D3 – Extreme drought
- D4 – Exceptional drought

Drought has a slow speed of onset and a variable duration. Drought can last for a short period of time, which does not usually affect water shortages and for longer periods. Should a drought last for a long period of time, water shortage becomes a larger issue. Current drought conditions in the City and the County are shown in Section 4.3.8 of the Base Plan.

Past Occurrences

There have been two state and one federal disaster declaration from drought. This can be seen in Table 1-18.

Table 1-18 Sacramento County – State and Federal Drought Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977

Source: Cal OES, FEMA

Since drought is a regional phenomenon, past occurrences of drought for the City are the same as those for the County and includes 4 multi-year droughts since 1950. Details on past drought occurrences can be found in Section 4.3.8 of the Base Plan. During 2016, the City implemented basic water saving measures.

Vulnerability to and Impacts from Drought and Water Shortage

Based on historical information, the occurrence of drought in California, including the City, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts can be extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users.

The vulnerability of the City to drought is City-wide, but impacts may vary and include reduction in water supply and an increase in dry fuels. The potential for a reduction in water supply during drought conditions generally leads to both mandated and voluntary conservations measures during extended droughts. During these times, the costs of water can also increase. The increased dry fuels and fuel loads associated with drought conditions can also result in an increased fire danger. In areas of extremely dry fuels, the intensity and speed of fires can be significant. Water supply and flows for fire suppression can also be an issue during extended droughts.

Other qualitative impacts associated with drought in the City and Sacramento County Planning Area are those related to water intensive activities such as, municipal usage, commerce, tourism, recreation and agricultural use. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

With more precipitation likely falling as rain instead of snow in the Sierra's, and warmer temperatures causing decreased snowfall to melt faster and earlier, water supply is likely to become more unreliable. In addition, drought and water shortage is predicted to become more common. This means less water available for use over the long run, and additional challenges for water supply reliability, especially during periods of extended drought.

The City of Isleton receives its drinking water from a groundwater well. With the drought and water shortage there is the likelihood of shortages of drinking water to the City's residents if groundwater tables lower beyond the depth of the well. The present water service is not reliable. The City has endured three

water outages – no water, not water pressure, no fire service – over the past four years. The present water purveyor has not adequately managed existing water service and has no plans for future services.

The main asset at risk due to water shortage would be the cities' Wastewater Treatment Plant. Water is the conveyance method used to expel the waste from the cities' sewer system. During a water shortage or while under drought restrictions, adequate water supply necessary to keep the waste suspended long enough to reach the wastewater plant may not be available. If the solids fall out of the stream, waste could possibly build up in the sewer lines causing a plug. This could lead to backups into homes onto the streets and create a health hazard.

The lack of water planning adversely effects City's planning efforts.

Future Development

As the population in the area continues to grow, so will the demand for water. Water shortages in the future may be worsened by drought, as the City relies on groundwater for its water source. Ongoing planning will be needed by the City and water agencies to account for population growth and increased future water demands.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the City, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the City. Historically, the City has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% and 0.2% annual chance floodplains and in other localized areas.

Snowmelt floods on the Sacramento and the San Joaquin Rivers and their higher elevation tributaries can be expected to occur during the period from April through June. Although snowmelt flooding is of much larger volume and longer duration than flooding from rain, it does not have the high peak flows characteristic of floods from rain. Snowmelt flood runoff is sometimes augmented by late spring rains on the snowfields or lower elevation tributary watersheds.

Location and Extent

According to the City of Isleton 2020 Draft Safety Element, the City of Isleton is located at the north end of Andrus Island, with an elevation of only five feet below mean sea level at its highest point, which is located at the base of the levee along the Sacramento River. The Sacramento River levee is a Project Levee

of the U.S. Army Corps of Engineers. It has a height of about 18 feet above mean sea level. The community is underlain by as much as 10 feet of organic peat soils, which increases to more than 40 feet at the southern end of Andrus Island. Most of the City of Isleton is located in the 1% annual chance flood zones. This is seen in Figure 1-9.

Figure 1-9 City of Isleton – FEMA DFIRM Flood Zones

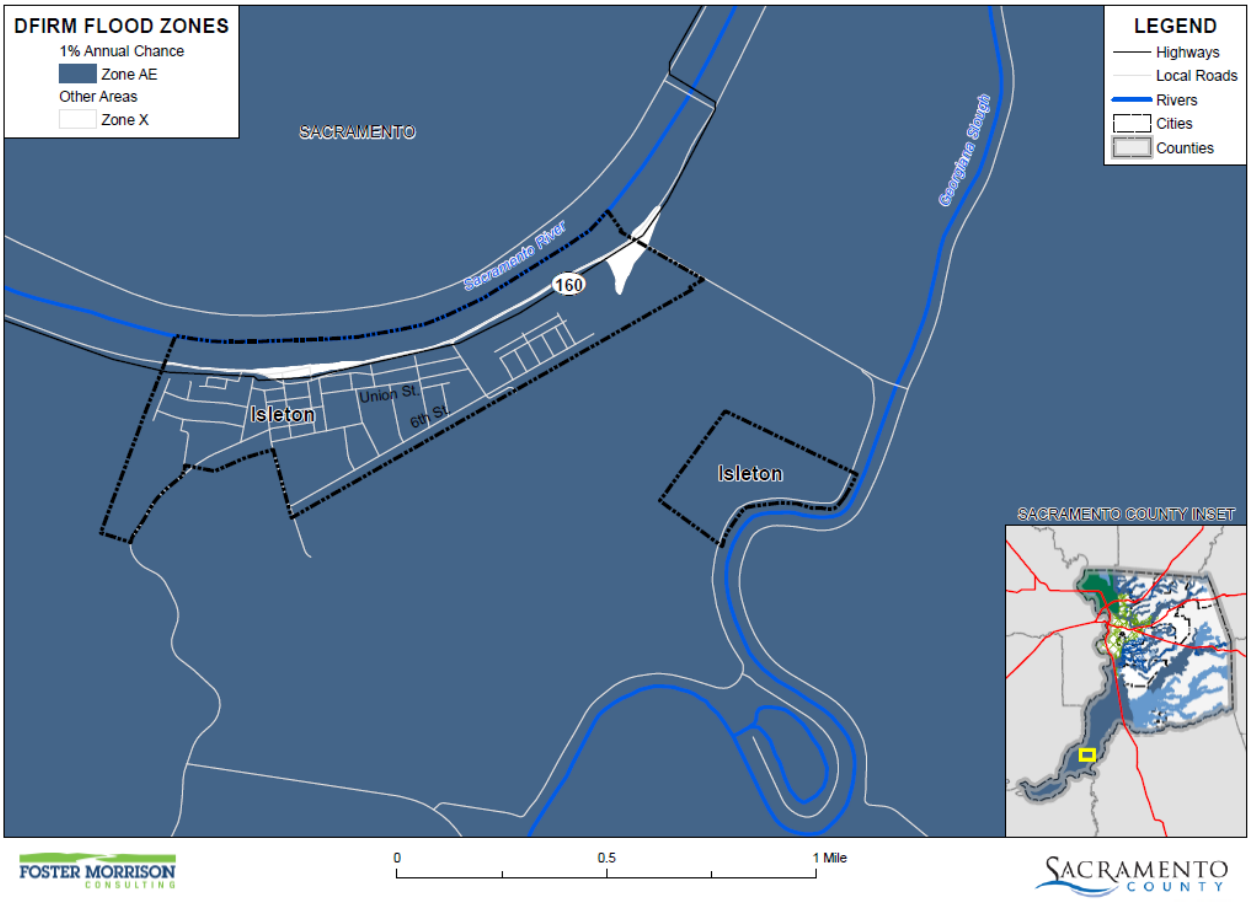


Table 1-19 details the DFIRM mapped flood zones located within the City.

Table 1-19 City of Isleton – DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in City
A	1% annual chance flooding: No base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
AE	1% annual chance flooding: Base flood elevations provided. Mandatory flood insurance purchase requirements and floodplain management standards apply.	X

Flood Zone	Description	Flood Zone Present in City
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No Base Flood Elevations (BFEs) or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.	
Shaded X	0.2% annual chance flooding: The areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood. Flood insurance is not mandatory but is available.	
X Protected by Levee	Areas protected by levees from 1% annual chance flood event. Levee protection places these areas in the 0.2% annual chance flood zone. Flood insurance is not mandatory but is available.	
X (unshaded)	No flood hazard	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the City vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the City tends to have a shorter speed of onset, due to the amount of water that flows through the City.

Geographical flood extent for the City from the FEMA DFIRMs are shown in Table 1-20.

Table 1-20 City of Isleton – Geographical DFIRM Flood Zone Extents

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance	220	94.27%	61	92.77%	159	94.85%
0.2% Annual Chance	0	0.00%	0	0.00%	0	0.00%
Other Areas	13	5.73%	5	7.23%	9	5.15%
Total	**233**	**100.00%**	**66**	**100.00%**	**168**	**100.00%**

Source: FEMA DFIRM 11/2/2018

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 1-21. These events also likely affected the City to some degree.

Table 1-21 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Past flooding in the City of Isleton area has been primarily due to levee failures caused by the separate or coincidental occurrence of very high tides and high stream outflow through the Delta region, or from unexplained levee failures apparently not related to these phenomena. As such, the past occurrences of flood in the City of Isleton can be found in the Levee Failure section below.

Vulnerability to and Impacts from Flood

Floods have been a part of the City's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Public schools may also be required to close or be placed on a delayed start schedule. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what

to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

The City noted that the largest impacts would be from lack of facilities and equipment to manage flood and flood's catastrophic impact to community.

Assets at Risk

Based on the vulnerability of Isleton to the flood hazard, the sections that follow describes significant assets at risk in the City of Isleton. This section includes the values at risk, flooded acres, population at risk, and critical facilities at risk.

Values at Risk

GIS was used to determine the possible impacts of flooding within the City of Isleton. The methodology described in Section 4.3.12 of the Base Plan was followed in determining structures and values at risk to the 1% (100-year) and 0.2% (500-year) annual chance flood event. Table 1-22 is a summary table for the City of Isleton. Parcel counts, values, estimated contents, and total values in the City are shown for the 1% and 0.2% annual chance flood zones, as well as for those properties that fall outside of the mapped FEMA DFIRM flood zones. Table 1-23 breaks down Table 1-22 and shows the property use, improved parcel count, improved values, estimated contents, and total values that fall in FEMA flood zones in the City.

*Table 1-22 City of Isleton – Count and Value of Parcel*s at Risk in Summary DFIRM Flood Zones*

Flood Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood	515	329	$21,145,419	$39,144,051	$24,482,767	$84,772,235
0.2% Annual Chance Flood**	-	-	$0	$0	$0	$0
Other Areas	21	9	$1,571,792	$2,124,228	$1,570,789	$5,266,809
City of Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

Table 1-23 City of Isleton – Count and Values of Parcels at Risk by Detailed Flood Zone and Property Use*

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
1% Annual Chance Flood Hazard						
Zone AE						
Agricultural	1	0	$32,472	$0	$0	$32,472
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	8	8	$208,114	$1,009,072	$1,009,072	$2,226,258
Industrial	5	5	$2,126,988	$1,224,909	$1,837,364	$5,189,260
Miscellaneous	17	0	$851,679	$0	$0	$851,679
Office	4	3	$188,095	$374,669	$374,669	$937,433
Public/Utilities	26	1	$43,974	$32,966	$32,966	$109,906
Recreational	0	0	$0	$0	$0	$0
Residential	257	254	$12,279,026	$30,529,882	$15,264,945	$58,073,852
Retail/ Commercial	55	53	$2,190,276	$5,963,751	$5,963,751	$14,117,778
Unknown	0	0	$0	$0	$0	$0
Vacant	142	5	$3,224,795	$8,802	$0	$3,233,597
Zone AE Total	**515**	**329**	**$21,145,419**	**$39,144,051**	**$24,482,767**	**$84,772,235**
1% Annual Chance Flood Hazard Total	**515**	**329**	**$21,145,419**	**$39,144,051**	**$24,482,767**	**$84,772,235**
Other Areas						
Zone X						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	3	0	$32,459	$0	$0	$32,459
Office	1	1	$259,659	$318,675	$318,675	$897,009
Public/Utilities	2	0	$189	$0	$0	$189
Recreational	0	0	$0	$0	$0	$0
Residential	3	3	$776,692	$1,106,878	$553,439	$2,437,009
Retail/ Commercial	5	5	$409,802	$698,675	$698,675	$1,807,152
Unknown	0	0	$0	$0	$0	$0
Vacant	7	0	$92,991	$0	$0	$92,991
Zone X Total	**21**	**9**	**$1,571,792**	**$2,124,228**	**$1,570,789**	**$5,266,809**

Flood Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Other Areas Total	**21**	**9**	**$1,571,792**	**$2,124,228**	**$1,570,789**	**$5,266,809**
Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

Table 1-24 summarizes Table 1-23 above and shows City of Isleton loss estimates and improved values at risk by FEMA 1% and 0.2% annual chance flood zones.

Table 1-24 City of Isleton – Flood Loss Estimates

Flood Zone	Total Parcel Count	Improved Parcel Count	Improved Structure Value	Estimated Contents Value	Total Value	Loss Estimate	Loss Ratio
1% Annual Chance Flood	515	329	$39,144,051	$24,482,767	$63,626,818	$12,725,364	14.1%
0.2% Annual Chance Flood**	0	0	$0	$0	$0	$0	0.00%
Grand Total	**515**	**329**	**$39,144,051**	**$24,482,767**	**$63,626,818**	**$12,725,364**	**14.10%**

Source: FEMA 11/2/2018 DFIRM, Sacramento County 2020 Parcel/Assessor's Data

*With respect to improve parcels within the floodplain, the actual structures on the parcels may not be located within the actual floodplain, may be elevated and or otherwise outside of the identified flood zone

**This parcel count only includes those parcels in the 0.2% annual chance flood zone, exclusive of the 1% annual chance flood zone. The 0.2% annual chance flood, in actuality, also includes all parcels in the 1% annual chance flood zone.

According to Table 1-23 and Table 1-24, the City of Isleton has 329 parcels and $63.6 million of structure and contents values or values in the 1% annual chance flood zone, and 0 improved parcels in the 0.2% annual chance flood zone. These values can be refined a step further. Applying the 20 percent damage factor as previously described in Section 4.3.11 of the Base Plan, there is a 1% chance in any given year of a flood event causing $12.7 million in damage and a 0.2% chance in any given year of a flood event causing $0 in damage in the City of Isleton. The loss ratio of 14.1% indicates that flood losses for 1% and 0.2% annual chance flooding, respectively, would be overwhelming and difficult to recover from.

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits. The same methodology, as discussed in Section 4.3.12 of the Base Plan, was used for the City of Isleton as well as for the County as a whole. Table 1-25 represents a summary analysis of total acres for each FEMA DFIRM flood zone in the City. Table 1-26 represents a detailed analysis of total acres and property use for each FEMA DFIRM flood zone in the City.

Table 1-25 City of Isleton – Flooded Acres by Summary Flood Zone

Flood Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard	220	0.03%	61	0.02%	159	0.06%
0.2% Annual Chance Flood Hazard	0	0.00%	0	0.00%	0	0.00%
Other Areas	13	0.00%	5	0.00%	9	0.00%
Isleton Total	**233**	**0.04%**	**66**	**0.02%**	**168**	**0.06%**

Source: FEMA 11/2/2018 DFIRM

Table 1-26 City of Isleton – Flooded Acres by Detailed Flood Zone and Property Use

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
1% Annual Chance Flood Hazard						
Zone AE						
Agricultural	2.6	0.00%	0	0.00%	2.6	0.00%
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	2.2	0.00%	2.2	0.00%	0	0.00%
Industrial	10.3	0.00%	10.3	0.00%	0	0.00%
Miscellaneous	12.1	0.00%	0	0.00%	12.1	0.00%
Office	0.7	0.00%	0.5	0.00%	0.2	0.00%
Public/Utilities	72.7	0.01%	0.1	0.00%	72.6	0.03%
Recreational	0	0.00%	0	0.00%	0	0.00%
Residential	37.7	0.01%	37.7	0.01%	0.1	0.00%
Retail/ Commercial	7.4	0.00%	7.0	0.00%	0.4	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	74.1	0.01%	3.0	0.00%	71.1	0.03%
Zone AE Total	**219.8**	**0.03%**	**60.8**	**0.02%**	**159.1**	**0.06%**
1% Annual Chance Flood Hazard Total	**219.8**	**0.03%**	**60.8**	**0.02%**	**159.1**	**0.06%**
Other Areas						
Zone X						
Agricultural	0	0.00%	0	0.00%	0	0.00%
Care/Health	0	0.00%	0	0.00%	0	0.00%
Church/Welfare	0	0.00%	0	0.00%	0	0.00%

Flood Zone/ Property Use	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Industrial	0.6	0.00%	0.6	0.00%	0	0.00%
Miscellaneous	0.5	0.00%	0	0.00%	0.5	0.00%
Office	0.2	0.00%	0.2	0.00%	0	0.00%
Public/Utilities	1.7	0.00%	0	0.00%	1.7	0.00%
Recreational	0	0.00%	0	0.00%	0	0.00%
Residential	2.1	0.00%	2.1	0.00%	0	0.00%
Retail/ Commercial	1.9	0.00%	1.9	0.00%	0	0.00%
Unknown	0	0.00%	0	0.00%	0	0.00%
Vacant	6.4	0.00%	0	0.00%	6.4	0.00%
Zone X Total	**13.4**	**0.00%**	**4.7**	**0.00%**	**8.6**	**0.00%**
Other Areas Total	**13.4**	**0.00%**	**4.7**	**0.00%**	**8.6**	**0.00%**
Isleton Total	**233.2**	**0.04%**	**65.5**	**0.02%**	**167.7**	**0.06%**

Source: FEMA 11/2/2018 DFIRM

Population at Risk

The DFIRM flood zones were overlayed on the parcel layer. Those residential parcel centroids that intersect the flood zones were counted and multiplied by the 2010 Census Bureau average household factors for Isleton – 2.70. According to this analysis, there is a total population of 701 and 0 residents of the City at risk to flooding in the 1% and 0.2% annual chance floodplains, respectively. This is shown in Table 1-27.

Table 1-27 City of Isleton – Count of Improved Residential Parcels and Population by Flood Zone

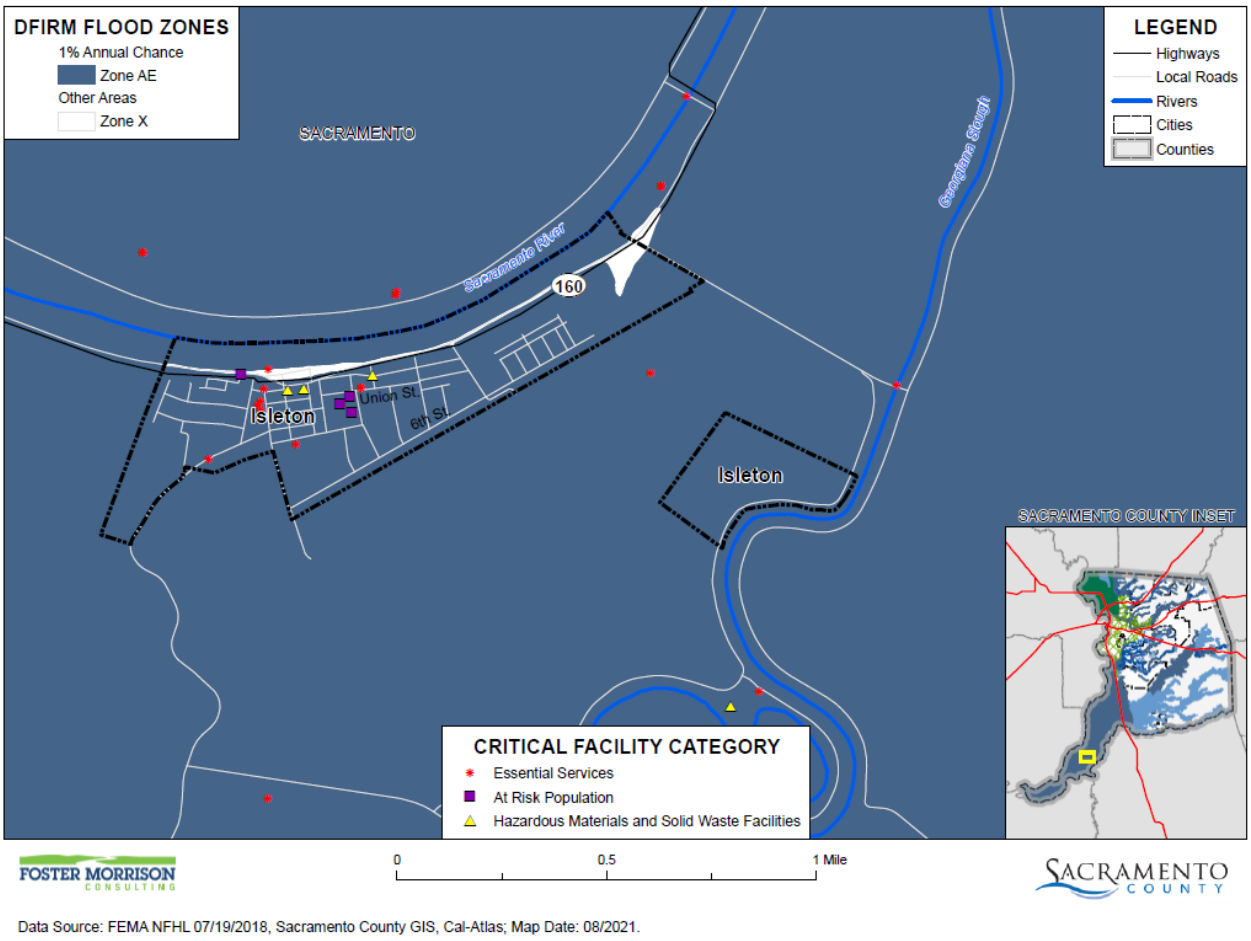
Jurisdiction	1% Annual Chance		0.2% Annual Chance	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Isleton	254	701	0	0

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, US Census Bureau

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Isleton in identified DFIRM flood zones. GIS was used to determine whether the critical facility locations intersect a DRIFM flood zone, and if so, which flood zone it intersects. Details of critical facilities in mapped DFIRM flood zones in the City of Isleton are shown in Figure 1-10 and detailed in Table 1-28. Details of critical facility definition, type, name and address and jurisdiction by DFIRM flood zone are listed in Appendix F.

Figure 1-10 City of Isleton - Critical Facilities and FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 1-28 City of Isleton – Critical Facilities in DFIRM Flood Zones by Facility Category and Type

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
1% Annual Chance Flood Hazard		
Essential Services Facilities	Emergency Evacuation Center	1
	EMS Stations	1
	Fire Station	2
	Law Enforcement	1
	Microwave Service Towers	2
	Water Well	1
	Total	**8**
At Risk Population Facilities	Day Care Center	1
	Mobile Home Parks	1
	School	2

Flood Zone Critical Facility Category	Critical Facility Type	Facility Count
	Total	**4**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	3
	Total	**3**
1% Annual Chance Flood Hazard Total		**15**
Other Areas		
Essential Services Facilities	Water Well	1
	Total	**1**
Other Areas Total		**1**
Isleton Total		**16**

Source: City of Isleton, FEMA 7/19/2018 DFIRM

Insurance Coverage, Claims Paid, and Repetitive Losses

Standard property insurance does not include flood coverage because of the relatively high risk. The National Flood Insurance Program (NFIP) provides flood insurance to residents in those communities that participate in the NFIP. Federal financial assistance requires the purchase of flood for structures located within a 100-year floodplain – a requirement that affects nearly all mortgages financed through commercial lending institutions. Flood insurance is also recommended for all structures protected by levees, even if not mapped within a floodplain.

The City of Isleton joined the National Flood Insurance Program (NFIP) on December 1, 1978. The City does not participate in CRS program. NFIP data indicates that as of March 24, 2020, there were 110 flood insurance policies in force in the City with $24,037,600 of coverage. Of the 110 policies, 107 were residential (single-family homes) and 3 were non-residential. Of the 110 policies, 107 were in A zones, while 3 were in B, C, and X zones. There have been 23 historical claims for flood losses totaling $467,013.07. NFIP data further indicates that there is 1 repetitive loss (RL) and no severe repetitive loss (SRL) buildings in Isleton. There have been 7 substantial damage claims since 1978.

Based on this analysis of insurance coverage, the City has values at risk to the 1% annual chance and greater floods. Of the 329 improved parcels within the 1% annual chance flood zone, only 107 (or 32.5 percent) of those parcels maintain flood insurance. This can be seen on Table 1-29.

Table 1-29 City of Isleton – Percentage of Policy Holders to Improved Parcels in the 1% Annual Chance Floodplain

Jurisdiction	Improved Parcels in SFHA (1% Annual Chance) Floodplain*	Insurance Policies in the SFHA (1% Annual Chance) Floodplain	Percentage of 1% Annual Chance Floodplain Parcels Currently Insured
City of Isleton	329	107	32.5%

Source: FEMA DFIRM 11/2/2018, Sacramento County 2020 Parcel/Assessor's Data, NFIP CIS data 3/2020.

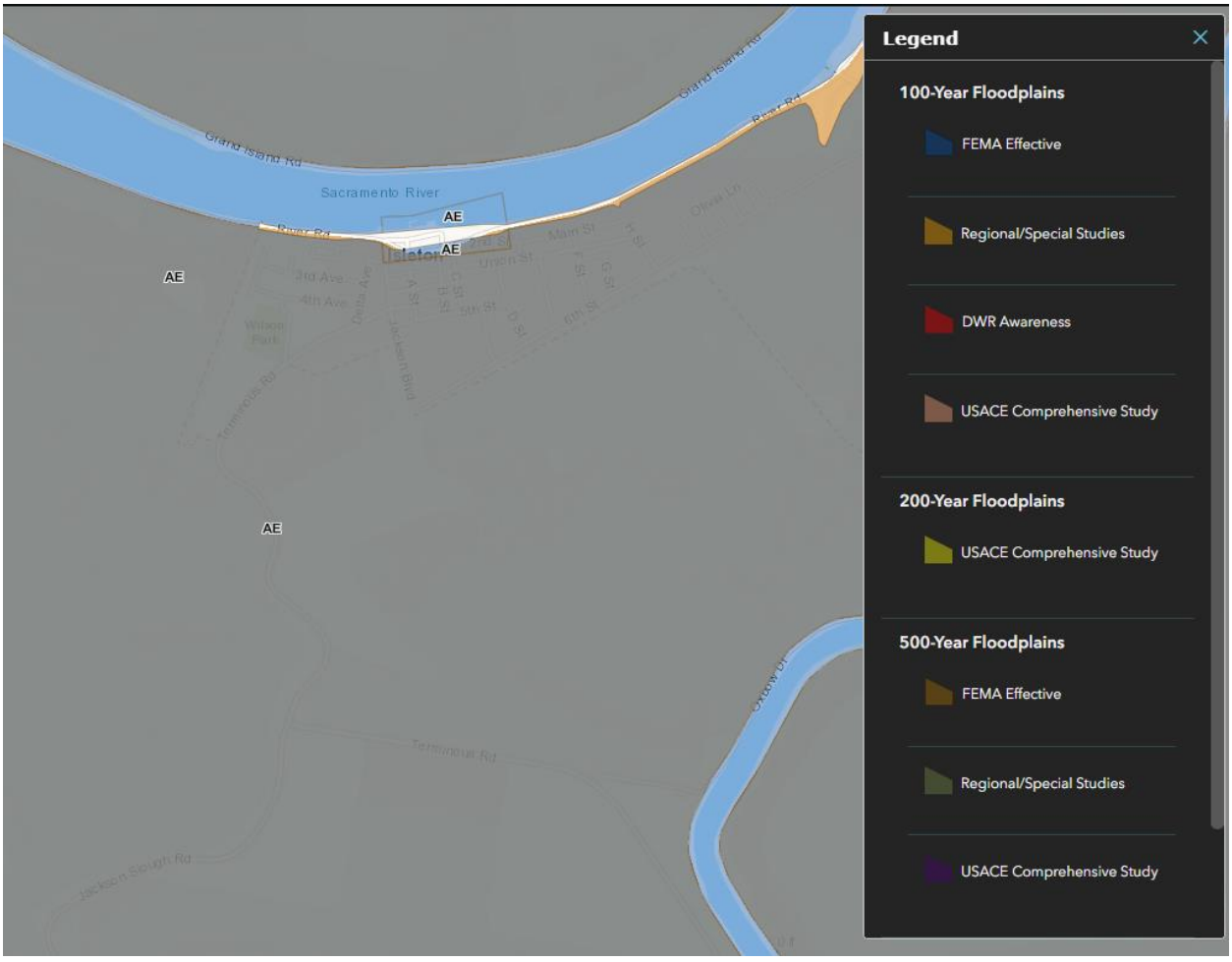
California Department of Water Resources Best Available Maps (BAM)

The FEMA regulatory maps provide just one perspective on flood risks in Sacramento County. Senate Bill 5 (SB 5), enacted in 2007, authorized the California DWR to develop the Best Available Maps (BAM) displaying 100- and 200-year floodplains for areas located within the Nevada-San Joaquin (SAC-SJ) Valley watershed. This effort was completed by DWR in 2008. DWR has expanded the BAM to cover all counties in the State and to include 500-year floodplains.

Different than the FEMA DFIRMs which have been prepared to support the NFIP and reflect only the 100-year event risk, the BAMs are provided for informational purposes and are intended to reflect current 100-, 200-(as applicable), and 500-year event risks using the best available data. The 100-year floodplain limits on the BAM are a composite of multiple 100-year floodplain mapping sources. It is intended to show all currently identified areas at risk for a 100-year flood event, including FEMA's 100-year floodplains. The BAM are comprised of different engineering studies performed by FEMA, Corps, and DWR for assessment of potential 100-, 200-, and 500-year floodplain areas. These studies are used for different planning and/or regulatory applications, and for each flood frequency may use varied analytical and quality control criteria depending on the study type requirements.

The value in the BAMs is that they provide a bigger picture view of potential flood risk to the City than that provided in the FEMA DFIRMs. The BAM map for Isleton is shown in Figure 1-11.

Figure 1-11 City of Isleton – Best Available Map



Source: California DWR

Legend explanation: Blue - FEMA 1%, Orange – Local 1% (developed from local agencies), Red – DWR 1%r (Awareness floodplains identify the 1% annual chance flood hazard areas using approximate assessment procedures.), Pink – USACE 1% (2002 Sac and San Joaquin River Basins Comp Study), Yellow – USACE 0.5% (2002 Sac and San Joaquin River Basins Comp Study), Tan – FEMA 0.2%, Grey – Local 0.2% (developed from local agencies), Purple – USACE 0.2%(2002 Sac and San Joaquin River Basins Comp Study).

Future Development

The potential for flooding may increase as floodwaters are channeled due to land development. Such changes can exacerbate flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. Floodplain modeling and master planning should be based on build out property use to ensure that all new development remains safe from future flooding. While local floodplain management, stormwater management, and water quality regulations and policies address these changes on a site-by-site basis, their cumulative effects can have a negative impact on the overall floodplain.

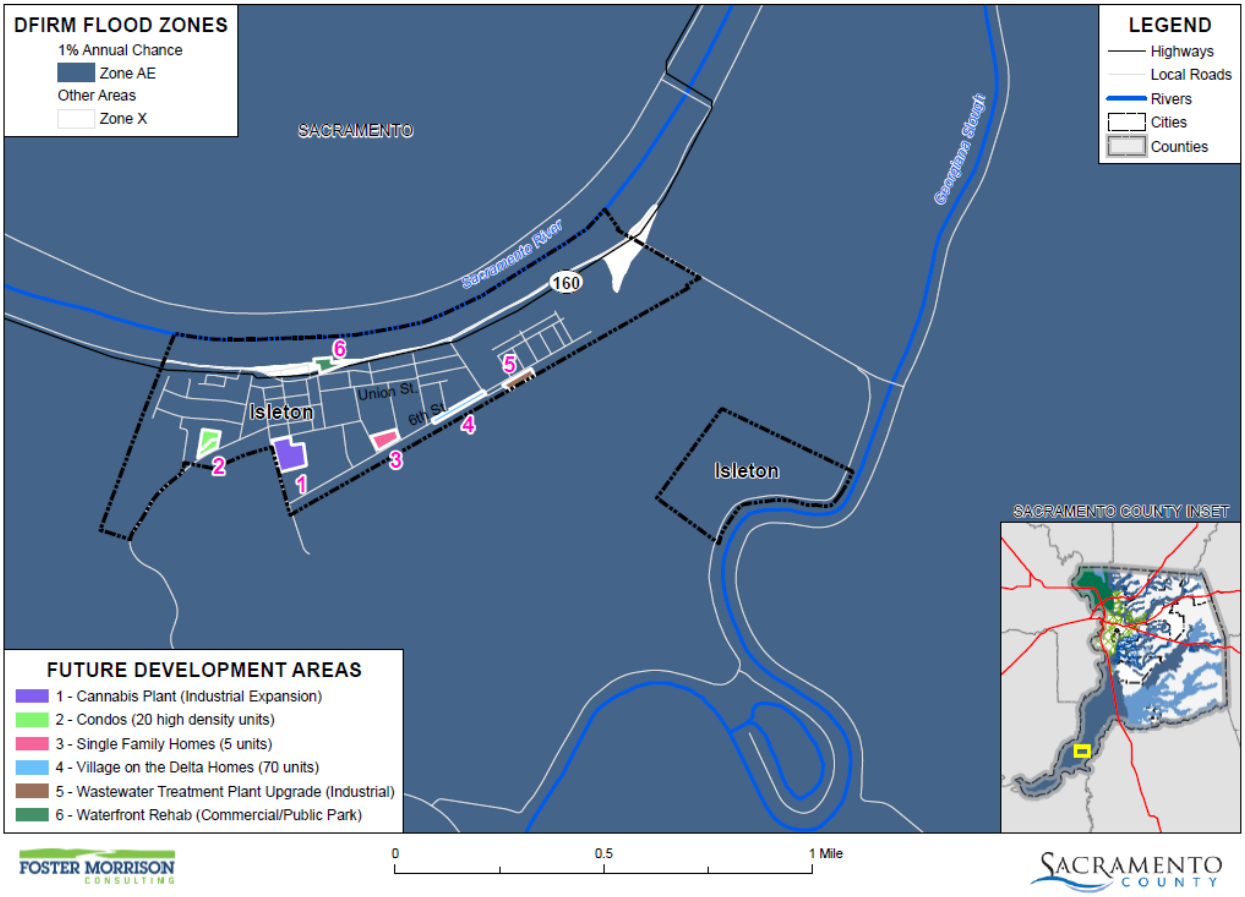
The entire city of Isleton lies within a 100-year flood zone, involving different standards for floor level elevation for residential, rehabilitated residential, and industrial construction. The most recent housing construction typically has involved two stories, with garages at ground level and living quarters on the

second story above the 100-year intensity flood level. The City enforces the floodplain ordinance. If any development is to occur in the floodplain, it would have to conform to the elevation standards of the floodplain ordinance. The City wants to engage an active flood improvement program and flood management program. This would allow the citizens to pursue normal residential and commercial construction.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure 1-12 shows the locations of future development areas the City is planning to develop on the DFIRM flood zones. Table 1-30 shows the parcels and acreages of each future development area in the City in the DFIRM flood zones.

Figure 1-12 City of Isleton – Future Development and FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Table 1-30 City of Isleton – Future Development Parcels and Acres by FEMA DFIRM Flood Zone

DFIRM Flood Zone/Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
1% Annual Chance Flood Hazard			
Cannabis Plant (Industrial Expansion)	1	1	3.00
Condos (20 high density units)	2	0	1.42
Single Family Homes (5 units)	1	0	1.15
Village on the Delta Homes (70 units)	1	0	1.03
Wastewater Treatment Plant Upgrade (Industrial)	1	0	0.90
1% Annual Chance Flood Hazard Total	**6**	**1**	**7.51**
Other Areas			
Waterfront Rehab (Commercial/Public Park)	1	0	0.96
Other Areas Total	**1**	**0**	**0.96**
Grand Total	**7**	**1**	**8.47**

Source: City of Isleton, FEMA 7/19/2018 DFIRM

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The City of Isleton is subject to localized flooding throughout the City. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the City vary by location. Flood durations in the City tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the City tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

The 2017 Isleton Opportunities, Constraints, and Vision report noted that surface water drainage consists of a traditional above-ground curb and gutter collection system and some underground facilities. Much of

the City street system has curb, gutter, and some drop inlets installed with ultimate disposal to major drainage ditches south of the city. Where curb, gutter, and drop inlets are missing, drainage occurs by gravity flow to the lowest points along the street system and adjacent parcels.

The City tracks localized flooding areas. Affected localized flood areas identified by the City of Isleton are summarized in Table 1-31.

Table 1-31 City of Isleton – List of Localized Flooding Problem Areas

Road Name	Flooding	Pavement Deterioration	Washout	High Water	Landslide/ Mudslide	Debris	Downed Trees
Jackson Blvd	X			X			
Hwy 160	X	X		X			
Union St	X	X		X			

Source: City of Isleton

Past Occurrences

The City noted the following areas where localized flooding occurs almost yearly:

During heavy rainfall, Isleton has three areas of concern as detailed in the above table.. At Jackson and 4th, there is a drainage inlet that gets overwhelmed with runoff and causes ponding that reaches into the intersection. At Highway 160 and A St. there is another drainage inlet that gets overwhelmed with rain water that causes 160 to flood. On Union St. between D St and E St the City has problems with ponding due to excessive runoff.

In addition, the East Isleton area/rural region has localized flooding which is widespread but generally minor; the flat land causes floodwaters to spread out reducing threats to life. These areas of potential concern are included in Table 1-31. In this area, roadside ditches and culverts lack capacity and are prone to blockages from debris. In addition, the southern edge of the town is very vulnerable to flooding.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the City and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

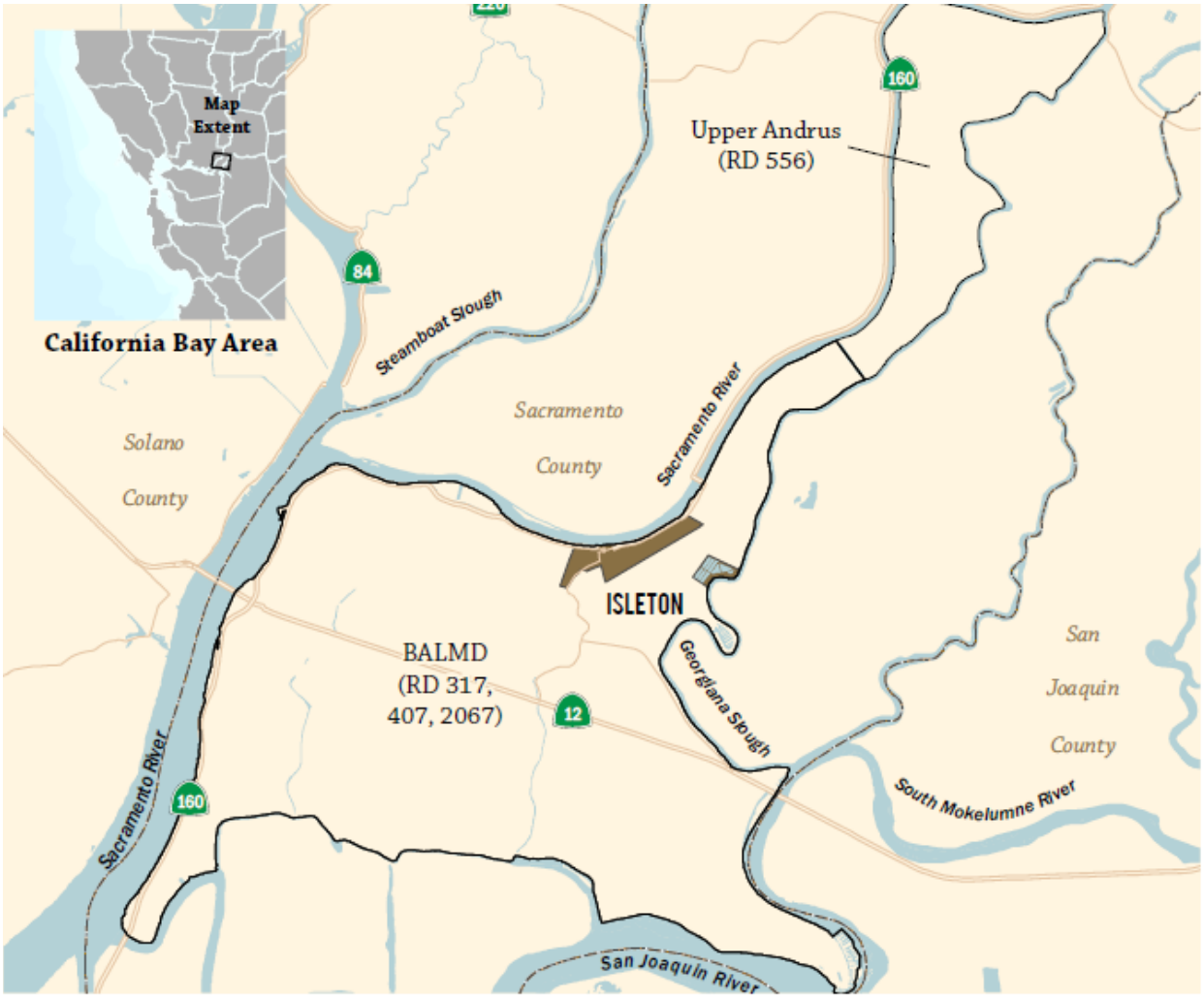
Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

To some extent in the City of Isleton, drainage from roofs and private properties has in the past been allowed to be funneled into the sewage collection system, adding to problems of sewage treatment during wet weather. Fortunately, much of the latter problem has been corrected by City inspection and notice to owners.

The 2017 Isleton Opportunities, Constraints, and Vision report noted that the islands of Brannan, Andrus, and Lower Andrus are represented by individual reclamation districts, each with its own elected Board of Trustees. The reclamation districts (RD) surrounding the city of Isleton include RD2067, RD317, and RD407. These agencies operate the drainage pump facilities and oversee maintenance of the primary drainage canals around Isleton. Recognizing that the levees of these three districts were interconnected and impacted each other, the oversight and maintenance of the levees protecting the three areas were legislatively vested in a single entity known as Brannan-Andrus Levee Maintenance District (BALMD).

RD407 within BALMD oversees dewatering for land areas encompassed by the Sacramento River, the RD556 cross levee, Georgiana Slough, Terminous Road, and the historical meander line of Jackson Slough.

Figure 1-13 City of Isleton – Surface Water Drainage



Source: 2017 Isleton Opportunities, Constraints, and Vision Report

The City has filed to expand its sphere of influence. Generally speaking, the sphere of influence is about a mile west of the City, to Georgiana Slough, and to about two miles east of the City.

Future Development

Future development in the City will add more impervious surfaces causing an increase in stormwater runoff and the continued need to drain these waters. The City will need to be proactive to ensure that increased development has proper siting and drainage for stormwaters. The risk of localized flooding to future development can also be minimized by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater flooding will reduce future risks of losses. The City of Isleton has taken measures to prevent storm water flooding by doing the following:

- Replaced damaged and crushed culvert pipes to help the flow of storm water to the reclamation ditches
- Removed and cleared all debris from storm water drainage ditches.

On an annual basis a vacuum truck is brought in to clean out all storm water collection basins throughout the City. Drainage basins grates have been replaced and repaired to help prevent debris clogs. During the fall the City employees temp help to sweep leaves and all other debris from gutters to prevent this material from causing drain blockages.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Extremely High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main channel of a stream. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

The City has participated in FEMA's Map Modernization Project and the requirements of Title 44 of the Federal Code of Regulations (CFR), Section 65.10 of the National Flood Insurance Program (NFIP) regulations to certify the Laguna West levee system. The Laguna West levee system meets the design, operation and maintenance criteria set forth 44 CFR Section 65.10.

The City's implements levee operation and maintenance activities which provide maintenance recommendations and requirements for specific levee inspections and maintenance operations. Levee inspections and maintenance activities include vegetation control, rutting/depressions, erosion control, slope stability, cracking, rodent control, encroachments/excavation, riprap revetments/banks, closure structures, underseepage relief wells/toe drainage system, seepage/sand boils, debris removal, roadway crown, utilities, minor structures, and mosquito abatement.

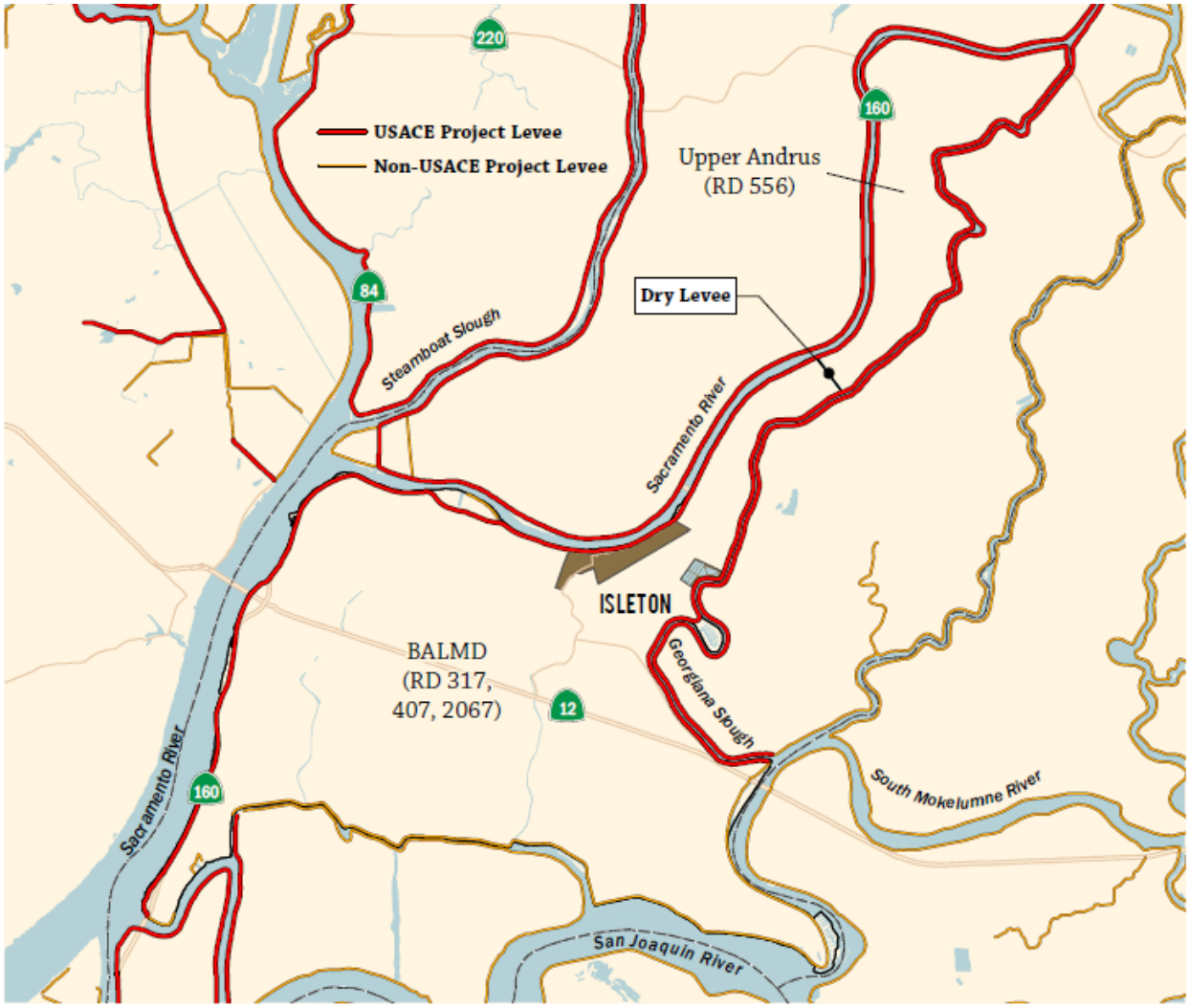
Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the City are not known. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. The HMPC noted that when northern California reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. The levees in the City are not shown as being certified on the DFIRM X Protected by Levee layer. As such, no mapping has been supplied for this Plan Update.

The 2017 City of Isleton Opportunities, Constraints, and Vision Report noted that the City of Isleton is protected by a system of leveed channels, multipurpose reservoirs, and other structures, which comprise the Sacramento River Flood Control Project (SRFCP). The goal of the SRFCP is to reduce the chance of flooding for communities like Isleton. Even with the realization of major physical improvements to the flood management system, the risk of flooding will continue to exist within the city.

The Brannan-Andrus Levee Maintenance District (BALMD) and Reclamation District 556 (RD 556) system of levees provide flood protection for the city of Isleton. Isleton is located along the left bank of the Sacramento River approximately 3.12 miles upstream of its confluence with Steamboat Slough. Isleton sits at an approximate elevation of +5 feet. BALMD staff monitors and maintains the levees on the island and maintains and controls the operations of the seven pumping stations to keep the island dry.

Figure 1-14 City of Isleton – Levees in and near the City



Source: 2017 City of Isleton Opportunities, Constraints, and Vision Report

Brannan-Andrus Island has a population of approximately 1,837, which is made up of a major recreation contingent and the City of Isleton. The maintenance of the levee system is critical to maintain the economy supported by over 10,856 acres of prime agricultural land and 1,500 residents. District levees protect about 1,500 residents, 613 residential structures, 33 gas wells, and approximately 9,088 acres of gas fields (Sacramento County and GEI Consulting Engineers, 2017).

Along RD 556, the flood protection facilities include the Sacramento River Unit 2, Segment 390 and Georgiana Slough Unit 1, and Segment 129 (see Figure 11). BALMD SPFC facilities include Sacramento River Unit 2, Segment 378, Georgiana Slough Unit 1, Segment 40, Mokelumne River Unit 3, Segment 1050, San Joaquin River Unit 4, Segment 1049, and Sevenmile Slough Unit 5, 1048 (see Figure 11). The Sacramento River and Georgiana Slough are project levees, and the Mokelumne and San Joaquin Rivers and Sevenmile Slough are non-project levees. These levee systems primarily protect the small communities of Isleton and the Delta Loop recreational area, in addition to other rural agricultural areas. Oxbow Marina

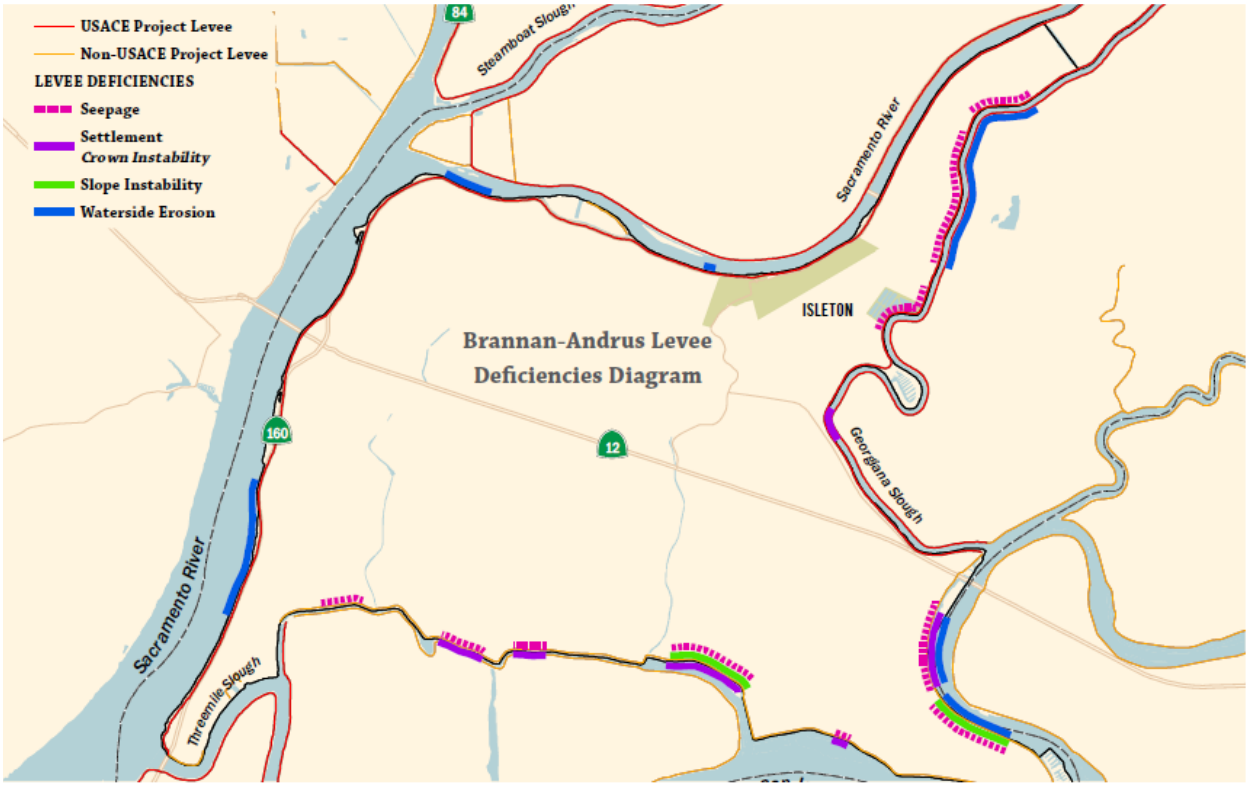
is accessed by the District's levee system. In the event of a flood, the area would be disconnected from services and the area's population would be forced to evacuate.

Isleton and the Delta Loop Recreational Area are protected by a levee system that is bordered by the Sacramento River, Georgiana Slough, Mokelumne River, San Joaquin River, and Sevenmile Slough. Oxbow Marina is outside of the flood protection system, but its access is protected by the system.

There are approximately 26.2 miles of levee that surround Brannan-Andrus Levee Maintenance District with 16.2 miles of project levees and 10 miles of non-project levees. In addition, BALMD is separated from Upper Andrus Island (RD 556) by a 0.46-mile cross levee that is owned by RD 556. RD 556 is surrounded by 11.2 miles of project levees. In the event of a levee failure and flood on RD 556, the cross levee could likely overtop and flood BALMD and the small communities of Isleton, Oxbow Marina, and the Delta Loop Recreational Area. Therefore, an evaluation is needed of the entire levee system surrounding the two districts as well as the cross levee (Sacramento County and GEI Consulting Engineers, 2017).

Most of the levees surrounding the districts do not meet the FEMA 100-year levee standard. In addition, there are several areas with Bulletin 192-82 (agricultural levee design standards) geometry deficiencies. As part of the Non-Urban Levee Evaluation (NULE) investigations, DWR analyzed the deficiencies currently (2017)associated with passing the 1957 design flow. The investigations concluded that some segments of the levees protecting Isleton, Oxbow Marina, and the Delta Loop Recreation Area suffer from under-seepage, through-seepage, landside stability, and geometry deficiencies (see Figure 1-15).

Figure 1-15 Brannan Andrus Levee Deficiencies Diagram



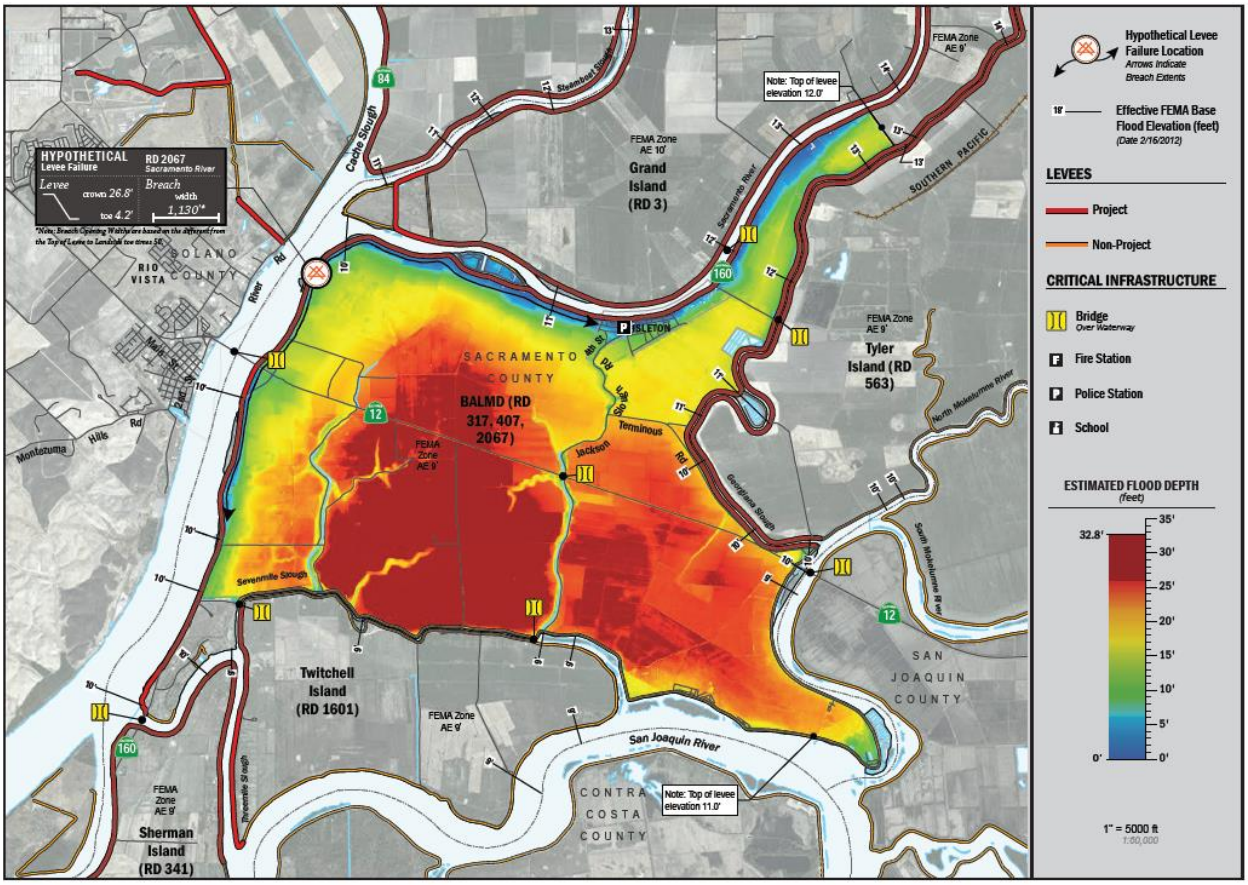
Source: 2017 City of Isleton Opportunities, Constraints, and Vision Report

The County, BALMD, and RD 556 have been active participants in DWR's Delta Flood Emergency Preparedness, Response, and Recovery Program, including activities associated with updating the Reclamation District's Flood Emergency and Safety Plans (ESPs), and Multi-Hazard Mitigation Plan (MHMP) for each of the County's RDs/Levee Maintaining Agencies (LMAs) located in the Delta. The ESPs and MHMPs for each of the RDs/LMAs in the Sacramento-San Joaquin Delta have been prepared and updated as non-structural measures to improve flood emergency preparedness, response, and recovery actions for each of the communities and adjoining agricultural areas. Simulated levee breaches of the State Plan of Flood Control (SPFC) levee sections indicating timing and potential deep flooding conditions have been developed for each of the RDs/LMAs inclusive of all the small communities and adjoining agricultural areas in the Delta, including the Isleton region.

The BALMD ESP provides mapping to show the projected flood depth and flood timing if a levee protecting BALMD were to fail. There were three hypothetical levee failure "breach" model scenarios provided for BALMD. The first scenario model was on the left bank of the Sacramento River across from Rio Vista. Tidal conditions as well as flows from the Yolo Bypass greatly impact the results of the levee failure in this location. The second scenario model was on the right bank of the Mokelumne River downstream of the confluence with Georgiana Slough. The third scenario model was on the right bank of the Sacramento River upstream of the city of Isleton and downstream of the cross levee. The criteria to approximate the hypothetical levee failure opening in the hydraulic model was developed by the DWR and USACE (Sacramento County and GEI Consulting Engineers, 2017).

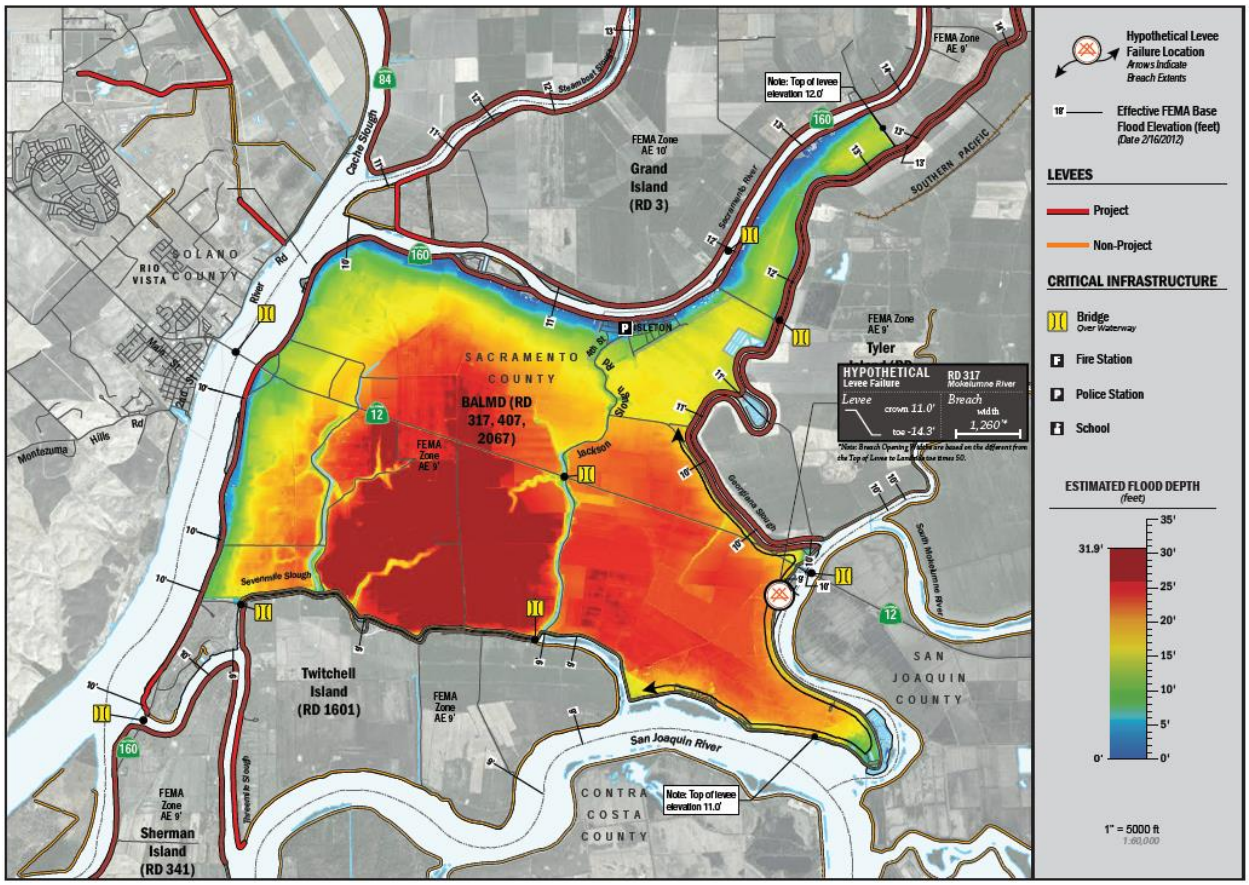
Maps in Figure 1-16, Figure 1-17, and Figure 1-18 provide the estimated depth of flooding (in feet) in assuming a levee fails and no relief cuts were placed in the levee. The results indicate that a levee failure located on the Sacramento River could produce enough volume to fill the basin close to the effective Federal Emergency Management Agency (FEMA) elevation. The lowest ground elevation in the basin is approximately El. -22.0 feet and the lowest top of levee along the San Joaquin is approximately El. 11.0 feet (Sacramento County and GEI Consulting Engineers, 2017).

Figure 1-16 City of Isleton – Depth of Flooding from Levee Breach Scenario #1



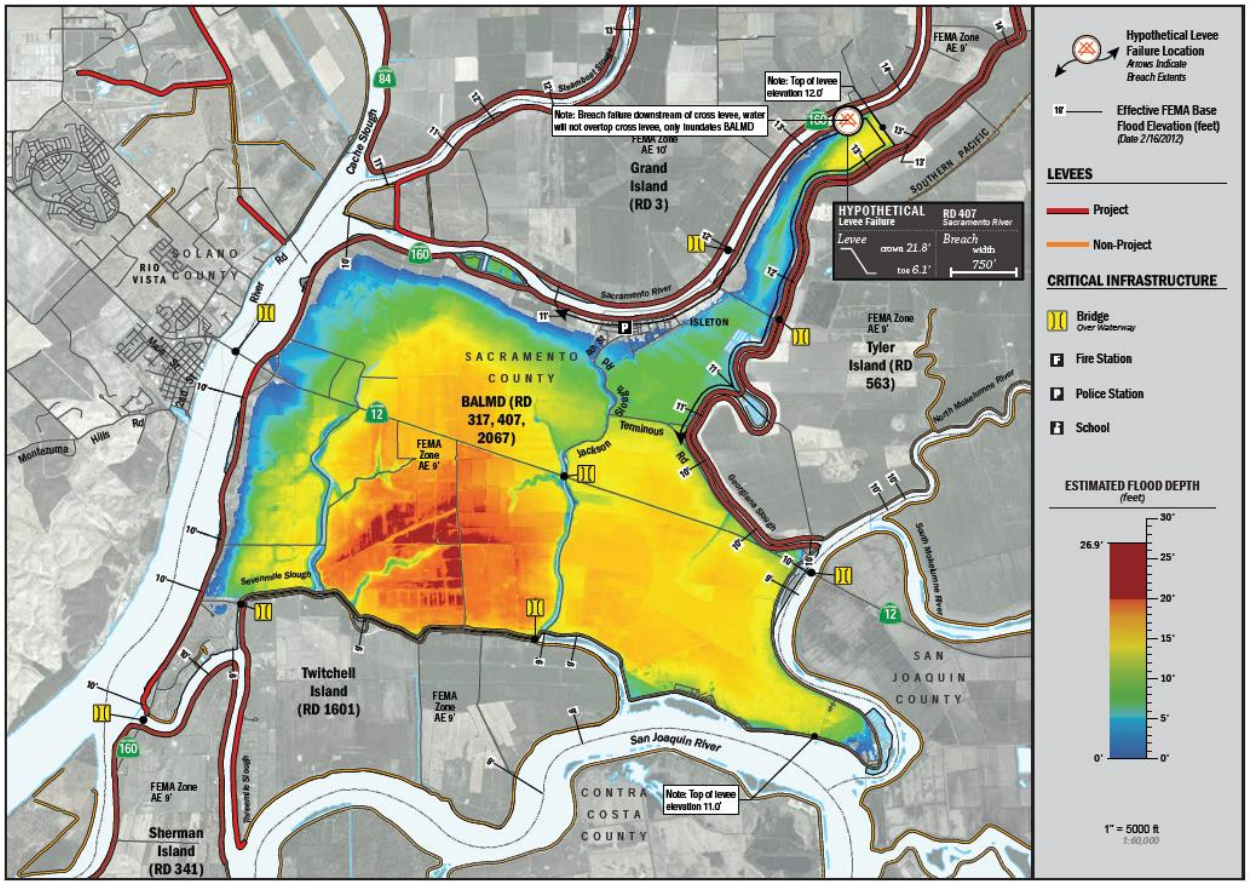
Source: 2017 City of Isleton Opportunities, Constraints, and Vision Report

Figure 1-17 City of Isleton – Depth of Flooding from Levee Breach Scenario #2



Source: 2017 City of Isleton Opportunities, Constraints, and Vision Report

Figure 1-18 City of Isleton – Depth of Flooding from Levee Breach Scenario #3



Source: 2017 City of Isleton Opportunities, Constraints, and Vision Report

Past Occurrences

There have been two state and two federal disaster declaration from levee failure. This can be seen in Table 1-32.

Table 1-32 Sacramento County – State and Federal Levee Failure Disaster Declarations 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Levee Break	2	1972, 1980	2	1972, 1980

Source: Cal OES, FEMA

The Delta has a long history of flooding, but little definitive data on specific flood events are available. Andrus, Brannan, and Twitchell Islands, have all experienced historical floods. Large areas of the delta were inundated during floods, and it is probable that the City of Isleton was damaged or seriously threatened.

The 1950 and 1955 floods were outstanding in peak outflows through the Delta and several islands were flooded. The City of Isleton, however, was not affected. In December 1965 and January 1965, the

coincidental occurrence of very high tides and heavy inflow resulted in unusually high stages on all Delta waterways. Concurrent strong onshore winds generated high waves that created very perilous conditions for many islands. Levees protecting Twitchell Island were seriously threatened by erosion and overtopping, but a massive flood fighting effort prevented overflow, destruction of levees and inundation of the City of Isleton.

The HMPC noted that in 1972, a levee break flooded areas of the City. The levee separating Andrus Island and the San Joaquin River failed from unknown causes in June 1972, resulting in the flooding of Andrus and Brannan Islands (including the City of Isleton). High winds had occurred prior to the break, but there had been no antecedent rainfall and the tidal cycle was not on the higher side. Approximately 200,000 acre-feet of water from the San Joaquin River inundated Andrus and Brannan Islands. Activities to fight floods to protect the City of Isleton proved to be a losing battle, and almost all of the City was flooded. The entire population was evacuated, with some residents not being able to return to their homes for 4 months. Approximately one-half of the housing units in the City were damaged or destroyed. About 15,000 acres were inundated and flood damages for the event approximated $30 million. Specific damages values for the City were unavailable.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Due to the low-lying tidal nature of the Delta and low elevation of the City of Isleton (just above 5 feet), the entire community must be considered to be in a floodplain. Flood conditions in the City of Isleton are influenced by Pacific Ocean tides and strong onshore winds, as well as high outflow from streams originating in the foothills or higher areas of the Sierra Nevada. Specifically, the City of Isleton may flood when the levees protecting Andrus, Brannan and Twitchell Islands, are either overtopped or fail, as a result of the separate or coincidental occurrence of higher high tides and high outflow through the Delta. The waterways surrounding the islands are the Mokelumne, Sacramento and San Joaquin Rivers, and Georgiana, Sevenmile and Threemile Sloughs. The levees within the City of Isleton are maintained by the levee district.

The levees in the City are not shown as being certified on the DFIRM X Protected by Levee layer. As such, no mapping has been supplied for this Plan Update.

Future Development

Future development built in the areas protected by levees is subject to being built to the standards in the City of Isleton Floodplain Ordinance. Whether a levee is certified as providing protection from the 1% annual chance flood will also factor into development requirements. Future development in levee protected areas may be affected by this hazard, thus there will always be some level of concern.

Severe Weather: Extreme Heat

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

According to FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and lasts for several weeks. Heat kills by taxing the human body beyond its abilities. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature." Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

In addition to the risks faced by citizens of the City, there are risks to the built environment from extreme heat. While extreme heat on its own does not usually affect structures, extreme heat during times of drought can cause wildfire risk to heighten. Extreme heat can lead to power outages and when combined with high winds, to Public Safety Power Shutdown (PSPS) events, creating significant issues in the City. However, PSPS events in the City have been declining with PG&E's refined system for shutting power off in high wildfire risk areas.

Location and Extent

Heat is a regional phenomenon and affects the whole of the City. Heat emergencies are often slower to develop, taking several days of continuous, oppressive heat before a significant or quantifiable impact is seen. Heat waves do not strike victims immediately, but rather their cumulative effects slowly affect vulnerable populations and communities. Heat waves do not generally cause damage or elicit the immediate response of floods, fires, earthquakes, or other more "typical" disaster scenarios.

The NWS has in place a system to initiate alert procedures (advisories or warnings) when extreme heat is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. The NWS HeatRisk forecast provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0-4) and color (green/yellow/orange/red/magenta) scale which is similar in approach to the Air Quality Index (AQI) or the UV Index. This can be seen in Section 4.3.3 of the Base Plan.

Past Occurrences

The City Planning Team noted that since extreme heat is a regional phenomenon, events that affected the County also affected the City. Those past occurrences were shown in the Base Plan in Section 4.3.3.

Vulnerability to and Impacts from Extreme Heat

The City experiences temperatures in excess of 100°F during the summer and fall months. The temperature moves to 105-115°F in rather extreme situations. During these times, drought conditions may worsen and the City may see an increase in dry fuels. Also, power outage events may occur during these times as well. Health issues are the primary concern with this hazard, although economic impacts can also be an issue.

The elderly and individuals below the poverty level are the most vulnerable to extreme temperatures. Nursing homes and elder care facilities are especially vulnerable to extreme heat events if power outages occur and air conditioning is not available. In addition, individuals below the poverty level may be at increased risk to extreme heat if use of air conditioning is not affordable. This is especially true of homeless people and the transient population.

Days of extreme heat have been known to result in medical emergencies, and unpredictable human behavior. Periods of extended heat and dryness (droughts) can have major economic, agricultural, and water resources impacts. Extreme heat can also dry out vegetations, making it more vulnerable to wildfire ignitions.

Future Development

Future development of new buildings in the City will likely not be affected by extreme heat. Extreme heat is more likely to affect vulnerable populations. Vulnerability to extreme heat will increase as the average age of the population in each City shifts. It is encouraged that nursing homes and elder care facilities have emergency plans or backup power to address power failure during times of extreme heat. Low income residents and homeless populations are also vulnerable. Cooling centers for these populations should be utilized when necessary.

Severe Weather: Heavy Rains and Storms

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the City occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the City falls mainly in the fall, winter, and spring months. Wind often accompanies these storms; hail and lightning are rare in the City.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the City. All portions of the City are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Hail and lightning are rare in the City and Sacramento County. Duration of severe storms in California, Sacramento County, and the City can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the City. This is the cause of many of the federal disaster declarations related to flooding.

In late 2016 the Wastewater Treatment Plant almost reached capacity during intense rains. This situation was going to lead to street flooding and unsanitary street conditions. The WWTP is still vulnerable to this catastrophe.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the City. These events can cause significant and localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the City, but also can cause damage, with lightning occasionally igniting wildfires.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Power outages may also occur. Heavy rains and storms often result in flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

The City of Isleton's Wastewater Treatment Plant, and City Hall are at risk. All of the City's operations are based out of these buildings. These storms also cause increases of infiltration that triples the inflow to the wastewater treatment plant. With the new development, Village on the Delta, these storms could cause amounts of water to be treated to exceed the amount of daily flow the wastewater plant can handle. Primarily the vulnerabilities are to do the being at low elevations and a limited wastewater treatment facility.

Future Development

Building codes in the City ensure that new development is built to current building standards, which should reduce the risk to future development in the City from heavy rains and storms. New critical facilities should be built to withstand hail damage, lightning, and thunderstorm winds. With adherence to development

standards, future losses to new development should be minimal. The City is conducting a sewer plant study that is expected to lead to WWTP upgrade by 2025.

Wildfire

Likelihood of Future Occurrence–Unlikely
Vulnerability–Low

Though considered a low significance hazard, due to its importance in the State of California, wildfire is profiled here. Wildfire is not considered a priority hazard to the City for mitigation planning and action purposes.

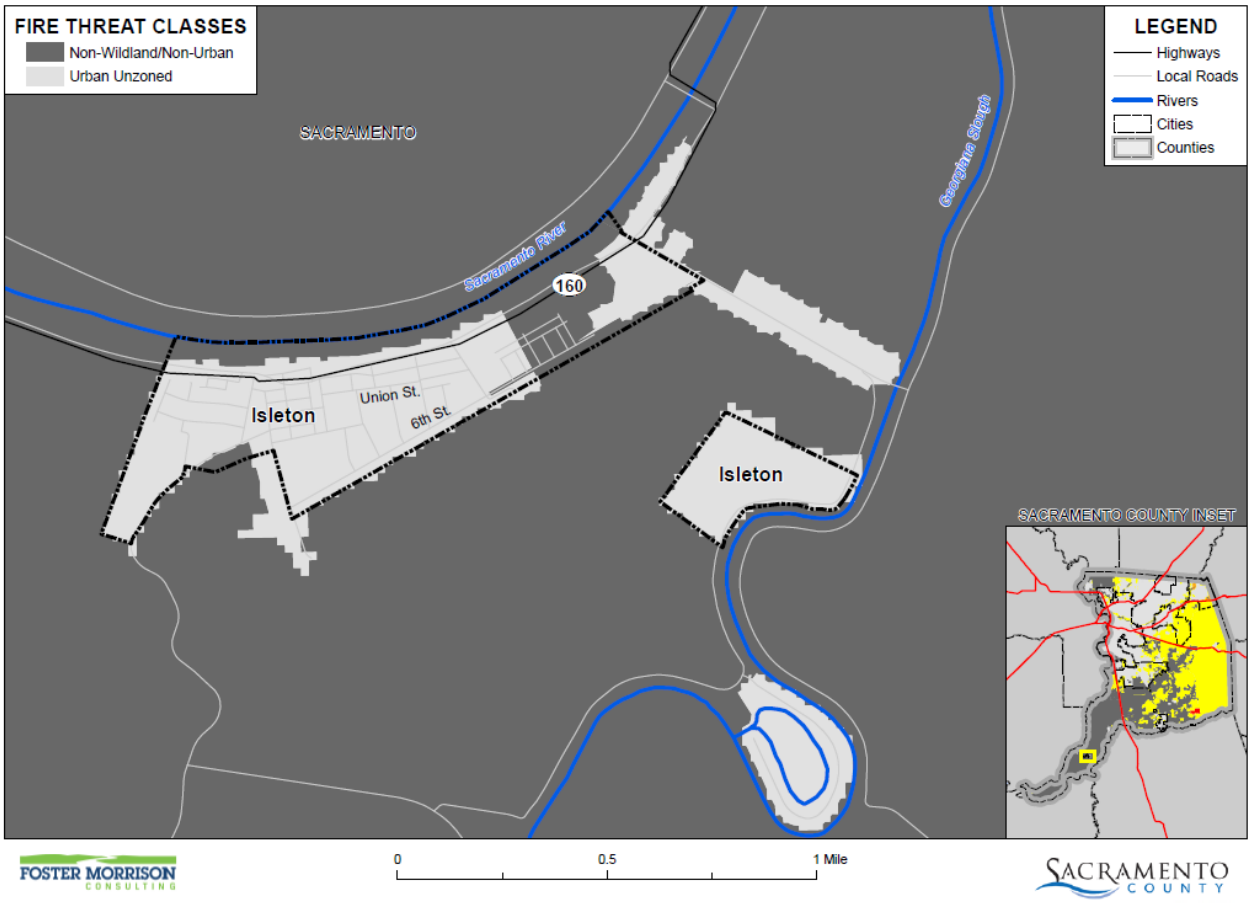
Hazard Profile and Problem Description

Wildland fire and the risk of a conflagration is an ongoing concern for the City of Isleton. Throughout California, communities are increasingly concerned about wildfire safety as increased development in the foothills and mountain areas and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brushlands, as well as any structures located within them. Where there is human access to wildland areas the risk of fire increases due to a greater chance for human carelessness and historical fire management practices. Historically, the fire season extends from early spring through late fall of each year during the hotter, dryer months; however, in recent years, the risk of wildfire has become a year around concern. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds. These high winds can result in red flag days, and can result in PSPS events in the City. While wildfire risk has predominantly been associated with more remote forested areas and wildland urban interface (WUI) areas, significant wildfires can also occur in more populated, urban areas.

Location and Extent

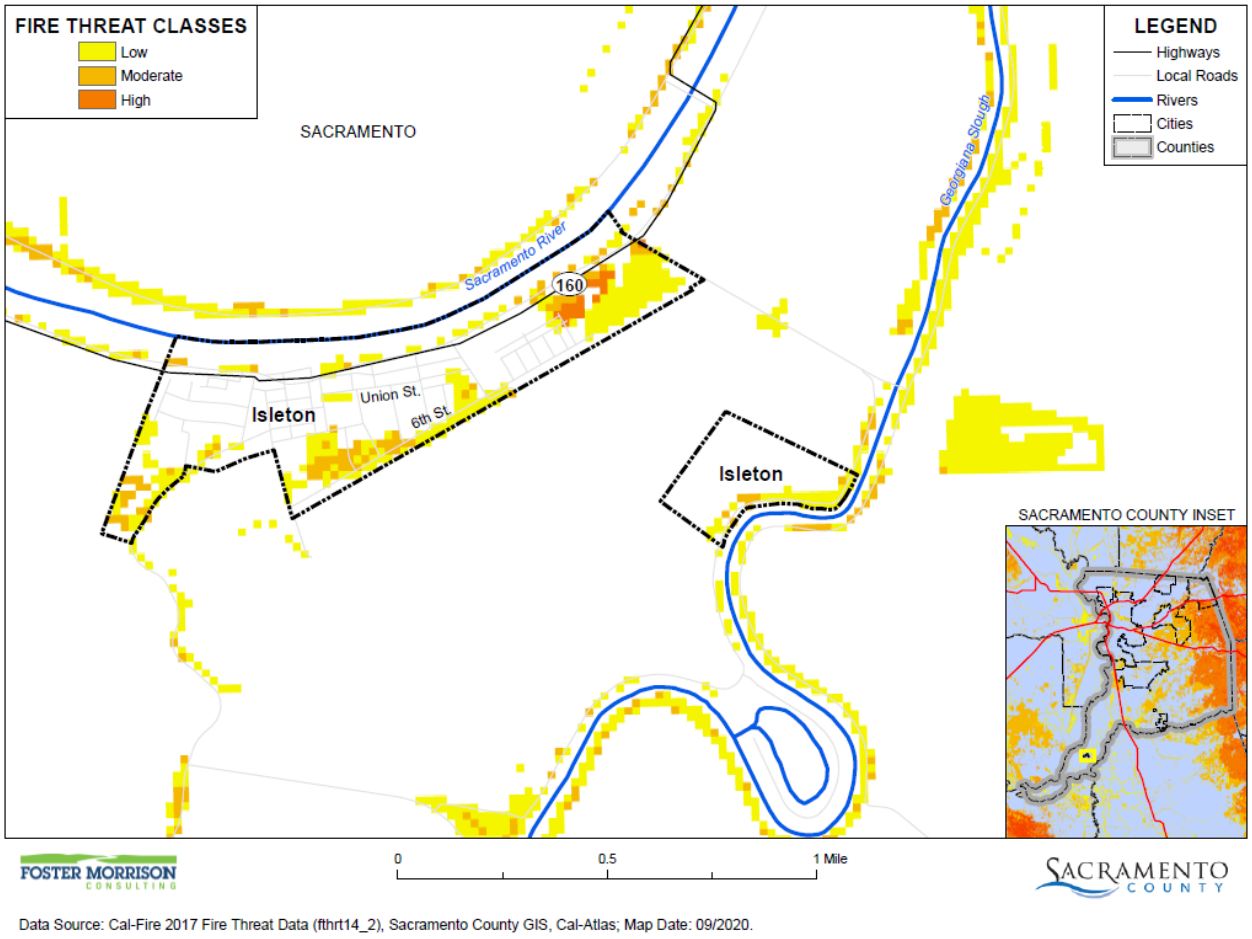
Wildfire can affect all areas of the City. CAL FIRE has estimated that the risk varies across the City and has created maps showing risk variance. Following the methodology described in Section 4.3.19 of the Base Plan, wildfire maps for the City of Isleton were created. Figure 1-19 shows the CAL FIRE Fire Hazard Severity Zone (FHSZS) in the City. As shown on the maps, FHSZs within the City fall outside the moderate or higher FHSZ. Figure 1-20 shows the CAL FIRE Fire Threat Areas in the City. As shown on the maps, fire threat within the City range from No Threat to High.

Figure 1-19 City of Isleton – Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure 1-20 City of Isleton – Fire Threat Areas



Wildfires tend to be measured in structure damages, injuries, and loss of life as well as on acres burned. Fires can have a quick speed of onset, especially during periods of drought or during hot dry summer months. Fires can burn for a short period of time, or may have durations lasting for a week or more. Geographical FHSZ extent from CAL FIRE is shown in Table 1-33. Geographical Fire Threat Area extents from CAL FIRE are shown on Table 1-34.

Table 1-33 City of Isleton – Geographical FHSZ Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	0	0.00%	0	0.00%	0	0.00%
Moderate	0	0.00%	0	0.00%	0	0.00%
Non-Wildland/non-Urban	35.2	15.08%	0.3	0.40%	34.9	20.81%
Urban Unzoned	198.0	84.92%	65.2	99.60%	132.8	79.19%
Total	**233.2**	**100.00%**	**65.5**	**100.00%**	**167.7**	**100.00%**

Source: CAL FIRE

Table 1-34 City of Isleton – Geographical Fire Threat Area Extents

Fire Hazard Severity Zone	Total Acres	% of Total Acres	Improved Acres	% of Total Improved Acres	Unimproved Acres	% of Total Unimproved Acres
Very High	0	0.00%	0	0.00%	0	0.00%
High	3.4	1.46%	0.1	0.17%	3.3	1.97%
Moderate	16.2	6.96%	2.2	3.32%	14.0	8.37%
Low	46.4	19.88%	4.6	6.99%	41.8	24.91%
No Threat	167.2	71.70%	58.6	89.52%	108.6	64.74%
Total	**233.2**	**100.00%**	**65.5**	**100.00%**	**167.7**	**100.00%**

Source: CAL FIRE

Past Occurrences

There has been no state and one federal disaster declaration due to fire, as shown in Table 1-35. It should be noted that this fire disaster was from an explosion in Roseville, and not from an actual wildfire.

Table 1-35 Sacramento County – State and Federal Wildfire Disaster Declarations 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Fire	1	1973	0	–

Source: Cal OES, FEMA

Vulnerability to and Impacts from Wildfire

Fuel loads in the City can create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. The more urbanized areas within the County are not immune from fire. The dry vegetation and hot and sometimes windy weather, combined with continued growth in the wildfire prone areas, results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. As development continues throughout the County and City, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

Isleton is not immune to numerous types of grass and brush fires and any one of them may accelerate into an urban interface wildfire. Such a situation could lead to evacuation of large portions of the population and the potential for significant loss of personal property, structures, and rangeland. The natural fuels available in or near the City vary greatly in the rate and intensity of burning. Fires in heavy brush and stands of trees burn with great intensity but more slowly than in dry grass and leaves. Dense fuels will propagate fire better than sparse fuels. This is the case at The Village on the Delta site at the east side.

Potential impacts from wildfire include loss of life and injuries; damage to structures and other improvements, natural and cultural resources, croplands, and timber; and loss of recreational opportunities.

Wildfires can cause short-term and long-term disruption to the City. Fires can have devastating effects on watersheds through loss of vegetation and soil erosion, which may impact the City by changing runoff patterns, increasing sedimentation, reducing natural and reservoir water storage capacity, and degrading water quality. Fires can also affect air quality in the City; smoke and air pollution from wildfires can be a severe health hazard.

Although the physical damages and casualties arising from wildland-urban interface fires may be severe, it is important to recognize that they also cause significant economic impacts by resulting in a loss of function of buildings and infrastructure. Economic impacts of loss of transportation and utility services may include traffic delays/detours from road and bridge closures and loss of electric power, potable water, and wastewater services. Schools and businesses can be forced to close for extended periods of time. Recently, the threat of wildfire, combined with the potential for high winds, heat, and low humidity, has caused PG&E to initiate a PSPS which can also significantly impact a community through loss of services, business closures, and other impacts associated with loss of power for an extended period. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

Assets at Risk

Based on the vulnerability of Isleton to the wildfire hazard, the sections that follow describes significant assets at risk in the City of Isleton. This section includes the values at risk, population at risk, and critical facilities at risk.

Values at Risk in Fire Hazard Severity Zones

GIS was used to determine the possible impacts of wildfire within the City of Isleton. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire hazard severity zones. Summary analysis results for Isleton are shown in Table 1-36, which summarizes total parcel counts, improved parcel counts and their structure values by fire hazard severity zone.

Table 1-36 City of Isleton – Count and Value of Parcels by Fire Hazard Severity Zone

Fire Hazard Severity Zone	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Isleton						
Non-Wildland/Non-Urban	70	4	$717,781	$1,041,625	$520,813	$2,280,218
Urban Unzoned	466	334	$21,999,430	$40,226,654	$25,532,743	$87,758,826
Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table 1-37 breaks out the Table 1-36 by adding the property use details by fire hazard severity zone for the City. As shown in both of these tables, the City has no properties in the very high or high fire hazard

severity zone. All of the City falls within the non-wildland/non-urban and urban unzoned fire hazard severity zones.

Table 1-37 City of Isleton – Count and Value of Parcels by Fire Hazard Severity Zone and Property Use

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Non-Wildland/Non-Urban						
Agricultural	1	0	$32,472	$0	$0	$32,472
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	5	0	$150	$0	$0	$150
Office	0	0	$0	$0	$0	$0
Public/Utilities	1	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	4	4	$336,256	$1,041,625	$520,813	$1,898,693
Retail / Commercial	1	0	$10	$0	$0	$10
Unknown	0	0	$0	$0	$0	$0
Vacant	58	0	$348,893	$0	$0	$348,893
Non-Wildland/Non-Urban Total	**70**	**4**	**$717,781**	**$1,041,625**	**$520,813**	**$2,280,218**
Urban Unzoned						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	8	8	$208,114	$1,009,072	$1,009,072	$2,226,258
Industrial	5	5	$2,126,988	$1,224,909	$1,837,364	$5,189,260
Miscellaneous	15	0	$883,988	$0	$0	$883,988
Office	5	4	$447,754	$693,344	$693,344	$1,834,442
Public/Utilities	27	1	$44,163	$32,966	$32,966	$110,095
Recreational	0	0	$0	$0	$0	$0
Residential	256	253	$12,719,462	$30,595,135	$15,297,571	$58,612,168
Retail / Commercial	59	58	$2,600,068	$6,662,426	$6,662,426	$15,924,920
Unknown	0	0	$0	$0	$0	$0
Vacant	91	5	$2,968,893	$8,802	$0	$2,977,695
Urban Unzoned Total	**466**	**334**	**$21,999,430**	**$40,226,654**	**$25,532,743**	**$87,758,826**

Fire Hazard Severity Zone / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Values at Risk in Fire Threat Areas

GIS was used to determine the possible impacts of wildfire within the City of Isleton. The methodology described in Section 4.3.19 of the Base Plan was followed in determining structures and values at risk in fire threat area. Summary analysis results for Isleton are shown in Table 1-38, which summarizes total parcel counts, improved parcel counts and their structure values by fire threat area. Table 1-39 breaks out the Table 1-38 by adding the property use details by threat areas for the City.

Table 1-38 City of Isleton – Count and Value of Parcels by Fire Threat Area

Fire Threat Class	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Very High	0	0	$0	$0	$0	$0
High	1	0	$45,900	$0	$0	$45,900
Moderate	9	0	$539,519	$0	$0	$539,519
Low	27	6	$1,846,908	$990,414	$494,473	$3,331,796
No Threat	499	332	$20,284,884	$40,277,865	$25,559,083	$86,121,829
Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Table 1-39 City of Isleton – Count and Value of Parcels by Fire Threat Area and Property Use

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
High						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	0	0	$0	$0	$0	$0
Office	0	0	$0	$0	$0	$0
Public/Utilities	0	0	$0	$0	$0	$0
Recreational	0	0	$0	$0	$0	$0
Residential	0	0	$0	$0	$0	$0
Retail/ Commercial	0	0	$0	$0	$0	$0

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Unknown	0	0	$0	$0	$0	$0
Vacant	1	0	$45,900	$0	$0	$45,900
High Total	**1**	**0**	**$45,900**	**$0**	**$0**	**$45,900**
Moderate						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	0	0	$0	$0	$0	$0
Office	0	0	$0	$0	$0	$0
Public/Utilities	2	0	$180	$0	$0	$180
Recreational	0	0		$0	$0	$0
Residential	0	0	$0	$0	$0	$0
Retail/ Commercial	0	0	$0	$0	$0	$0
Unknown	0	0	$0	$0	$0	$0
Vacant	7	0	$539,339	$0	$0	$539,339
Moderate Total	**9**	**0**	**$539,519**	**$0**	**$0**	**$539,519**
Low						
Agricultural	0	0	$0	$0	$0	$0
Care/Health	0	0	$0	$0	$0	$0
Church/Welfare	0	0	$0	$0	$0	$0
Industrial	0	0	$0	$0	$0	$0
Miscellaneous	5	0	$814,337	$0	$0	$814,337
Office	0	0	$0	$0	$0	$0
Public/Utilities	4	0	$9	$0	$0	$9
Recreational	0	0	$0	$0	$0	$0
Residential	4	4	$255,889	$979,150	$489,575	$1,724,615
Retail/ Commercial	1	1	$3,050	$4,898	$4,898	$12,846
Unknown	0	0	$0	$0	$0	$0
Vacant	13	1	$773,623	$6,366	$0	$779,989
Low Total	**27**	**6**	**$1,846,908**	**$990,414**	**$494,473**	**$3,331,796**
No Threat						
Agricultural	1	0	$32,472	$0	$0	$32,472
Care/Health	0	0	$0	$0	$0	$0

Fire Threat Class / Property Use	Total Parcel Count	Improved Parcel Count	Total Land Value	Improved Structure Value	Estimated Contents Value	Total Value
Church/Welfare	8	8	$208,114	$1,009,072	$1,009,072	$2,226,258
Industrial	5	5	$2,126,988	$1,224,909	$1,837,364	$5,189,260
Miscellaneous	15	0	$69,801	$0	$0	$69,801
Office	5	4	$447,754	$693,344	$693,344	$1,834,442
Public/Utilities	22	1	$43,974	$32,966	$32,966	$109,906
Recreational	0	0	$0	$0	$0	$0
Residential	256	253	$12,799,829	$30,657,610	$15,328,809	$58,786,246
Retail/ Commercial	59	57	$2,597,028	$6,657,528	$6,657,528	$15,912,084
Unknown	0	0	$0	$0	$0	$0
Vacant	128	4	$1,958,924	$2,436	$0	$1,961,360
No Threat Total	**499**	**332**	**$20,284,884**	**$40,277,865**	**$25,559,083**	**$86,121,829**
Isleton Total	**536**	**338**	**$22,717,211**	**$41,268,279**	**$26,053,556**	**$90,039,044**

Source: Sacramento County 2020 Parcel/Assessor's Data, CAL FIRE

Population at Risk

The FHSZ dataset was overlayed on the parcel layer. Those residential parcel centroids that intersect the FHSZs were counted and multiplied by the 2010 Census Bureau average household factors for the City of Isleton – 2.70. According to this analysis, there is a total population of 0 residents of Isleton at risk to moderate or higher FHSZs, while there is a total of 0 in the moderate or higher fire threat areas. This is shown in Table 1-40 and Table 1-41, respectively.

Table 1-40 City of Isleton – Count of Improved Residential Parcels and Population by Fire Hazard Severity Zone

Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Isleton	0	0	0	0	0	0

Source: CAL FIRE, US Census Bureau Average Household Sizes: Isleton (2.7)

Table 1-41 City of Isleton – Count of Improved Residential Parcels and Population by Fire Threat Area

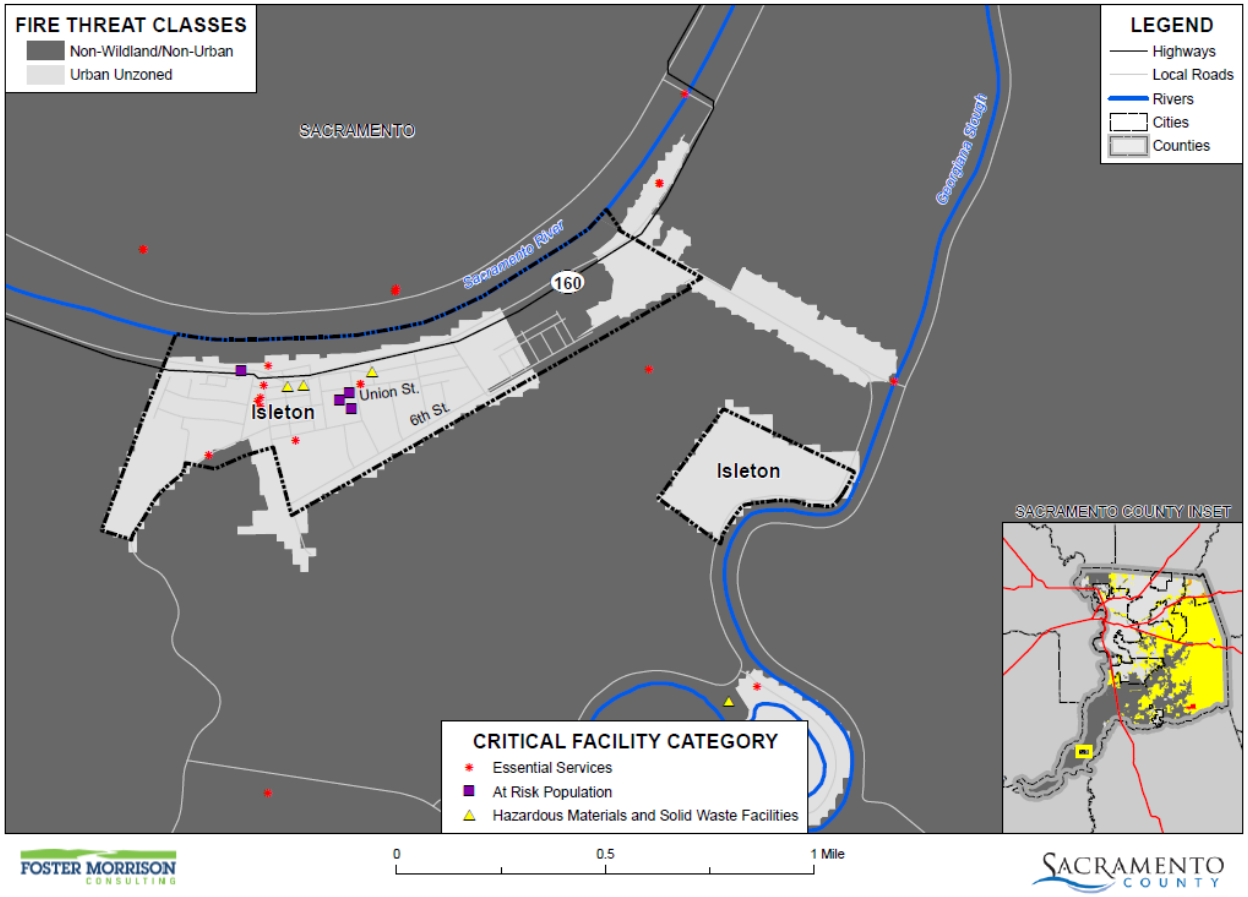
Jurisdiction	Very High		High		Moderate	
	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk	Improved Residential Parcels	Population at Risk
Isleton	0	0	0	0	0	0

Source: CAL FIRE, US Census Bureau Average Household Sizes: Isleton (2.7)

Critical Facilities at Risk

An analysis was performed on the critical facility inventory in Isleton in identified FHSZs. Critical facilities in a FHSZ in the City of Isleton are shown in Figure 1-21 and detailed in Table 1-42. Critical facilities in a fire threat area in the City of Isleton are shown in Figure 1-22 and detailed in Table 1-43. Details of critical facility definition, type, name and address and jurisdiction by fire hazard severity zone are listed in Appendix F.

Figure 1-21 City of Isleton – Critical Facilities in Fire Hazard Severity Zones



Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

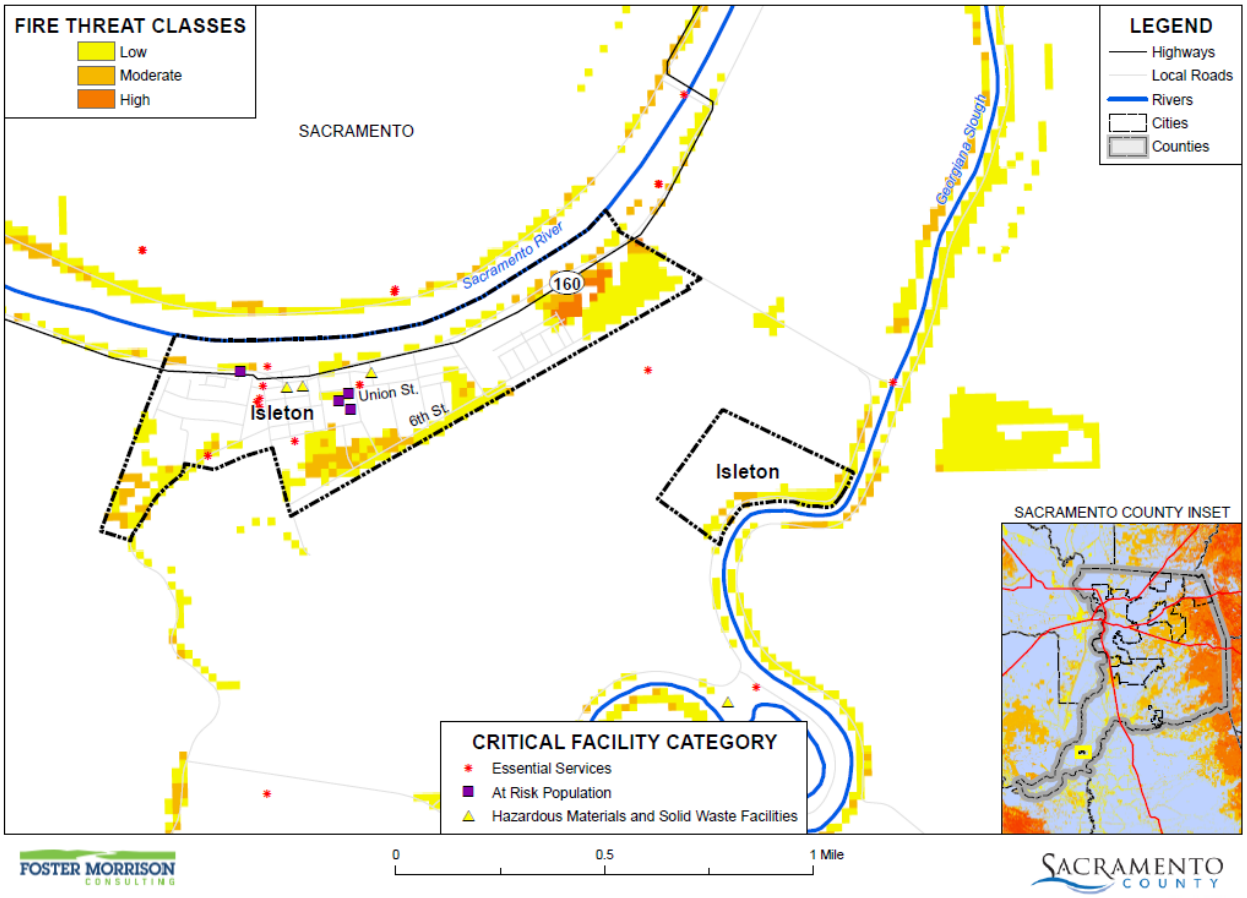
Table 1-42 City of Isleton – Critical Facilities by Fire Hazard Severity Zone by Category and Type

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
Urban Unzoned		
Essential Services Facilities	Emergency Evacuation Center	1
	EMS Stations	1
	Fire Station	2

Fire Hazard Severity Zone/Critical Facility Category	Critical Facility Type	Facility Count
	Law Enforcement	1
	Microwave Service Towers	2
	Water Well	2
	Total	**9**
At Risk Population Facilities	Day Care Center	1
	Mobile Home Parks	1
	School	2
	Total	**4**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	3
	Total	**3**
Urban Unzoned Total		**16**
Isleton Total		**16**

Source: CAL FIRE, Sacramento County

Figure 1-22 City of Isleton – Critical Facilities in Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 08/2021.

Table 1-43 City of Isleton – Critical Facilities by Fire Threat Areas by Category and Type

Fire Threat/ Critical Facility Category	Critical Facility Type	Facility Count
Moderate		
Essential Services Facilities	Emergency Evacuation Center	1
	Total	**1**
Moderate Total		**1**
No Threat		
Essential Services Facilities	EMS Stations	1
	Fire Station	2
	Law Enforcement	1
	Microwave Service Towers	2
	Water Well	2
	Total	**8**
At Risk Population Facilities	Day Care Center	1
	Mobile Home Parks	1
	School	2
	Total	**4**
Hazardous Materials and Solid Waste Facilities	Leaky Underground Storage Tank	3
	Total	**3**
No Threat Total		**15**
Isleton Total		**16**

Source: CAL FIRE, Sacramento County

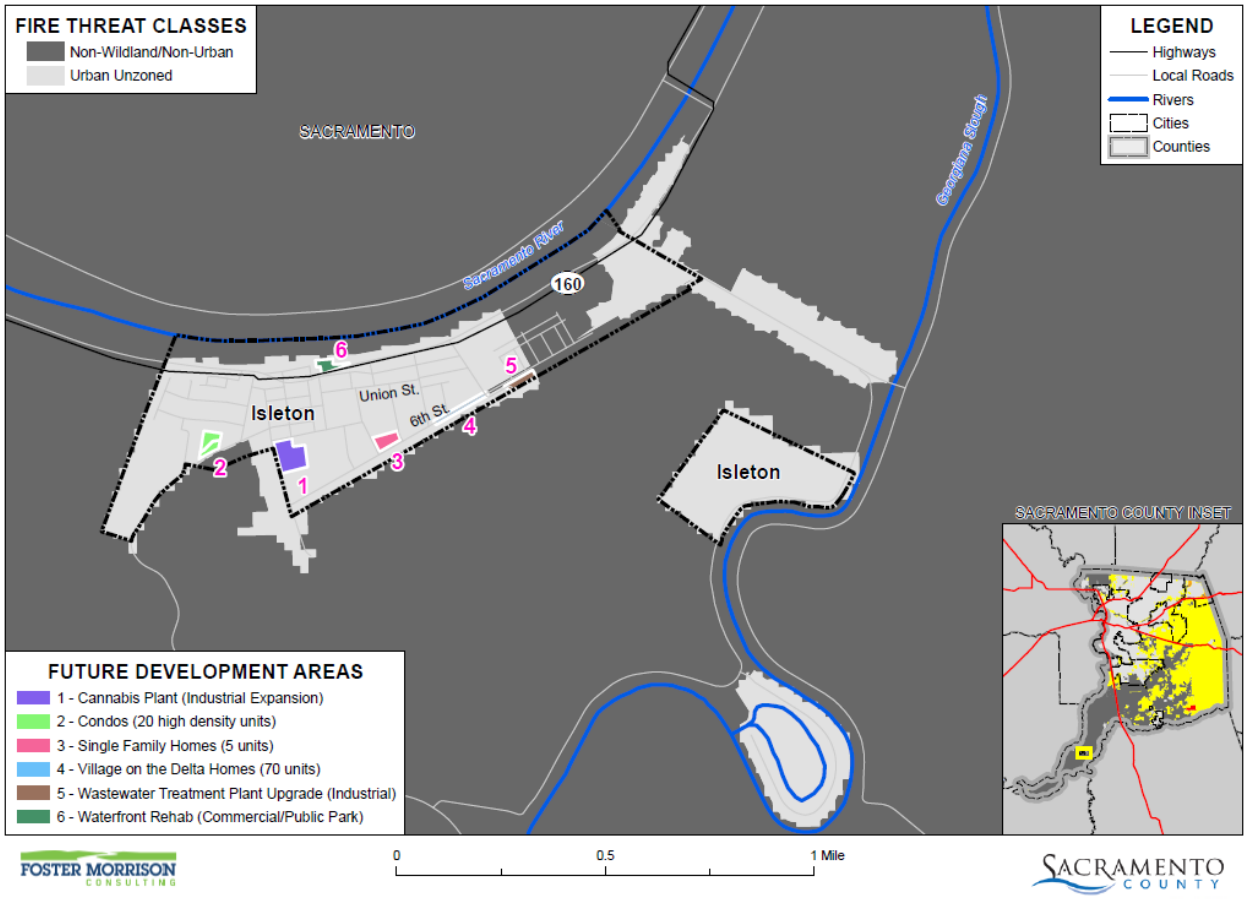
Future Development

Additional growth and development within moderate or higher fire hazard severity zones in the City would place additional values at risk to wildfire. City building codes are in effect and should continue to be updated as appropriate to reduce this risk.

GIS Analysis

The City provided future development areas were used as the basis for the inventory of future development areas for the City. Using the GIS parcel spatial file for each of these areas, the areas and parcels associated with future development projects for which the analysis was to be performed were identified. Utilizing the future development project spatial layer, the parcel centroid data was intersected to determine the parcel counts within each area. Figure 1-23 shows the locations of future development areas the City is planning to develop on the FHSZs. Table 1-44 shows the parcels and acreages of each future development area in the City in each FHSZ. Figure 1-24 shows the locations of future development areas the City is planning to develop on the Fire Threat Area. Table 1-45 shows the parcels and acreages of each future development area in the City in each Fire Threat Area.

Figure 1-23 City of Isleton – Future Development in FHSZs



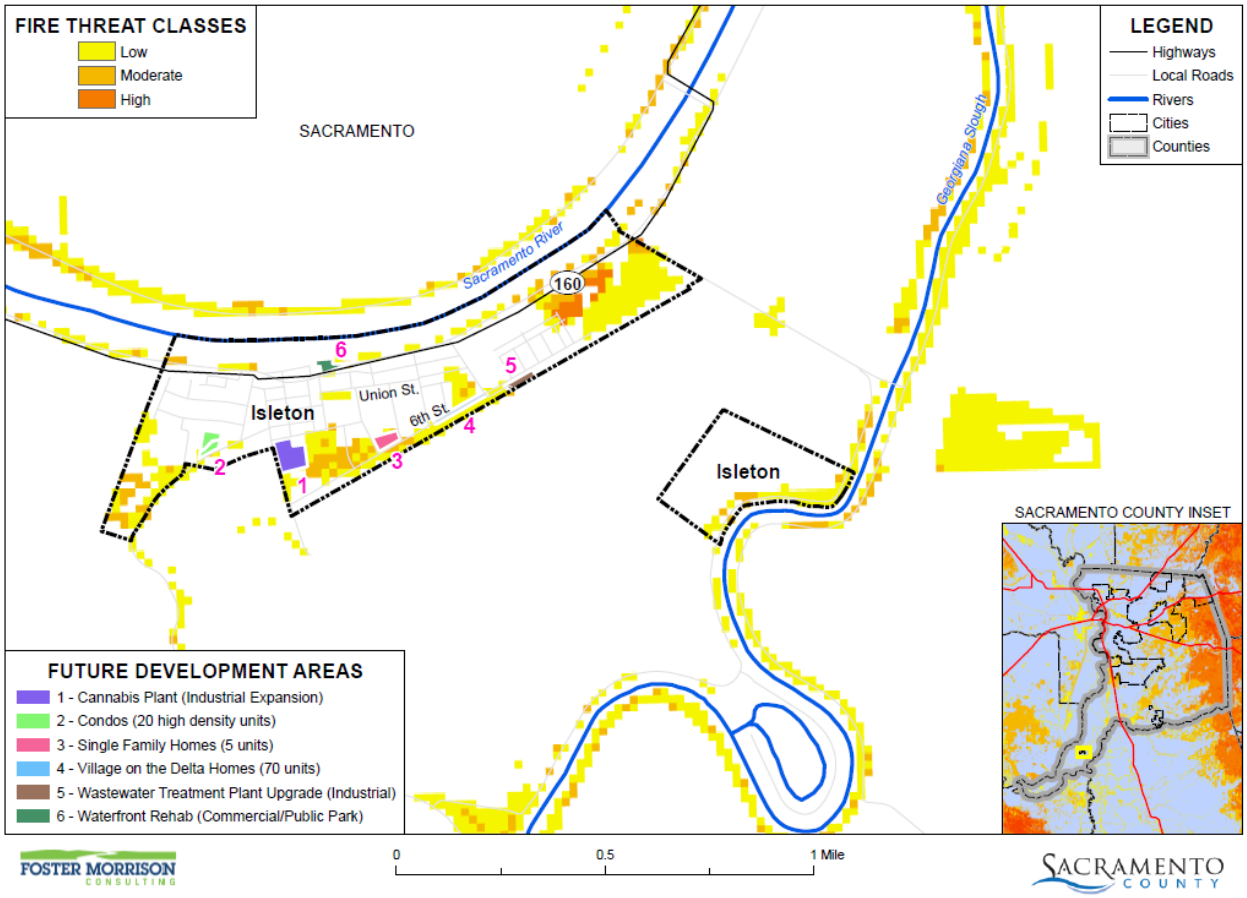
Data Source: Cal-Fire 2017 (Draft 9/2007 - c34fhszl06_1, Adopted 11/2007 - fhsz06_3_34, Recommended 10/2008 - c34fhszl06_3), Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Table 1-44 City of Isleton – Future Development Parcels and Acres in FHSZs

Fire Hazard Severity Zones/ Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
Urban Unzoned			
Cannabis Plant (Industrial Expansion)	1	1	3.00
Condos (20 high density units)	2	0	1.42
Single Family Homes (5 units)	1	0	1.15
Village on the Delta Homes (70 units)	1	0	1.03
Wastewater Treatment Plant Upgrade (Industrial)	1	0	0.90
Waterfront Rehab (Commercial/Public Park)	1	0	0.96
Grand Total	**7**	**1**	**8.47**

Source: City of Isleton, CAL FIRE

Figure 1-24 City of Isleton – Future Development in Fire Threat Areas



Data Source: Cal-Fire 2017 Fire Threat Data (fthrt14_2), Sacramento County GIS, Cal-Atlas; Map Date: 07/2021.

Table 1-45 City of Isleton – Future Development Acres and Parcels by Fire Threat Areas

Fire Threat/ Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
Moderate			
Single Family Homes (5 units)	1	0	1.15
Moderate Total	**1**	**0**	**1.15**
Low			
Condos (20 high density units)	1	0	0.59
Village on the Delta Homes (70 units)	1	0	1.03
Waterfront Rehab (Commercial/Public Park)	1	0	0.96
Low Total	**3**	**0**	**2.58**

Fire Threat/ Future Development	Total Parcel Count	Improved Parcel Count	Total Acres
No Threat			
Cannabis Plant (Industrial Expansion)	1	1	3.00
Condos (20 high density units)	1	0	0.84
Wastewater Treatment Plant Upgrade (Industrial)	1	0	0.90
No Threat Total	**3**	**1**	**4.74**
Grand Total	**7**	**1**	**8.47**

Source: City of Isleton, CAL FIRE

1.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

1.6.1. Regulatory Mitigation Capabilities

Table 1-46 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Isleton.

Table 1-46 City of Isleton Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2000	Yes it address hazards and mitigation measures to address such hazards. Yes it may be implemented
Capital Improvements Plan	Y 2019	The capital improvement plan is in development
Economic Development Plan	Y In Process	Yes to all aspects of the questions above
Local Emergency Operations Plan	Yes	The City of Isleton follows the State of California's Plan
Continuity of Operations Plan	No	
Transportation Plan	Yes	Only identifies mitigation strategy and actions
Stormwater Management Plan/Program	Y In Process	It will address all aspects of above requirements

Engineering Studies for Streams	N	No streams inside city limits
Community Wildfire Protection Plan	No	City's fire dept doesn't cover any SRA or wildland coverage
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: 2015 IBC
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	Y	Rating: 5/9 (urban/rural)
Site plan review requirements	Y	Through the building official.
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	Yes through the planning commission and building official
Subdivision ordinance	Y	
Floodplain ordinance	Y	Yes through the building dept
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	Yes through the building dept
Flood insurance rate maps	Y	Yes
Elevation Certificates	Y	Yes
Acquisition of land for open space and public recreation uses	Y	Yes through the planning commission
Erosion or sediment control program	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
With education incentives for employees and furthering education we can make sure that we improve in all aspects concerning the above departments. The planning commission is now fully appointed; they have started working with staff to improve in these fields.		

Source: City of Isleton

City of Isleton General Plan (2000)

Under the body of statutory and case law which has evolved in California, including Guidelines issued by the State Office of Planning and Research, the General Plan for Isleton functions as a "constitution" in much the same way as a state or national constitution. The Plan reflects the City's long-range aspirations of physical form and amenity and provides guidance to the substance of development regulations such as zoning and subdivision ordinances, and to other programs approved by the City, such as the Redevelopment Program, which combine as the package of tools necessary to carry out the General Plan over time.

Mitigation related goals and policies from the General Plan are:

- Inventory all buildings which are unsound under conditions of "moderate" seismic activity; buildings having questionable structural resistance ·should be considered for either rehabilitation or demolition.

Structures determined by the City's Building Official to be structurally unsound are to be reported to the owner and recorded with the County Recorder to ensure that future owners are made aware of hazardous conditions and risks.

- All new building construction shall conform to the latest seismic requirements of the Uniform. Building Code as a minimum standard. A building height limit of 50 feet shall be maintained, with a maximum of four stories.
- Soil compaction tests, and geotechnical analysis of soil conditions and behavior under seismic conditions shall be required of all subdivisions and of all commercial, industrial and institutional structures over 6,000 square feet in area (or in the case of institutional structures, those which hold 100 or more people).
- The City should adopt an Earthquake Disaster Plan in coordination with Sacramento County and local special districts (school, levee maintenance, reclamation and irrigation). The Plan should identify hazards that may occur as the result of an earthquake of major magnitude, and should designate evacuation routes and means to coordinate all local government agencies in assisting local residents in the event of a major earthquake, fire or explosion, or hazardous chemical spill or release of hazardous air-borne gas.
- All lines which are part of the domestic water distribution system should be looped to assure adequate pressure in the event of major fire, earthquake, or explosion. Emergency standby power generation capability should be available at all water wells to assure water availability in the event of a major power failure.
- The City will continue to give high priority to the support of police protection, and to fire suppression and prevention functions of the Isleton Fire Department.
- The City will work to maintain a fire flow standard of 3,000 gpm for all commercial and industrial areas of the community, and 1,000 gpm for residential areas, to assure the capability to suppress urban fires.
- The City will maintain a street system which is capable of providing access to any fires that may develop within the urban area, and which is capable of providing for the adequate evacuation of residents in the event of an emergency condition of magnitude.
- In the event that any part of the levee system protecting Isleton was to fail, the most expedient evacuation routes would be east and north along the Sacramento River levee roads toward Walnut Grove, and then east toward Interstate 5.

1.6.2. Administrative/Technical Mitigation Capabilities

Table 1-47 identifies the City department(s) responsible for activities related to mitigation and loss prevention in Isleton.

Table 1-47 City of Isleton's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	Y	Effective
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	No, through measure A funds and HUT funds work is done to reduce these risks, Still behind in labor capacity.
Mutual aid agreements	N	
Other		

Staff	Y/N FT/PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	PT	No
Floodplain Administrator	N	
Emergency Manager	N	
Community Planner	N	
Civil Engineer	Y/PT	No
GIS Coordinator	N	
Other	N	
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	N	
Hazard data and information	Y	
Grant writing	N	
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
With new people filling these positions we will ensure that we do everything possible within budgetary means to reduce all risks posed to the public within our jurisdiction. By working in conjunction with county services we can expand our capabilities to provide the best coverage. Need more budget to address personnel deficiencies.		

Source: City of Isleton

1.6.3. Fiscal Mitigation Capabilities

Table 1-48 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table 1-48 City of Isleton's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Measure A and HUT funds are used on a regular basis to mitigate all hazards posed to the City of Isleton
Authority to levy taxes for specific purposes	Y	Yes a special tax was just passed 2015 to buy new equipment for the fire dept. Yes
Fees for water, sewer, gas, or electric services	Y	Sewer income is used to mitigate hazards and can be used to fund future actions but is not adequate to cover all costs.
Impact fees for new development	Y	Very little impact fees are paid to the city due to limited building being done inside city limits
Storm water utility fee	N	

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Incur debt through general obligation bonds and/or special tax bonds	Y	General Bonds were used to improve the sewer system. Due to the high costs and low revenue
Incur debt through private activities	N	
Community Development Block Grant	Y	No possibly could be used for mitigation actions
Other federal funding programs	Y	Depends on what funding was dispersed
State funding programs	Y	Depends on what funding was dispersed
Other		
How can these capabilities be expanded and improved to reduce risk?		
Need capital and personnel to administer capital programs.		

Source: City of Isleton

1.6.4. Mitigation Education, Outreach, and Partnerships

Table 1-49 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 1-49 City of Isleton's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	This is handled through CalAm water and the cities fire dept. Yes could be possibly used to mitigate activities
Natural disaster or safety related school programs	Y	River Delta Unified School District
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Need fiscal support to conduct education and outreach.		

Source: City of Isleton

1.6.5. Other Mitigation Efforts

The City has performed numerous mitigation projects citywide. One is the change out of old storm water grates that were causing localized flooding during heavy rain due to foliage clogging them. The City has also taken steps yearly to bring a vac truck to clean out the catch basins in the storm water drainage inlets to keep them from clogging the drainage pipes. The City has also taken steps to remove the brush from all stormwater drainage ditches that lead to the reclamation ditch in an effort to keep the flow unobstructed. Isleton has a leaf and branch collection program to prevent the clogging of drains.

1.7 Mitigation Strategy

1.7.1. Mitigation Goals and Objectives

The City of Isleton adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

1.7.2. NFIP Mitigation Strategy

The City of Isleton joined the National Flood Insurance Program (NFIP) on December 1, 1975. As a participant of the NFIP, the City of Isleton has administered floodplain management regulations that meet the minimum requirements of the NFIP. The management program objective is to protect people and property within the City. The City of Isleton will continue to comply with the requirements of the NFIP in the future.

In addition, the City of Isleton actively participates with Sacramento County to address local NFIP issues through a regional approach. Many of the program activities are the same for the City of Isleton as for Sacramento County since participation at the County level includes all local jurisdictions.

The City of Isleton General Services Department provides public outreach activities which include map information services, public awareness, public hazard disclosure, and flood protection information. This information is readily available to the public and consists of current and accurate flood mapping. In addition, the General Services Department provides information about our stormwater management program and up-to-date information related to the maintenance of our drainage system.

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS which are to reduce flood losses, facilitate accurate insurance rating, and promote the awareness of flood insurance. The City of Isleton is not a current participant in the CRS program.

More information about the floodplain administration in the City of Isleton can be found in Table 1-50.

Table 1-50 City of Isleton Compliance with NFIP

NFIP Topic	Comments
Insurance Summary	
How many NFIP policies are in the community? What is the total premium and coverage?	110 policies $255,191 in premiums $24,037,600 in coverage
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	23 claims $467,013.07 in claims paid 7 substantial damage claims
How many structures are exposed to flood risk within the community?	329 in 1% annual chance 0 in 0.2% annual chance
Repetitive Loss (RL) and Severe Repetitive Loss Properties (SRL)	1 RL properties 0 SRL properties
Describe any areas of flood risk with limited NFIP policy coverage	None
Staff Resources	
Is the Community Floodplain Administrator or NFIP Coordinator certified?	No
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	Due to budgetary shortfalls, there is no staff for NFIP coordination.
What are the barriers to running an effective NFIP program in the community, if any?	Budgets for staff.
Compliance History	
Is the community in good standing with the NFIP?	Y
Are there any outstanding compliance issues (i.e., current violations)?	No
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	CAV 5/13/2010 CAC 1/1/2001
Is a CAV or CAC scheduled or needed?	No
Regulation	
When did the community enter the NFIP?	12/1/1975
Are the FIRMs digital or paper?	Digital
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	The City's standards meet FEMA and state standards by applying all regulations in the permitting process.
Provide an explanation of the permitting process.	Planning and building departments review permits for compliance with floodplain requirements.
Community Rating System	
Does the community participate in CRS?	N
What is the community's CRS Class Ranking?	N/A
What categories and activities provide CRS points and how can the class be improved?	N/A

NFIP Topic	Comments
Does the plan include CRS planning requirements?	N/A

1.7.3. Mitigation Actions

The planning team for the City of Isleton identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Drought & Water Shortage
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Integrate Local Hazard Mitigation Plan into Safety Element of General Plan

Hazards Addressed: Multi-hazard (Climate Change, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms)

Goals Addressed: 1, 2, 3, 4, 5,

Issue/Background: Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (AB 2140).

Project Description: Specifically, this section requires that each jurisdiction adopt a local hazard mitigation plan (LHMP) in accordance with the federal Disaster Mitigation Act of 2000 as part of the Safety Element of its General Plan. Adoption of the LHMP into the Safety Element of the General Plan may be by reference or incorporation.

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Safety Element of General Plan

Responsible Office: City of Isleton Planning Department

Cost Estimate: Jurisdictional board/staff time

Potential Funding: Local budgets

Benefits (avoided Losses): Incorporation of an adopted LHMP into the Safety Element of the General Plan will help jurisdictions maximize the cost recovery potential following a disaster.

Schedule: As soon as possible

Priority (H, M, L): High

Action 2. Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness

Hazards Addressed: Multi-hazard (Climate Change, Drought & Water Shortage, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Extreme Heat, Severe Weather: Heavy Rains and Storms)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City and County play a key role in public outreach/education efforts to communicate the potential risk and vulnerability of their community to the effects of natural hazards. A comprehensive multi-hazard public education program will better inform the community of natural hazards of concern and actions the public can take to be better prepared for the next natural disaster event.

Project Description: A comprehensive multi-hazard outreach program will ascertain both broad and targeted educational needs throughout the community. The City will work with the County and other agencies as appropriate to develop timely and consistent annual outreach messages in order to communicate the risk and vulnerability of natural hazards of concern to the community. This includes measures the public can take to be better prepared and to reduce the damages and other impacts from a hazard event. The public outreach effort will leverage and build upon existing mechanisms.

Other Alternatives: Continue public information activities currently in place.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Existing County outreach programs will be reviewed for effectiveness and leveraged and expanded upon to reach the broader region.

Responsible Office: City of Isleton in partnership with the County

Cost Estimate: Annual costs to be determined, and will depend on the scope and frequency of activities and events as well as volunteer participation

Benefits (Losses Avoided): Increase residents' knowledge of potential hazards and activities required to mitigate hazards and be better prepared. Protect lives and reduce damages, relatively low cost to implement.

Potential Funding: Local budgets, grant funds

Schedule: Ongoing/Annual public awareness campaign

Priority (H, M, L): High

Action 3. Support climate change mitigation laws

Hazards Addressed: Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Mitigating Climate Change

Project Description: Support climate change mitigation laws

Other Alternatives: No action.

Existing Planning Mechanisms through which Action will be Implemented: Council resolution

Responsible Office: City of Isleton

Cost Estimate: Low – mostly staff time.

Potential Funding: Local funding.

Benefits (avoided Losses): Reduced risk to the City, County, and State from climate change effects.

Schedule: Ongoing

Priority (H, M, L): Low

Action 4. Support drought mitigation laws. Establish RWIP (Redundant Water for Isleton Plan).

Hazards Addressed: Drought and Water Shortage

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: State is in water drought. City needs to develop secondary source of water.

Project Description: Find and acquire rights to a secondary water source

Other Alternatives: Third water source

Existing Planning Mechanisms through which Action will be Implemented:

Responsible Office: City of Isleton

Cost Estimate: $25,000

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Benefits (avoided Losses): Avoids water shortages in City

Schedule: within 10 years.

Priority (H, M, L): High

Action 5. Levee Reinforcement Projects

Hazards Addressed: Severe Weather: Heavy Rains and Storms, Flood, Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The City is protected from flooding by levees. The levees are not certified by FEMA as providing protection from 1% annual chance flooding.

Project Description: Reinforcement of levees

Other Alternatives: Implement Isleton Flood Management Agency

Existing Planning Mechanisms through which Action will be Implemented: No current mechanism.

Responsible Office: City of Isleton

Cost Estimate: $1,000,000

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Benefits (avoided Losses): Flood losses to the City could be avoided.

Schedule: Within 5 years

Priority (H, M, L): High

Action 6. Implement IFIP (Isleton Flood Improvement Plan) and create and activate IFMA (Isleton Flood Management Agency)

Hazards Addressed: Severe Weather: Heavy Rains and Storms, Flood, Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Stormwater and flooding adversely impact lives and facilities in City.

Project Description: Create and activate Isleton Flood Management Agency (IFMA) and implement Isleton Flood Improvement Plan (IFIP)

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Form a flood management agency with operations goals and capital goals.

Responsible Office: City of Isleton

Cost Estimate: $100,000

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Benefits (avoided Losses): Will mitigate floods both actively and passively.

Schedule: within 10 years

Priority (H, M, L): High

Action 7. Create and activate IFMA (Isleton Flood Management Agency)

Hazards Addressed: Severe Weather: Heavy Rains and Storms, Flood, Levee Failure

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Levee failure can cause catastrophic loss to residents and businesses in City.

Project Description: Create and activate Isleton Flood Management Agency (IFMA)

Other Alternatives: No action

Existing Planning Mechanisms through which Action will be Implemented: Obtain grant to study and develop plan to reinforce levee. Create and activate Isleton Flood Management Agency (IFMA)

Responsible Office: City of Isleton

Cost Estimate: $100,000

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Benefits (avoided Losses): Will mitigate levee damage after failure.

Schedule: within 10 years

Priority (H, M, L): High

Action 8. Activate Emergency Operation Plan (Cooling Center)

Hazards Addressed: Extreme Heat, Climate Change

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: Severe heat can cause local residents to be overwhelmed with heat exhaustion.

Project Description: Use City community center as a cooling center.

Other Alternatives: Build swimming pool.

Existing Planning Mechanisms through which Action will be Implemented: City emergency operational plan to be activated.

Responsible Office: City of Isleton

Cost Estimate: $20,000 per year

Potential Funding: Grants from Cal OES, FEMA, CA DWR

Benefits (avoided Losses): Reduced risk to local residents from heat stroke and heat exhaustion. This is a life safety issue.

Schedule: 3 years

Priority (H, M, L): Medium

Action 9. Storm Water Runoff Rehabilitation Project

Hazards Addressed: Flood, Localized Storm water flooding, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: City of Isleton has several locations where the storm water causes ponding in the streets and along hwy 160 due to inadequate drainage on aging storm water drainage system. The drainage system we have drains on one side of the street and bubbles up across the street and drains down the gutter. These gutters get overwhelmed which causes debris from yards and streets to clog up downstream drains.

Project Description: To change the flow of the storm water from running down gutters along the street to creating drains that take the flow under the streets to the reclamation ditch.

Other Alternatives: No action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Stormwater program

Responsible Office/Partners: City of Isleton Department of Public Works

Project Priority: High priority

Cost Estimate: $3M

Benefits (Losses Avoided): The potential of car accidents due to heavy storm water ponding. The potential of flooding homes due to nowhere for the storm water to go.

Potential Funding: FEMA grants, Measure "A", or other grants

Timeline: As soon as funding is available/ 1-3 years

Action 10. Wastewater Treatment Plant Pond Levee Elevation Raise to 200-year Flood Standard

Hazards Addressed: Climate Change, Flood, Localized Flood, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: There is a possibility that if the City has a 200-year flood event that the levees around the wastewater treatment plant ponds will not be sufficient, due to the fact they were made to protect against a 100-year flood. This action is intended to address the possible spillover of wastewater from the sewer ponds due to levee elevation under 200-year flood standard

Project Description: Levee elevation increase around wastewater treatment plant ponds

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: Capital Improvement Projects for the City of Isleton Wastewater treatment plant

Responsible Office/Partners: City of Isleton Department of Public Works

Project Priority: High Priority

Cost Estimate: $1M

Benefits (Losses Avoided): The benefit would be that if a flood happened there would be adequate protection to keep wastewater from contaminating drinking water and the public's health and safety

Potential Funding: FEMA grants, other grants, and impact fees from new homes built within the City of Isleton

Timeline: 1 - 3 years

Delta Annex Chapter 2 Brannan-Andrus Levee Maintenance District; Reclamation Districts 317, 407, 2067

2.1 Introduction

This Annex details the hazard mitigation planning elements specific to Brannan-Andrus Levee Maintenance District (BALMD or District) and Reclamation Districts (RD or District) 317, 407, and 2067, a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to BALMD and RDs 317, 407, and 2067, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

2.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 2-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 2-1 BALMD and RDs 317, 407, and 2067 – Planning Team

Name	Position/Title	How Participated
Andrew Giannini	District Superintendent and Incident Commander	Provided information regarding the annex.
Larry Gardiner	President, Board of Directors	Provided information regarding the annex.
Gilbert Labrie	Contract District Engineer	Attended planning meetings. Provided information regarding the annex.
Barb McGowan	Assistant to District Engineer	Provided information regarding the annex.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 2-2.

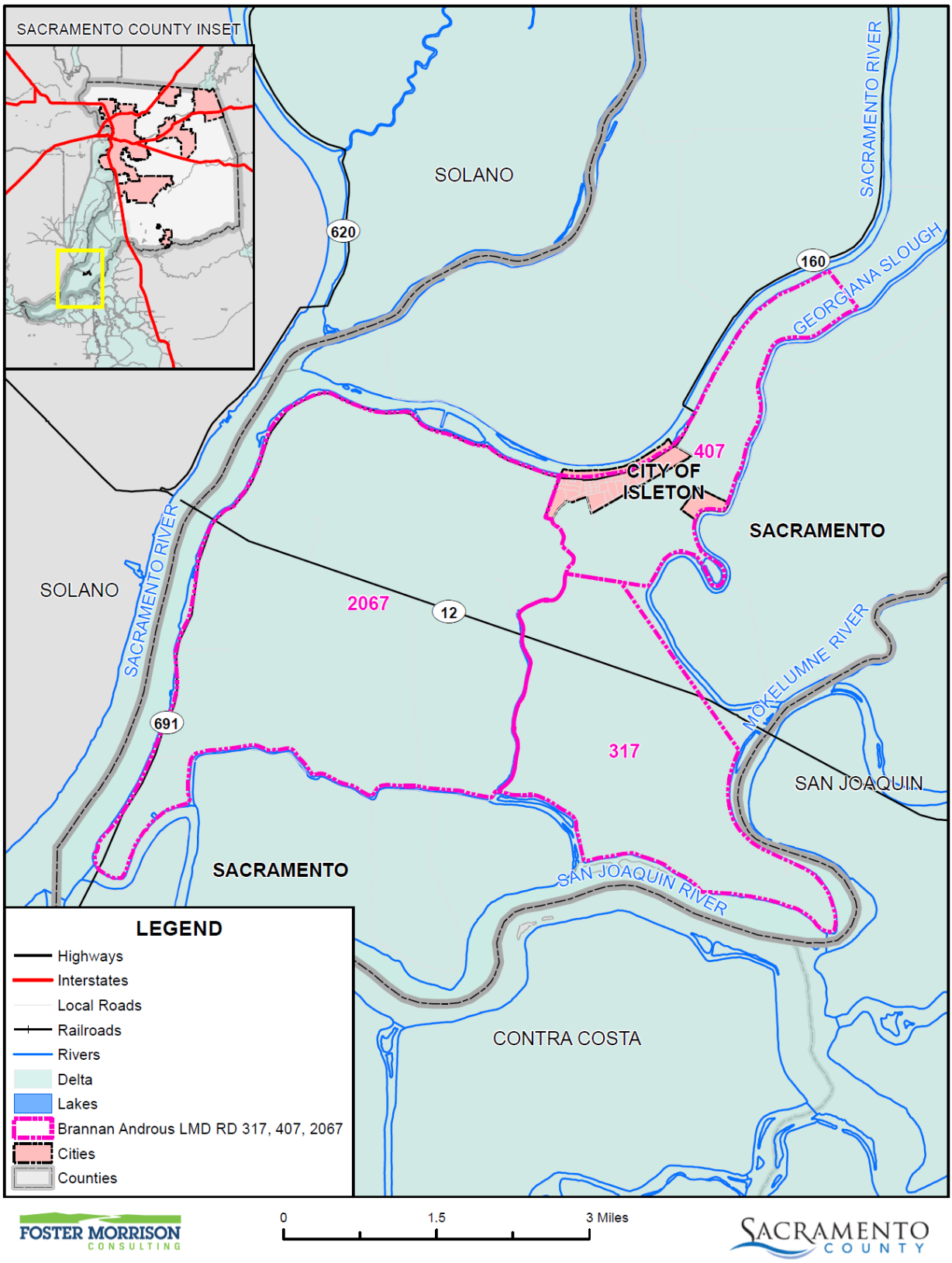
Table 2-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
2016 Sacramento County Flood Safety Plan (by GEI). Currently being updated in 2021	The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter.
2021 Emergency Operations Plan (EOP)	Coordination between BALMD team members to clarify and ensure conformance and focus to prevent duplication efforts when a solution is available and planned.

2.3 District Profile

The District profile for the BALMD and RDs 317, 407, and 2067 is detailed in the following sections. Figure 2-1 displays a map and the location of the District within Sacramento County.

Figure 2-1 BALMD and RDs 317, 407, and 2067



Data Source: Brannan Androus Levee Maintenance District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

2.3.1. Overview and Background

Brannan-Andrus Island is surrounded by 26.2 miles of levee, excluding the Brannan Island State Park, that protects about 13,000 acres of land, which is primarily in agricultural/rural use. It is bordered by the Sacramento River, Georgiana Slough, Mokelumne River, San Joaquin River, and Sevenmile Slough. The levees along the Sacramento River and Georgiana Slough are designated as project levees (16.2 miles). The remaining levees along the Mokelumne River, San Joaquin River and Sevenmile Slough are considered non-project levees (10.0 miles). Out of the 10 miles of non-project levee, 3.3 miles border the non-tidal, controlled section of Sevenmile Slough.

The BALMD monitors and maintains the levees on the island. Reclamation Districts 317, 407, and 2067 maintain and control the operations of the seven pumping stations to keep the island dry. Five pumping stations are located along Sevenmile Slough, another is on Georgiana Slough, and a lift station is located on the main drainage canal in the northern part of the island.

The BALMD levee system protects an island population of approximately 1,837. This figure includes a major recreation contingent and the City of Isleton, with close to 900 residents. Approximately 379 acres are urbanized, with about 187 acres incorporated by the City of Isleton.

2.4 Hazard Identification

BALMD and RDs 317, 407, and 2067 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 2-3).

Table 2-3 BALMD and RDs 317, 407, and 2067—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Limited	Occasional	Negligible	Low	–
Dam Failure	Extensive	Unlikely	Catastrophic	Medium	Medium
Drought & Water Shortage	Significant	Likely	Critical	Low	High
Earthquake	Limited	Occasional	Limited	Low	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Low	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Limited	Highly Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Limited	Low	Medium
Levee Failure	Limited	Occasional	Critical	Medium	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Critical	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Low	Low
Subsidence	Significant	Likely	Negligible	Medium	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Likely	Limited	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

2.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

2.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section □, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 2-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

2.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the BALMD and RDs 317, 407, and 2067's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 2-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. BALMD and RDs 317, 407, and 2067's physical assets, valued at over $250 million, consist of the buildings and infrastructure to support the District's operations.

Table 2-4 BALMD and RDs 317, 407, and 2067 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
BALMD			
District Levees	Infrastructure	$235,000,000	Flood 1%/0.2%, Subsidence, Levee Failure
District Maintenance Yard	Infrastructure	$1,000,000	Floods: 1%/0.2%, Levee Failure
RD 317			
150 HP Pump	Infrastructure	$500,000	Floods: 1%/0.2%, Levee Failure
50 HP Pump	Infrastructure	$250,000	Floods: 1%/0.2%, Levee Failure
75 HP Pump	Infrastructure	$250,000	Floods: 1%/0.2%, Levee Failure
RD 407			
60 HP Pump Station	Infrastructure	$250,000	Floods: 1%/0.2%, Localized Flood, Levee Failure
60 HP Pump Station	Infrastructure	$250,000	Floods: 1%/0.2%, Localized Flood, Levee Failure
RD 2067			
100 HP Pump	Infrastructure	$500,000	Floods: 1%/0.2%, Localized Flood, Levee Failure
60 HP Pump	Infrastructure	$250,000	Floods: 1%/0.2%, Localized Flood, Levee Failure
60 HP Pump	Infrastructure	$250,000	Floods: 1%/0.2%, Localized Flood, Levee Failure
60 HP Pump	Infrastructure	$250,000	Floods: 1%/0.2%, Localized Flood, Levee Failure
60 HP Pump	Infrastructure	$250,000	Floods: 1%/0.2%, Localized Flood, Levee Failure
100 HP Pump	Infrastructure	$500,000	Floods: 1%/0.2%, Localized Flood, Levee Failure
75 HP Pump	Infrastructure	$250,000	Floods: 1%/0.2%, Localized Flood, Levee Failure

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
75 HP Pump	Infrastructure	$250,000	Floods: 1%/0.2%, Localized Flood, Levee Failure

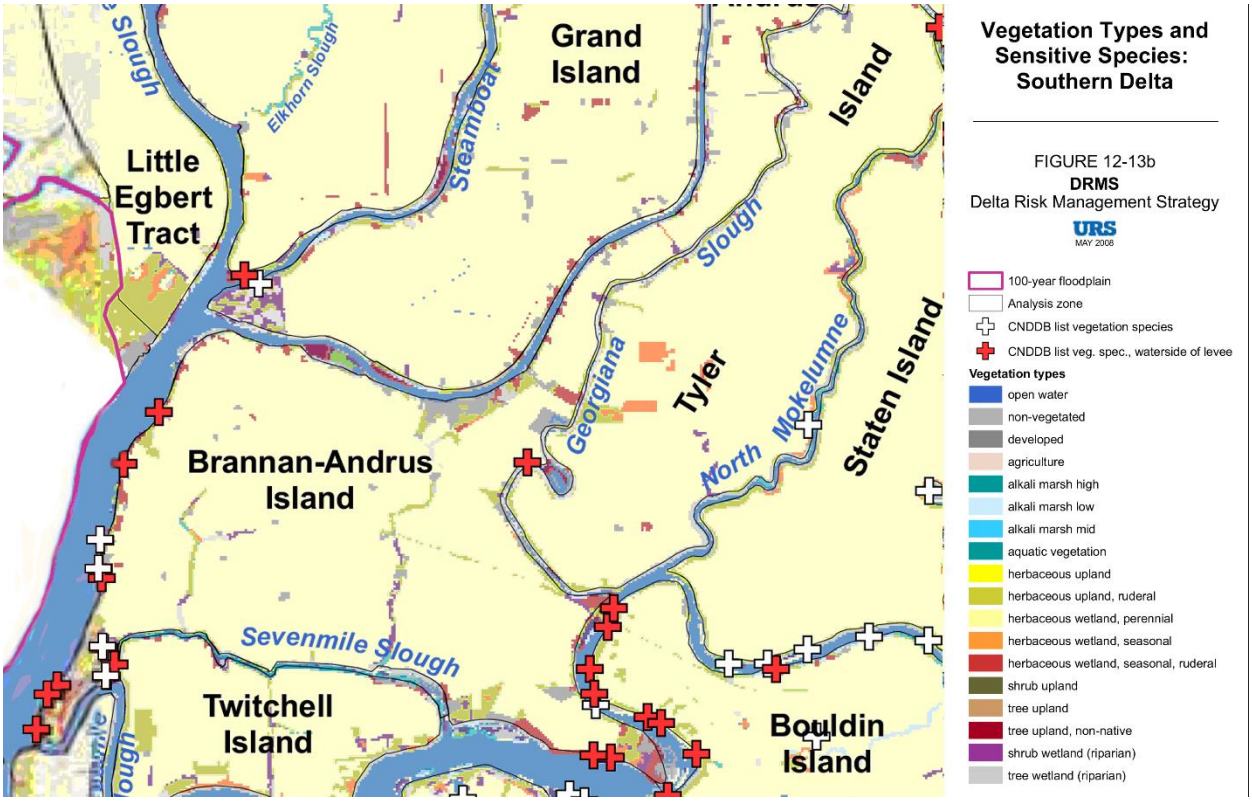
Source: BALMD and RDs 317, 407, and 2067

Natural Resources

BALMD and RDs 317, 407, and 2067 has a variety of natural resources of value to the District. The 5-Year Plan noted that in terms of natural resources, Brannan-Andrus Island has freshwater wetland, upland, and riparian habitats. Within the freshwater wetland category, there are 12.36 acres of herbaceous perennial wetland and 26.63 acres of herbaceous seasonal/ruderal wetland. Upland habitat consists of 724.74 acres of herbaceous ruderal, 10.13 acres of shrub, 47.61 acres of tree, and 292.56 of non-native tree upland. There is also approximately 142.31 acres of riparian habitat, with 96.88 acres of shrub wetland, and 45.43 acres of tree wetland.

Two small sloughs, Tomato Slough and Jackson Slough, in the interior of the island provide some riparian habitat. Refer to Figure 2-2 for specific habitat areas. According to the California Natural Diversity Database the sensitive species found on Brannan-Andrus Island are: Northern California Black Walnut, Swainson Hawk, Northwestern Pond Turtle, Delta Tule Pea, Suisun Marsh Aster, Mason Lilaeopsis, and Delta Mudwort.

Figure 2-2 BALMD and RDs 317, 407, and 2067 Vegetation Types and Sensitive Species



Source: BALMD 2012 5-Year Plan

Historic and Cultural Resources

BALMD and RDs 317, 407, and 2067 has a variety of historic and cultural resources of value to the District. The 5-Year Plan noted that BALMD, RD 317, RD 407, and RD 2067 protect the City of Isleton. The City has two nationally registered historic districts, the Isleton Chinese and the Japanese Commercial Districts.

Growth and Development Trends

The BALMD 2012 5-Year Plan noted that the standard island elevation is about -14' with a minimum elevation of -22' and a maximum of +9' per the 2007-2008 DWR Lidar Survey. With the adoption of the Delta Protection Act in 1992, about 40% of Brannan-Andrus Island was designated as a Secondary Zone of the legal Delta, extending from the northern edge of Highway 12 to Tyler Island Bridge Road, east of Isleton. The remainder of the island is in the Primary Zone, which was established to protect the area for agriculture, wildlife habitat, and recreation uses within the Delta. The BALMD levee system protects an island population of approximately 1,837. This figure includes a major recreation contingent and the City of Isleton, with close to 900 residents. Approximately 379 acres are urbanized, with about 187 acres incorporated by the City of Isleton.

Beyond the city limits of Isleton, Sacramento County zoning designates approximately 1,200 acres to recreational use along the southeast corner of Andrus Island. Scattered around Brannan-Andrus Island are a large contingent of the Delta resorts, including RV parks, boat launches, and marinas for local and public use. A majority of these recreational uses are located along the Delta Loop, a 7.2-mile drive with 40 recreational attractions bordering the Mokelumne and San Joaquin Rivers, and Sevenmile Slough. Overall, there are 5 large marinas (over 200 berths), 5 medium marinas (50 to 200 berths), and 8 small marinas (less than 50 berths) that account for a total of 2400 berths and 6 boat launching facilities. Twelve of the resorts also have RV/camping grounds totaling about 800 sites overall. Five of the resorts have cabins (approx. 300 total). About 40 acres total of dry storage is provided at eleven resorts. Four resorts are on their own island that bridges to Brannan-Andrus and may not be inundated by a flood, but access could be compromised. Including marinas and resorts, there are approximately 148 businesses on the island.

There was a development of approximately 650 homes that failed in the housing crash of 2008. It is still developable land but many projects to revive the development have also failed. Development of that size is possible in the future given Isleton is in the Secondary Zone of the Delta which allows for some development. One hindrance is the levees are not certified by FEMA to protect against the 100-year flood. Thus homes will have to be elevated to protect from flooding. The failed development had accounted for that and designed the homes to be elevated with garages on the first story.

Development since 2016

No District facilities have been constructed since 2016. A maintenance storage building has been improved. As such, vulnerability of District facilities is unchanged.

Future Development

A maintenance vehicle storage building has been proposed and will be located in an identifiable hazard area. Increased levee protection and additional levee improvements in the 5-year plan, include but not limited to:

- Sacramento River Erosion Control / Habitat Enhancement Project near river mile 14.60L to 17.34L. BA-15-1.0-SP. This project is funded and scheduled for construction in 2022.
- Erosion repair upstream of B&W along the Georgina Slough confluence with the Mokelumne River. BA-17-1.0-SP. This project is funded and scheduled for construction in 2023.
- Existing Sevenmile Slough crown raising project from Jackson Slough to Bruno's has been planned and is pending authorization and schedule.
- Stability berm for Sevenmile Slough and Mokelumne River is planned but not scheduled.
- Drainage blankets and French drains are planned for Georgiana Slough, but not scheduled.
- 7702.72: Sacramento Erosion STA510 (HWY 160)

2.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 2-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Currently, there is no affect and no backup power is required. This could change if the length of outage is significant. Efforts have been made and RD 2067 was considering an option to add solar capabilities.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan. The Districts' have not been affected by a PSPS event in the past, and given the low potential for a significant wildfire event in the Delta area, a PSPS event, while possible, is unlikely.

Dam Failure

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

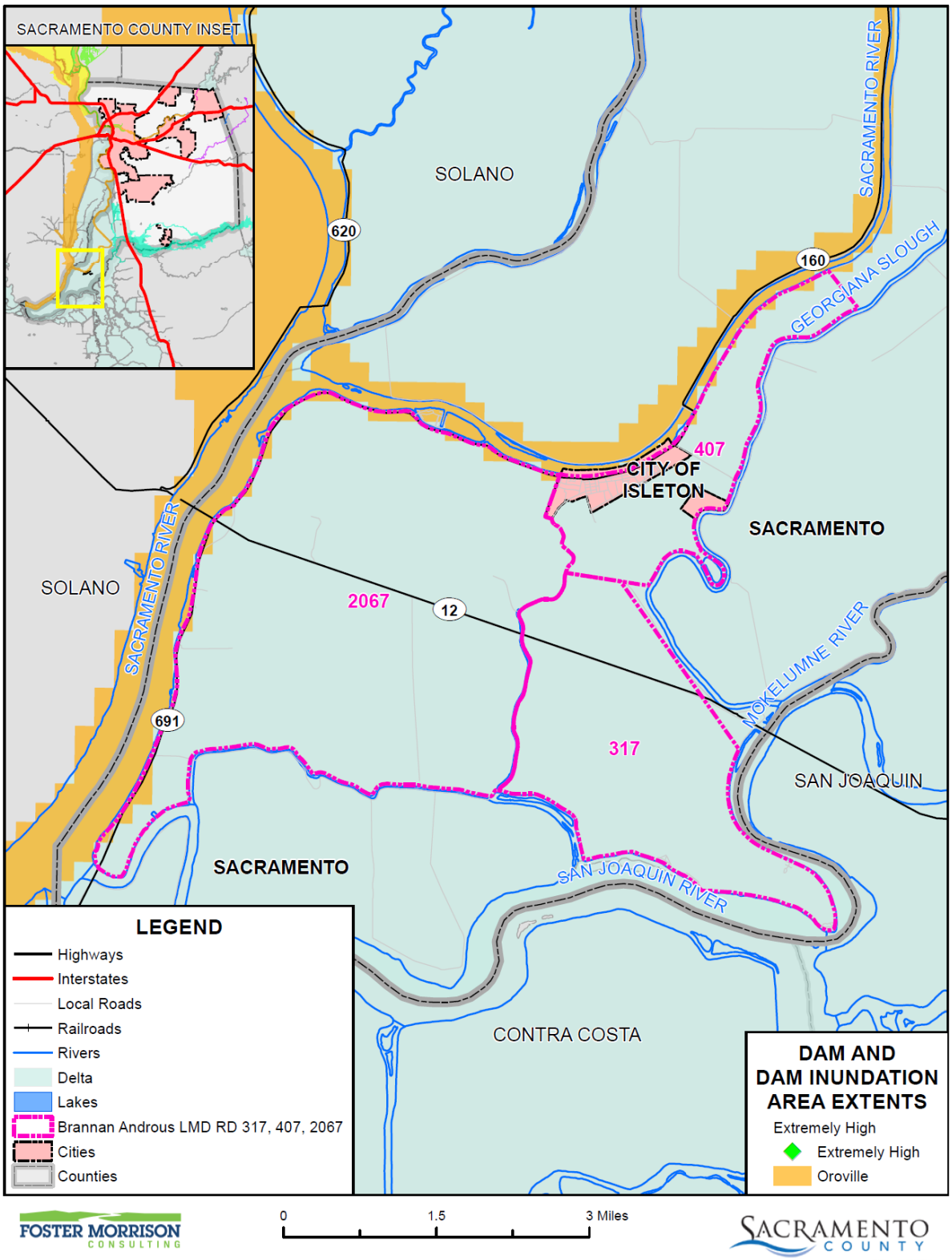
Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

There are no dam inundation areas from dams inside the County that can affect the District. Dams outside the County that can affect the District can be seen on Figure 2-3.

Figure 2-3 BALMD and RDs 317, 407, and 2067 – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Brannan Androus Levee Maintenance District, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

Riparian habitats that border the channel can be lost due to erosive forces of high flows from dam failure. The City has two nationally registered historic districts, the Isleton Chinese and the Japanese Commercial Districts that could be lost in the event of a flood due to dam failure.

Assets at Risk

As shown in the figures above, the levees and some District facilities in Table 2-4 could be at risk to dam failure, depending on the dam that fails and the nature of its failure.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

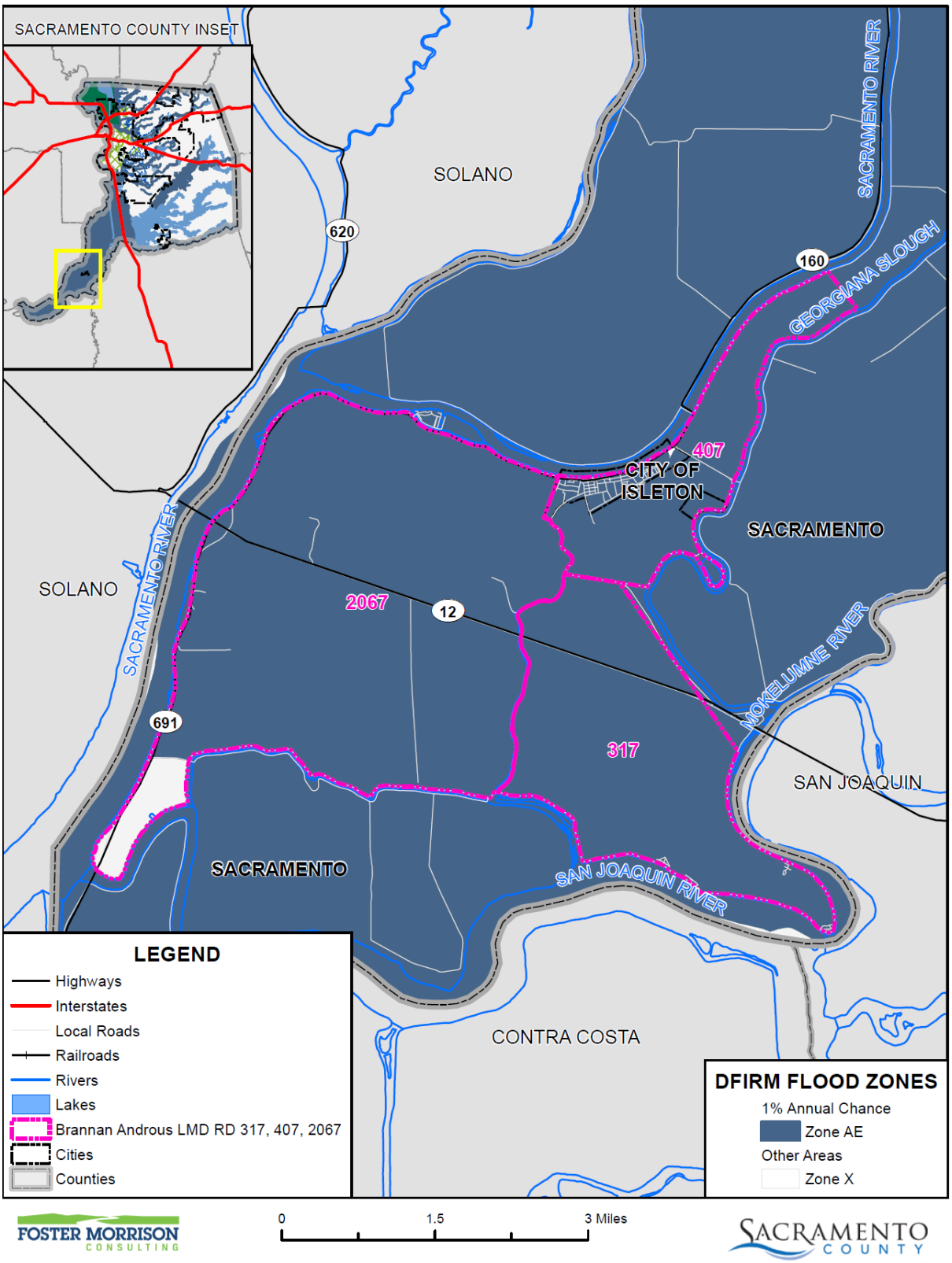
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the BALMD and RDs 317, 407, and 2067 have been subject to historical flooding.

Location and Extent

The BALMD and RDs 317, 407, and 2067 is mostly located in the 1% annual chance floodplain. This is seen in Figure 2-4.

Figure 2-4 BALMD and RDs 317, 407, and 2067 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Brannan Androus Levee Maintenance District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 2-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 2-5 BALMD and RDs 317, 407, and 2067– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	
X (unshaded)	Areas outside flood zones.	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 2-6. These events also likely affected the District to some degree.

Table 2-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

1986 was the closest the District came to experiencing a 100-year flood. The District has not experienced a 200 or 500-yr flood. Recent high water events (HWE) include:

- 2017 HWE: Initiated Extra monitoring.
- 2017 HWE: Overtopping concerns on Mokelumne River.
- 2017 HWE: Levee stability evidence on the San Joaquin River levee.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

A 1%, 0.5%, or 0.2% annual chance flood event could cause flooding within the District. A high water event, depending on the water elevation, could cause failure due to overtopping but more realistically could increase hydraulic gradients within the levee section resulting in landside seepage or boils. Continued seepage, if left unaddressed, could erode the levee and result in failure. Heavy flows could also cause erosion and scour on the waterside bank that could undermine the levee and cause failure.

Riparian habitats that border the channel can be lost due to erosive forces of high flows from 100/200/500-year flows. The District's two nationally registered historic districts, the Isleton Chinese and the Japanese Commercial Districts could be negatively impacted from inundation due to a 100/200/500-year flood. The marinas along the Delta Loop along Georgiana Slough, Mokelumne River and the San Joaquin River could also be damaged and possibly lost as a result of high flows from a 100/200/500 year flood event.

Assets at Risk

The levee system and pumping stations are vulnerable to a 1%, 0.5%, or 0.2% annual chance flood. Higher flows from such events could exceed the capacity of both the levee system and the pumping stations that are needed to drain the island. Assets at risk to flooding, as shown in Table 2-4, include all District facilities.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The BALMD and RDs 317, 407, and 2067 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture. One specific area is the Delta Bay site where levee instability and seepage are problem areas.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. Some form of localized stormwater flooding occurs during most heavy rains. The most likely time this could have occurred in the past was during the wet year in 2006. Past occurrences that affected the District include:

- 2017 HWE: Initiated extra monitoring. Stormwater resulted in excess electrical cost to pump the excess run off required to prevent localized flooding.
- 2017 HWE: Sandbag management and implementation.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Localized stormwater flooding can occur during heavy rains or seepage events that exceed the District's drainage capabilities. Lower areas around the island may be subject to minor flooding.

Assets at Risk

Localized flooding can overtax the Districts pumping system and create a more hazardous situation involving the levee system by limiting the ability for inspection. District pump stations could be at risk from localized flooding. All RD 407 and 2607 assets, as shown in Table 2-4, are at risk to localized flooding.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

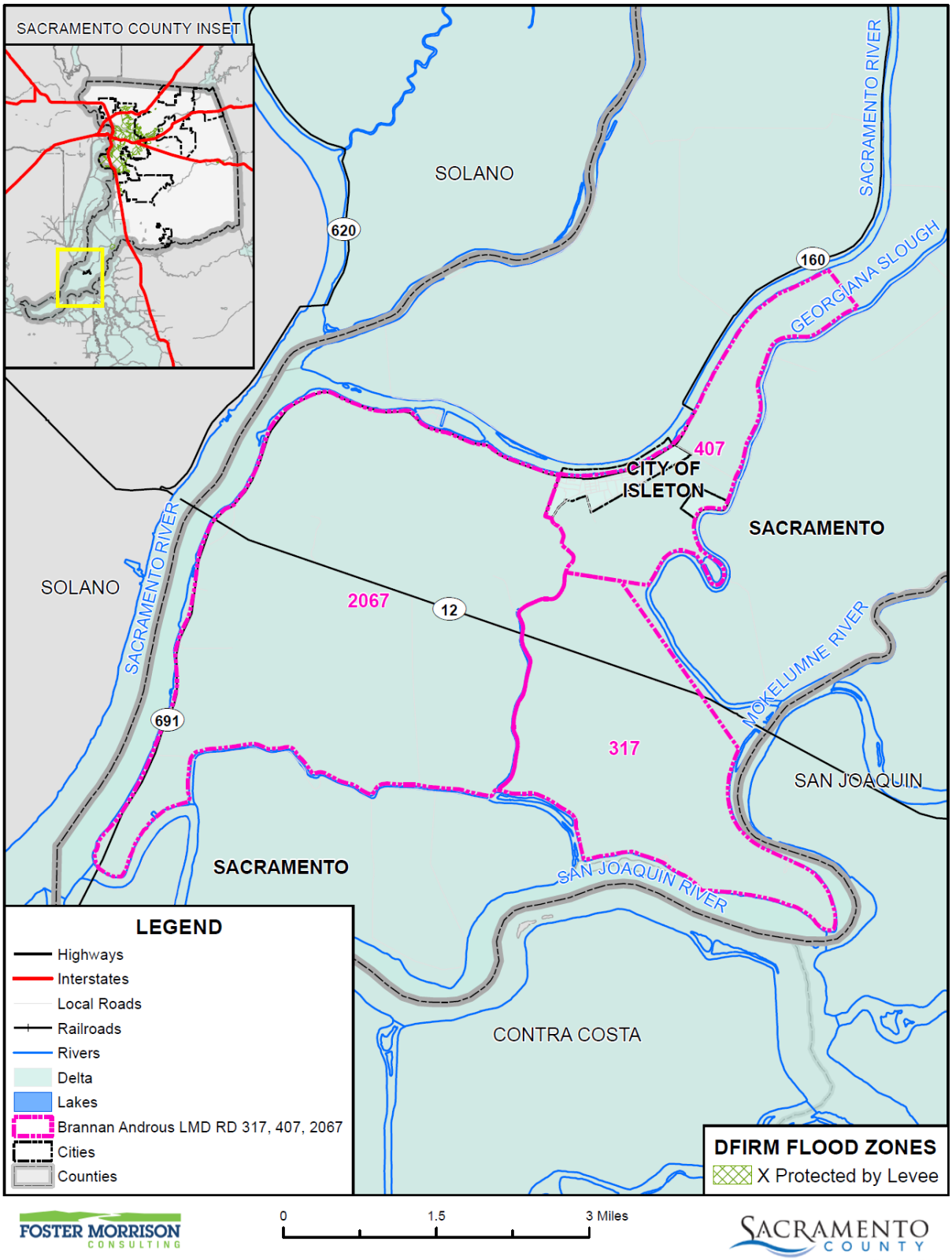
Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When

northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levee protected areas from the DFIRM in the District are shown on Figure 2-5. As shown, the levees were not certified by FEMA in the 2018 DFIRM as providing 1% annual chance flood protection.

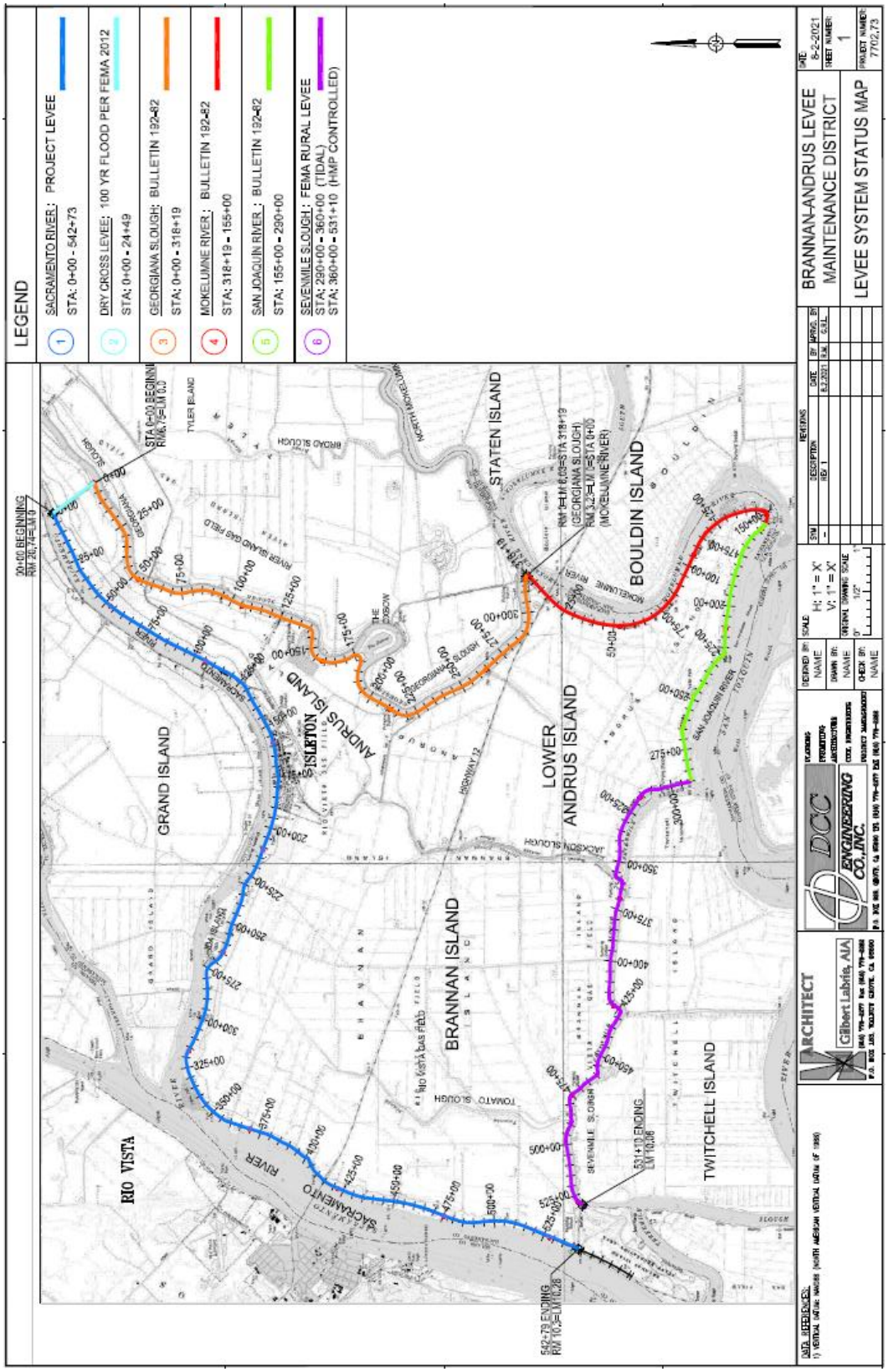
DCC Engineering Co., Inc. has prepared a Levee System Status Map of BALMD. Dated 8/2/2021. This is shown on Figure 2-6.

Figure 2-5 BALMD and RDs 317, 407, and 2067 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Brannan Androus Levee Maintenance District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure 2-6 BALMD – Levee System Status Map



Source: BALMD

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The 2012 5-Year Plan reported that since the creation of the BALMD in 1967, Brannan-Andrus Island has experienced one flood event on June 22, 1972. The levee failed on the southern end of the island along the San Joaquin River. The levee breach occurred after hours during a construction effort to raise the levee and address an instability problem. The elevation of the levee crown at the time was 10.8 feet. The subsequent water level on the inundated island reached 6.2 feet. To protect the town of Isleton, a bow levee was constructed by the US Army Corps of Engineers and volunteers. The bow levee only held for 36 hours. When it failed, 35% of the Isleton community was inundated.

The flood resulted in a "big gulp" effect, where the salt water from Suisun Bay moved into the central and southern Delta, decreasing the Delta's freshwater outflow. The saltwater intrusion degraded water quality for central Delta farms and forced pumping to be cut back at the Central Valley Project pumping plant in Tracy. In order to push back the salinity gradient, a hydraulic barrier was created by increasing water releases from Folsom, Oroville, and Shasta reservoirs. Still, it took those releases several days to reach the affected Delta areas. After releasing over 150,000 acre feet of water, salinity levels were eventually restored to pre-flood levels. It took eight weeks of pumping to dewater the Brannan-Andrus Island.

The USACE spent $1.4 million to repair the breach with another $1.0 million used in federal disaster assistance totaling $2.4 million. In addition, numerous marinas and restaurants suffered from a loss of business and the flood's negative publicity. Crops were lost and intrastate commerce was disrupted. When adding up all of the flood's indirect costs, including the diversion of fresh water destined for CVP customers, it was estimated that the total economic impact of the 1972 Brannan-Andrus flood was approximately $40 million.

The BALMD became concerned about another levee failure during a high water event in 1997, when a section of the landside slope sloughed into a toe ditch along the Georgiana Slough levee. The USACE spent over $1.1 million to stabilize approximately 6,700 lineal feet of levee. No damages have been reported since 2016.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Levee failure could result in inundation of the Districts and could also result in the flooding of Brannan and lower Andrus islands.

As previously stated, BALMD monitors and maintains the levees on the island. Reclamation Districts 407, 2067, and 317 maintain and control the operations of the seven pumping stations to keep the island dry. Five pumping stations are located along Sevenmile Slough, another is on Georgiana Slough, and a lift station is located on the main drainage canal in the northern part of the island.

The 5-Year Plan noted that to repair a levee breach the average cost has been estimated to be approximately $25 million. But the total cost truly depends on the accessibility, size and severity of the breach, the size of the island, volume of water to be pumped out, weather conditions, etc. The $25 million figure assumes costs of $5/yd^3 of on-island replacement fill, $15/yd^3 of off-island fill, 6% per foot of engineering costs, and $5/foot for rip rap. A summer levee breach occurred on Brannan-Andrus in 1972 (discussed above). The Jones Tract failure in 2004, the most recent levee failure, provides insight into determining what a levee breach could cost today. It has been publicized that this 500 foot breach cost approximately $90 million for repair, recovery, and associated damage. However, many knowledgeable locals consider that figure inflated by as much as a factor of two.

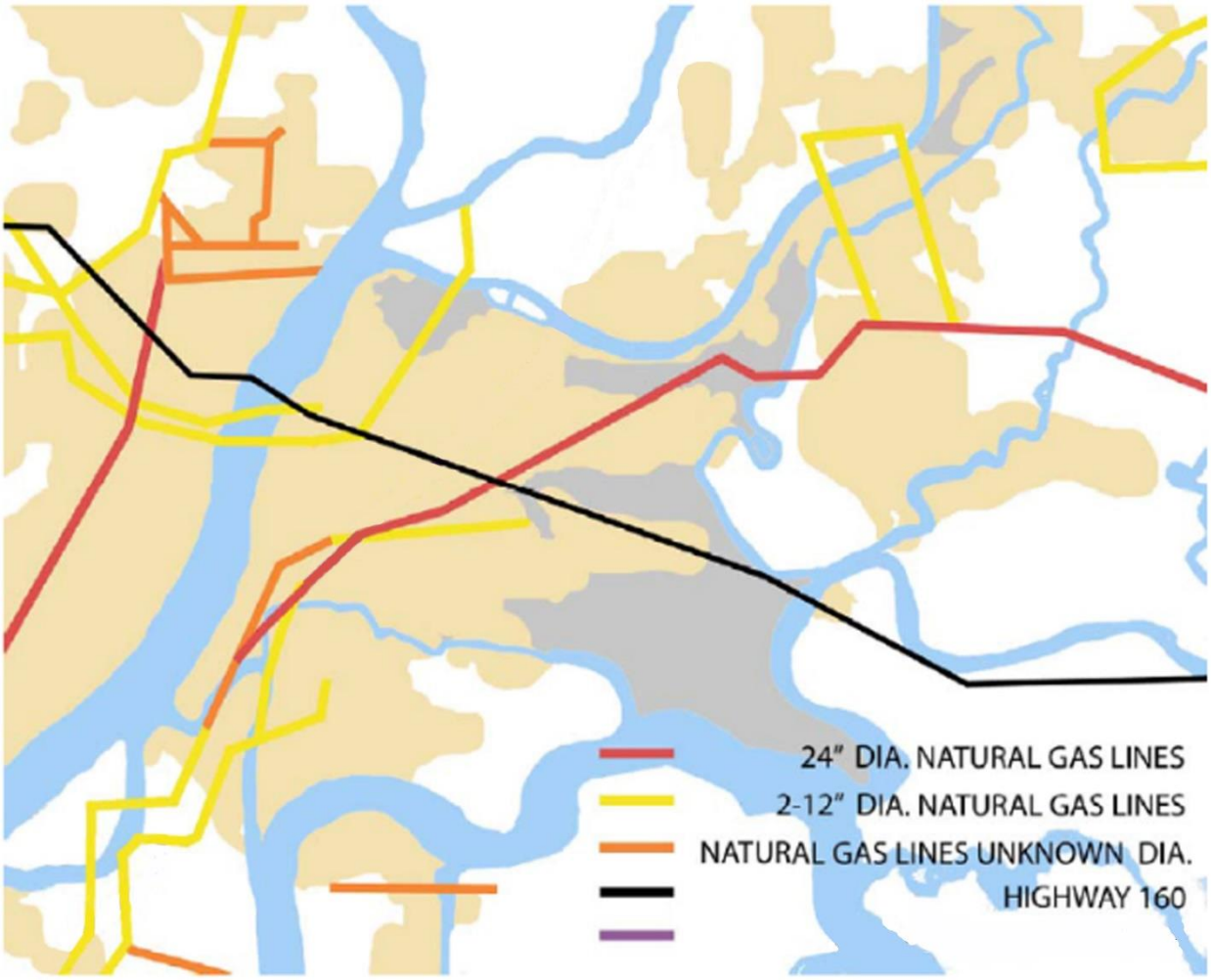
The 5-Year Plan broke down costs by land use type. The District noted that land values have increased because of the changes in crops. The infrastructure exposure related to HWY 12 and HWY 160 has increased significantly due to commuter traffic. Both HWY's are major thoroughfares and would create major economic consequences in all aspects with commercial being impacted the hardest.

- **Residential** – The costs associated with inundation are taken from FEMA's method for estimating displacement. This includes a one-time cost of $500 per flooded household, a cost of $500 per month of inundation per household, and a monthly rental cost of $747. For Brannan-Andrus, it is estimated that there could be a one-time displacement cost of $182,400 for all occupied households along with an additional $15,600 per day to house these residents elsewhere. In addition to the residents, the various resorts on the island generate a transient population. To house this population in emergency shelters it could cost an estimated $85 per person per day. There are no reliable statistics covering that element of the population to determine a total cost per day for emergency housing, since the population fluctuates with the seasons. Flooding threats usually allow sufficient time to evacuate, so the costs to accommodate this unique group of part-time residents may not be significant.
- **Commercial** – Commercial structures will be adversely impacted from the time they are inundated through the time it takes to repair such damage and damage to surrounding infrastructure. For any business that is flooded FEMA assumes a one-time displacement cost of $1000, for a total of $148,000. Upon inundation, the businesses are assumed to have $77,500 of lost output value, $3,900 of lost profit, and $44,000 of lost value added per day on average. "Value added" is the sum of wages and salaries, proprietor's incomes, other property income, and indirect business taxes (URS 67). When a flood occurs, the island businesses could lose $140 million in sales for that year. Four-hundred seventy-one jobs could be lost per day over the duration of inundation. Overall, a flood could cost Brannan-Andrus Island businesses about $125,400 per day. Some businesses may be unable to recover from a flood and could possibly be lost as a result of such an event.
- **Agricultural** – Main crops grown on Brannan-Andrus Island are alfalfa, corn, wheat, pears, apples, cherries, and wine grapes. Brannan-Andrus Island has 10,517 acres of crops. Average cost for rehabilitation and field cleanup is $235 per acre. This involves the removal of debris and sediment deposits after floodwaters have receded. Silt and debris can also clog drainage and irrigation ditches adding a variable cost to rehabilitation. The estimated total one-time cost for clean-up and rehabilitation is estimated to be $2.0 million. If inundation lasts longer than 14 days, it is assumed that the crops will be permanently lost. In 1972, it took eight weeks to pump out the island. Using that estimate, essentially all crops could be lost in a similar flood event. Any flood event that occurs between planting and

harvest, could completely destroy the crops. Reestablishment of a lost crop dramatically increases economic losses. The inundation period is assumed to be five weeks on lower Tyler Island, meaning all crops on the lower end could potentially be lost in a flood event. However, due to the smaller size of RD 554 and an assumed inundation period of five days, not all crops may be lost. Not including clean-up costs, reestablishment of all crops on the island could total an estimated $23.9 million. In addition to reestablishment costs, a flood could also result in annual crop production losses. Annual crop production losses are incurred from the time of the flood and depend on how long inundation occurs, cleanup and the time required for the crops to produce a harvestable yield. If a flood occurs between planting and harvest, the crop will be lost for the year. Planting on Brannan-Andrus begins in April and harvest ends by October. This report adds two months onto the planting season since it is estimated to take two months before the soils are dry enough for planting. As a result, the critical flood season for crops really occurs between February and October. If planting cannot occur within the same year as the flood event, annual production losses from orchards and vineyards could amount to about $17 million. If an event occurs between February and October, pushing planting to the following year, annual production losses will be about $26.8 million. Degraded water quality from salinity intrusion can also reduce crop yields.

The Brannan-Andrus Island levee system also protects several critical infrastructure components. There is an approximately 18-mile network of roads that include State Highway 12 (4.21 mi.) and Highway 160 (8 mi.) which provide east-west and north-south links with interstate corridors. There are approximately 9,088 acres of underground gas fields and storage areas with a total of 33 natural gas wells and 157 gas/oil wells. The areas in beige represent the natural gas fields. A Lodi Gas' natural gas pipeline (24" diameter) runs west to east across the island feeding two 2-12" diameter pipelines. In total there are about 14.3 miles of PG&E pipeline with natural gas production at about 5,117,858 mcf. These are all shown on Figure 2-7. The District noted that the 230kV transmission line has been removed since the creation of this map.

Figure 2-7 PG&E Natural Gas Pipelines, Gas Fields, Storage Areas, and Transmission Lines



Source: 2012 5-Year Plan

StormReady Flood Scenarios and Evacuation Routes

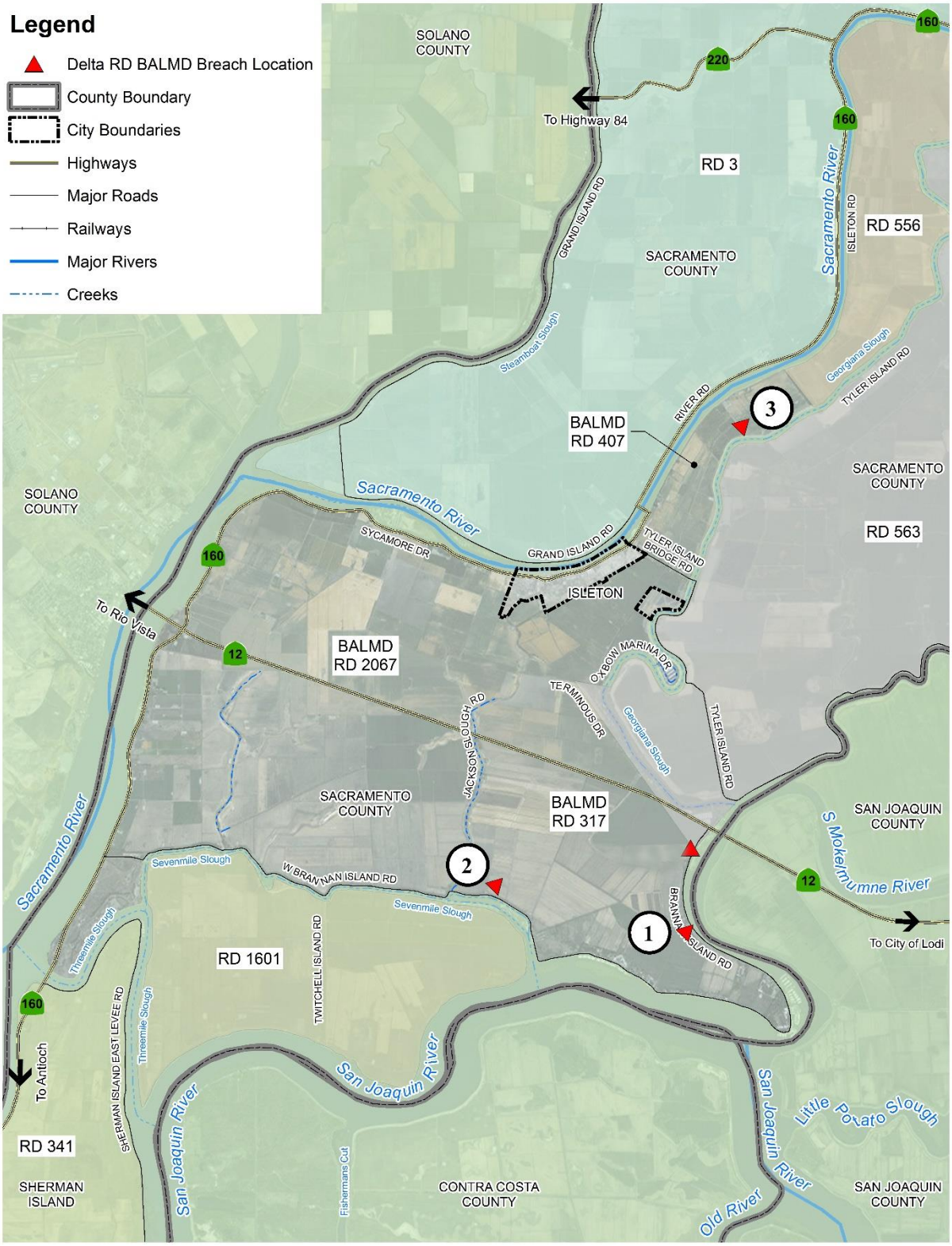
The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

For BALMD and RDs 317, 407, and 2067, Figure 2-8 details the locations in the Delta within BALMD and RDs 317, 407, and 2067 where flooding could occur. The red triangles denote potential levee breach locations. BALMD and RDs 317, 407, and 2067 has three potential levee break scenarios. Maps for Scenario 1 regarding time to one foot inundation (Figure 2-9), estimated flood depths (Figure 2-10), and

suggested evacuation routes (Figure 2-11) are displayed below. Maps for Scenario 2 and 3 can be found on the Sacramento County stormready.org website.

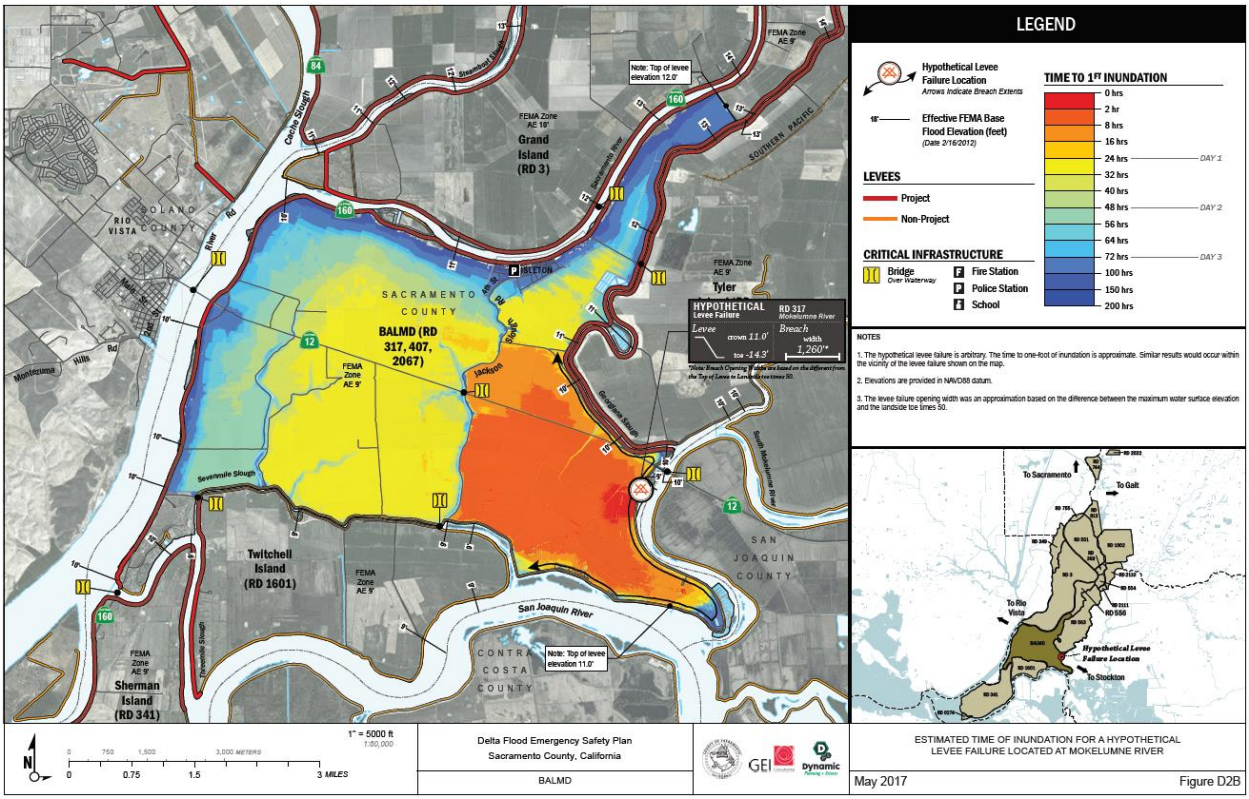
Note: This information is based on assumptions and scenarios developed as part of the flood safety planning done for Delta RDs in 2017; areas of possible flooding depicted in these maps may or may not reflect current conditions and would change depending on the location of breach areas and conditions during any given event. Current conditions should be verified with an LMA representative

Figure 2-8 BALMD and RDs 317, 407, and 2067 – Potential Levee Breach Location



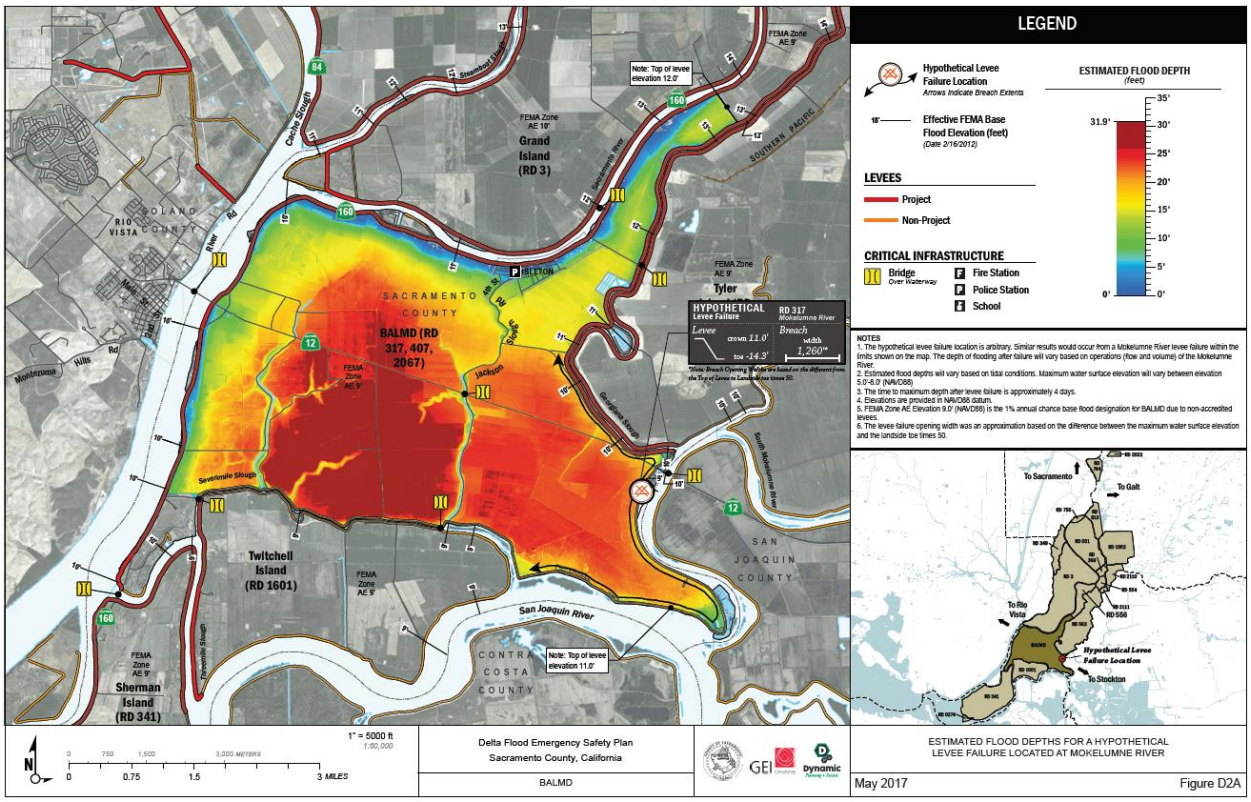
Source: BALMD, DCC Engineering

Figure 2-9 BALMD and RDs 317, 407, and 2067 – Time to One Foot Inundation after Levee Breach



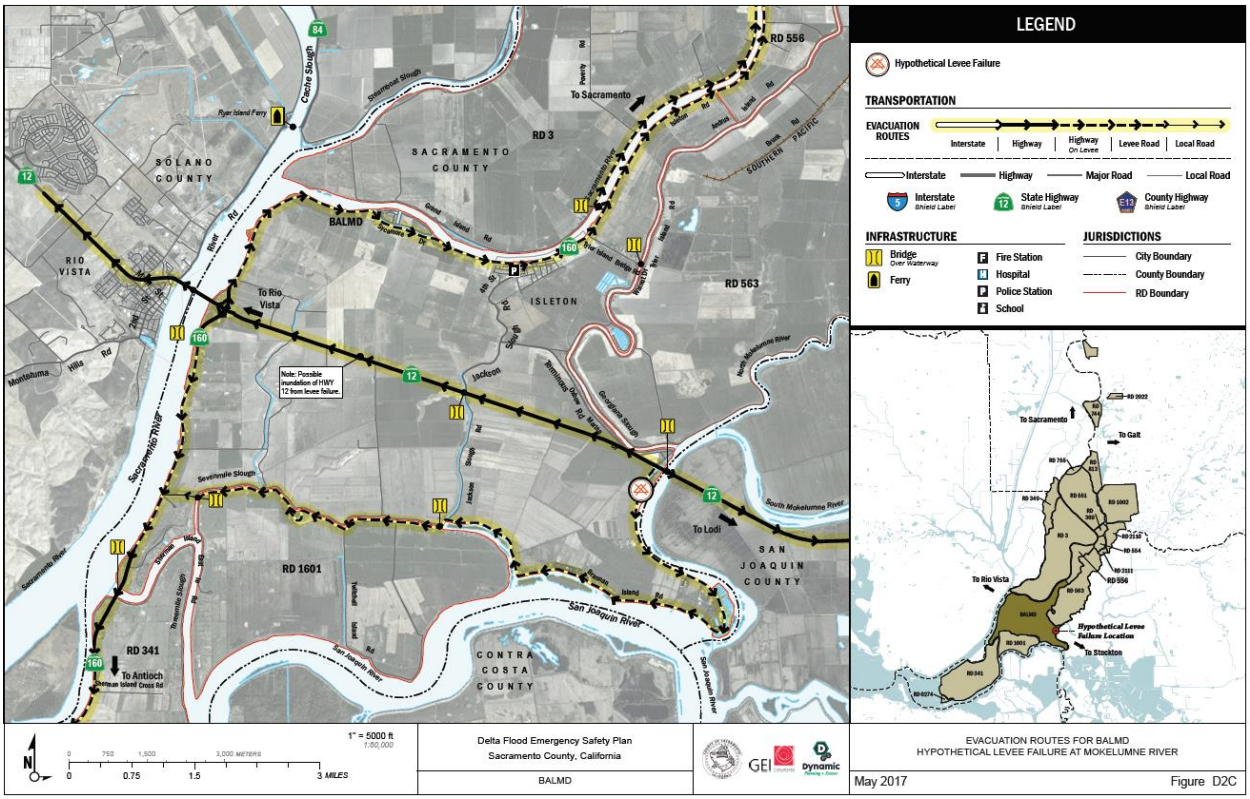
Source: Sacramento County Storm Ready – retrieved March 25, 2021

Figure 2-10 BALMD and RDs 317, 407, and 2067 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 25, 2021

Figure 2-11 BALMD and RDs 317, 407, and 2067 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 25, 2021

Assets at Risk

Levees and district pumping plant. On island inundation can create an open water situation where a large fetch could develop and erode the interior of other levees within the District. Inundation of the drainage pumps and system can make them inoperable and require replacement. Other critical facilities at risk include two fire departments, Isleton city offices and an elementary school.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an occasional occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

There are heavy storms that occur sporadically. The last heavy rain and storm event that raised river levels the District experienced was in 2006, 1997 and 1986. No significant damages occurred due to these high water events. Events since 2016 include:

- 2017 HWE: Initiated extra monitoring. Severe weather resulted in excess electrical cost to pump the excess run off required to prevent localized flooding.
- 2017 HWE: Overtopping concerns on Mokelumne River.
- 2017 HWE: Levee instability evidence on the San Joaquin River.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

Heavy rains and storms can result in higher flood flows that could increase the hydraulic gradients within the levee section and result in seepage and boils or if great enough, possibly overtopping. They can also increase flows and result in erosion of the waterside bank.

Assets at Risk

The Planning Team for the District noted that the District levees and pumping plant are at risk of damage from heavy rains and storms.

Subsidence

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Subsidence is the gradual settling or sinking of the earth's surface over manmade or natural underground voids with little or no horizontal motion. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. Subsidence is worsened when groundwater drawdown exceeds the ability of the ground to naturally recharge. This is more common during periods of drought.

Location and Extent

There is no scientific scale to measure subsidence. Subsidence is measured in inches or feet of elevation change over time. Subsidence has a long speed of onset, as it occurs over many years. The duration of subsidence is long, as it is rare for subsidence to be reversed. In Sacramento County, the Delta in the southeast portion of the County is highly at risk to subsidence. In the Delta, subsidence affects the islands as well as the levees.

Past Occurrences

There have been no state or federal disasters in the County related to subsidence. No events of past subsidence have affected the District. The District noted that subsidence occurs over time, so pinning a past occurrence is difficult.

Vulnerability to and Impacts from Subsidence

Historically, the County has been at risk from subsidence. Vulnerability in the County from subsidence comes from several different causes:

- Compaction of Unconsolidated Soils by Earthquake Shaking (Liquefaction)
- Compaction by Heavy Structures
- The Erosion of Peat Soils
- Fluid Withdrawal

These were discussed in detail in Section 4.3.16 of the Base Plan. The District is concerned with all four causes. Subsidence will cause the District levees additional stress.

Assets at Risk

The District levees are most at risk from this hazard.

2.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

2.6.1. Regulatory Mitigation Capabilities

Table 2-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the BALMD and RDs 317, 407, and 2067.

Table 2-7 BALMD and RDs 317, 407, and 2067 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y	1. Current 5-year plan is under review and being updated. It describes past, present, and future hazards. These hazards are managed and implemented using the standard operating plan strategies. 2. At this time, an Emergency Operations Plan Update is still in development. Expected process to the finalized during the next 2 years. 3. 2016 Sacramento County Flood Safety Plan is in place. As well, as a Hazard Plan concerted with Sacramento County with GEI as the interface. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter. 4. Small Communities Program for flood protection and structural and nonstructural mitigation. This Legacy grant is interfaced through GEI/MBK in conjunction with agencies and BALMD to improve levee integrity, operations, and management to reduce flood related losses. The benefit as a participant in SCP is to reduce risk to people, property, and environmental resources. Flood risk reduction can be implemented through this program. 5. Update of the 2016 LHMP continues to include valuable information about the priority of hazards BALMD faces. Once accepted this data and information can be used to the highest and best protection of the District and its communities.
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	Y	The plan addresses flooding hazards and can be used to implement mitigation actions. While EOP is in development, there is unofficial protocol of those that live and work on the island. They have used this protocol over a long time to respond to flood and other related hazards.
Continuity of Operations Plan	Y	While EOP is in development, there is unofficial protocol of those that live and work on the island. They have used this protocol over long period of time to respond to flood and other related hazards. The EOP provides continuity for the District and the expected process is to finalize during the next 2 years.
Transportation Plan	N	

Stormwater Management Plan/Program	Y	Included in the District standard operations and maintenance procedures is management for Stormwater. Patrols are dispatched at critical times. Before and after storms, patrols know where to look, inspect and take action to proactively provide flood risk reduction. Procedures are in place to keep water flow moving.
Engineering Studies for Streams	Y	District is contracted with local engineering company who provides counseling and advice of Operations and Management for risk reduction, levee integrity, and mitigation relating to water/flood flows. Engineer provides and satisfies agency interface as well as Fiscal advice.
Community Wildfire Protection Plan	Y	In the event of such hazard, the community Reverse 911 and phone tree would be initiated. Detailed communication from RDFD command center would be put into action.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation) Research and Development of burrowing animals	N	BALMD is constantly reviewing or studying data for reduction of hazards and improvements to current plans to provide a safer environment to its community. Assist in research and develop plan for preparedness, management and control of burrowing animals. In very recent years, burrowing animals have become a hazard. Burrowing causes extensive damage to water infrastructure, banks, and levees, and creates a hazard for people, livestock, and machine operators. Potential levee and dike failures due to nutria burrowing have serious implications for flood protection, water delivery, and agricultural irrigation in California.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: CBC 2019
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	Y	The District has granted the authorization for limited development adjacent to levees.
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	Sacramento County Zoning Code reduces both hazard and growth and development. The District is a mixture of zoned agriculture and residential property which, in itself also limits development. The City of Isleton has attempted residential development in the past (failed developments is contributed to economics).
Subdivision ordinance	N	
Floodplain ordinance	Y	Yes, Sacramento County Floodplain Ordinance restricts development in the floodplain
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	Y	AE Zone

Elevation Certificates	Y	Sacramento County requires Elevation Certificates for new construction. Other outside resources such as insurance companies and mortgage companies may choose to require EC also. There is emphasis and funding from FEMA to raise existing homes to provide safer residential properties against hazards. Thereby reducing risk.
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	Y	5-Year Plan continues to include monitoring for such hazards. Through the Districts standard operating plan, patrols are dispatched at critical times. Special attention is given to inspection of critical erosion sites. The District is responsible for its own main levee repair and maintenance in which procedures are outlined in the general patrol guidelines. Patrols act to proactively provide erosion or sediment reports. The results are reduced risk for the District and Community.
Other	Y	The District has granted the authorization for limited development adjacent to levees. Pre permit submissions requires an owner to receive RD approval before proceeding forward with permits. This procedure prepares new developers or owners for the risk reduction measure to include in their projects.
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. BALMD would like to expand and improve to reduce risk by implementing: 1. Research and develop a plan to improve the Delta Bay site where landslide and seepage are potential risks. BALMD can further reduce risk at this site by stabilizing berms and improved seepage and drainage management. 2. Research the continuity of multiple hazard plans and identify the projects that include mitigation strategies. Therefore, implementing mitigation strategies to improve District LOP for its communities. Thus, reducing risk to life and property. 3. Increase a more centralized vehicle coverage area on BALMD. By doing so and having a vehicle command center, service to the District can be more efficient therefore reducing risk to hazards. These capabilities to expand and improve upon are a District priority, but expenditures and allowances of financial resources slow or stall efforts to implement preventive maintenance plans.		

Source: BALMD and RDs 317, 407, and 2067

2.6.2. Administrative/Technical Mitigation Capabilities

Table 2-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in BALMD and RDs 317, 407, and 2067.

Table 2-8 BALMD and RDs 317, 407, and 2067's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	BALMD has planned maintenance programs that include vegetation management. Levees are mowed (or goat grazing practices), vegetation is trimmed, and roadways are clear for patrol and emergency vehicles to have access.
Mutual aid agreements	N	BALMD is contracted with a local engineering company who provides counseling, review, and implementation on risk reduction, levee integrity, and mitigation related to mitigation capabilities. Official contracts are in place with local Contractors, equipment rental resources and supply companies. BALMD has purchased hazard relief supplies which are stored and on-hand at local supply yards available to barge where needed on a moment's notice. Unofficial coordination between many community members and local residents responding to their respective duties during a hazard is in place. This is a very effective risk reduction coordination.
Other	N	
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	Y	Determined via the Sacramento County Flood Safety Plan and Emergency Operations Plan that is in development
Emergency Manager	Y	Determined by the District Board.
Community Planner	N	County Board of Supervisors through town meetings, Board of Directors, and interface with District Engineer.
Civil Engineer	Y, FT	Staff is trained to coordinate with agencies and perform tasks in an emergency situation. The staff and Engineer provides interface with agencies and their staff.
GIS Coordinator	N	
Other	N	Funding for additional staff would be very effective to improve upon agency task assignments, improvement with interface to the community, and be more effective throughout the District.
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Phone tree, Reverse 911, Isleton siren, and organized communication from the RDFD command center would be put into action.

Hazard data and information	Y	1. Current 5-year plan is under review and being updated. It describes past, present, and future hazards. These hazards are managed and implemented using the standard operating plan strategies. 2. At this time, an Emergency Operations Plan Update is still in development. Expected process to the finalized during the next 2 years. 3. 2016 Sacramento County Flood Safety Plan is in place. As well, as a Hazard Plan concerted with Sacramento County with GEI as the interface. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter. 4. Small Communities Program for flood protection and structural and nonstructural mitigation. This Legacy grant is interfaced through GEI/MBK in conjunction with agencies and BALMD to improve levee integrity, operations, and management to reduce flood related losses. The benefit as a participant in SCP is to reduce risk to people, property, and environmental resources. Flood risk reduction can be implemented through this program. 5. Update of the 2016 LHMP continues to include valuable information about the priority of hazards BALMD faces. Once accepted this data and information can be used to the highest and best interest of the District and the protected community.
Grant writing	N	
Hazus analysis	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
BALMD would like to expand and improve to reduce risk by implementing: 1. Research and develop a plan to improve the Delta Bay site where landslide and seepage are potential risks. BALMD can further reduce risk at this site by stabilizing berms and improved seepage and drainage management. 2. Increase a more centralized vehicle coverage area on BALMD. By doing so and having a vehicle command center, service to the District can be more efficient therefore reducing risk to hazards. Both of these capabilities to expand and improve upon are a District priority, but expenditures and allowances of financial resources slow or stall efforts to implement preventive maintenance plans.		

Source: BALMD and RDs 317, 407, and 2067

2.6.3. Fiscal Mitigation Capabilities

Table 2-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 2-9 BALMD and RDs 317, 407, and 2067's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Delta Levees Subventions program to maintain levee system.
Authority to levy taxes for specific purposes	Y	Proposition 218 provides the District with the limited ability to raise benefit assessments through a vote of property owners.
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	Unknown, would be dictated by Sacramento County and the City of Isleton, but development is limited.
Storm water utility fee	Y	Benefit Assessments are applied for drainage
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	Y	Districts may borrow from a financial institution over an extended period and repay from assessment revenue.
Community Development Block Grant	N	
Other federal funding programs	N	
State funding programs	Y	State or local approved grants would be another financial resource for expenditure on top priority hazards that have been identified. Such funding would offer expenses on operations and maintenance to improve levee rehabilitation and vegetation management. Delta Levee Subventions Program Delta Levee Special Projects Proposition 84 and 1E
Other	N	Additional funding would allow more projects to be completed per year adding staff to better reduce the risk in the District and provide improved protection for our communities. Research and develop a plan to improve the Delta Bay Resort site where landslide and seepage are potential risks. BALMD can further reduce risk at this site by stabilizing berms and improved seepage and drainage management.

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
How can these capabilities be expanded and improved to reduce risk?		
The involvement of Federal agencies funds would help in reducing risk. BALMD is in the Subventions Program. BALMD would benefit from improvement in the guidelines, process, and timelines with agencies. Some improvements are included in the Flood Safety Plan, the Small Community Plan, and the 2021 EOS Update that is currently in development. These improvements also require additional funding which could be accessed with better staffing. All of these together, reduce risk and provide improved protection for our communities. In addition, additional funding would: 1. Assist in a research and develop plan for preparedness and control of burrowing animals. In very recent years, burrowing animals have become a hazard. Burrowing causes extensive damage to water infrastructure, banks, and levees, and creates a hazard for people, livestock, and machine operators. Potential levee and dike failures due to nutria burrowing have serious implications for flood protection, water delivery, and agricultural irrigation in California. 2. Research and develop a plan to improve the Delta Bay site where landslide and seepage are potential risks. BALMD can further reduce risk at this site by stabilizing berms and improved seepage and drainage management.		

Source: BALMD and RDs 317, 407, and 2067

2.6.4. Mitigation Education, Outreach, and Partnerships

Table 2-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 2-10 BALMD and RDs 317, 407, and 2067's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	Fish and Wildlife – Preparedness of burrowing animals, Eradication of Nutria Department of Water Resources Delta Flood Emergency Preparedness, Cal OES Financial Assistance River Delta Unified School District. River Delta Fire District
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Local schools provide a small amount of public education to students for their general school safety. Multiple agencies hold town meetings to distribute topic specific information.
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	Y	Through neighboring RD's, unofficial partnerships are in place for assistance in the event of a hazard.

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Other	Y	BALMD is contracted with a local engineering company who provides counseling, review, and implementation on risk reduction, levee integrity, and mitigation related to mitigation capabilities. Official contracts are in place with local Contractors, equipment rental resources and supply companies. BALMD has purchased emergency response supplies which are stored and on-hand at local supply yards available to barge where needed on short notice. Unofficial coordination between many community members and local residents responding to their respective duties during a hazard is in place. This is a very effective risk reduction coordination.
How can these capabilities be expanded and improved to reduce risk?		
As a small number of people district, current planned coordination for BALMD is consistently reviewed, implemented, and quite effective. Continuation of improving outreach programs in coordination with State agencies and neighboring RD's may be helpful in community education about disaster related issued. Assist in research and develop plan for preparedness, management, and control of burrowing animals. In very recent years, burrowing animals have become a hazard. Burrowing causes extensive damage to water infrastructure, banks, and levees, and creates a hazard for people, livestock, and machine operators. Potential levee and dike failures due to nutria burrowing have serious implications for flood protection, water delivery, and agricultural irrigation in California.		

Source: BALMD and RDs 317, 407, and 2067

2.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

- The Districts do annual erosion repair and seepage abatement projects. There are currently two large projects in the planning stages that will address critical erosion sites on the Sacramento River and Georgiana Slough. The Districts are also updating their Five Year Plan with levee repair and enhancement projects to continue to maintain and improve the levee system.

2.7 Mitigation Strategy

2.7.1. Mitigation Goals and Objectives

The BALMD and RDs 317, 407, and 2067 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

2.7.2. Mitigation Actions

The planning team for the BALMD and RDs 317, 407, and 2067 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each

action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Dam Failure
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms
- Subsidence

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.

Hazards Addressed: Floods, Subsidence, Levee Failure, Heavy Rain and Storms, Dam Failure, Burrowing Animals, Erosion/Bank/Slope

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including BALMD. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to improve levee integrity to manage flood risk and provide safer systems for the community. These projects will contain many levee and flood management improvements including but not limited to environmental projects such as burrowing animal mitigations, levee repairs, erosion control, riparian bench restorations,

crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; Small Communities Program Projects; 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; FEMA hazard mitigations, the Army Corps of Engineers; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, and HMA 2021 BRIC and FMA Programs and subsequent mitigations and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Action 2. Regional Flood Management Plan Projects

Hazards Addressed: Floods, Subsidence, Levee Failure, Heavy Rain and Storms, Dam Failure, Burrowing Animals, Erosion/Bank/Slope

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including BALMD.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to improve levee integrity to manage flood risk and provide safer systems for the community. These projects will contain many levee and flood management improvements including but not limited to environmental projects such as burrowing animal mitigations, levee repairs, erosion control, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment

modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; Small Communities Program Projects; and 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, and HMA 2021 BRIC and FMA Programs and subsequent mitigations and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Action 3. Small Communities Plans – Flood Protection – Structural and Nonstructural Mitigation

Hazards Addressed: Floods, Subsidence, Levee Failure, Heavy Rain and Storms, Dam Failure

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: BALMD and RD#554 Walnut Grove East, Sacramento County, are included in the Small Communities Plans. These and other communities obtained grants under the CA DWR flood protection programs. Phase 1 provided the resourced to access and evaluate levee and flood risks. The upcoming Phase 2 of the program will involve implementation and construction of mitigation projects identified in Phase 1.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects brought to light in the Small Communities Plans. The agencies will work to improve levee integrity to manage flood risk and provide safer systems for the communities. These projects will contain many levee and flood management improvements including but not limited to environmental projects such as burrowing animal mitigations, levee repairs, erosion control, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Small Communities Projects. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; and 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners:

1. Isleton – BALMD (RD 317, RD 407)

2. Walnut Grove East – RED 554 Walnut Grove

3. Walnut Grove West – RD 3 Grand Island

4. Locke – RD 369 Libby McNeil

5. Courtland – RD 551 Courtland

Cost Estimate: Phase 1 of the Small Communities projects were $500,000 per community. Phase 2 Construction Costs will be determined upon the completion of Phase 1

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR, FEMA hazard mitigation, the Army Corps of Engineers, and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Timeline: Upon completion of Phase 1 and moving into Phase 2 Construction a timeline would be included.

Project Priority (H, M, L): High

Action 4. 2021 Emergency Operations Plan (EOP) – Currently in development

Hazards Addressed: Floods, Subsidence, Levee Failure, Heavy Rain and Storms, Dam Failure, Burrowing Animals, Erosion/Bank/Slope

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including BALMD. The EOP is coordination between BALMD team members to clarify and ensure conformance and focus to prevent duplication efforts when a solution is available and planned.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to improve levee integrity to manage flood risk and provide safer systems for the community. These projects will

contain many levee and flood management improvements including but not limited to environmental projects such as burrowing animal mitigations, levee repairs, erosion control, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2021 Emergency Operations Plan (EOP) – Currently in development; 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021; Regional Flood Management Plan; the Small Communities Program Projects; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; FEMA hazard mitigations, the Army Corps of Engineers; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, and HMA 2021 BRIC and FMA Programs and subsequent mitigations and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Delta Annex Chapter 3 Reclamation District 3

3.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 3 (RD 3 or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 3, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

3.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 3-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 3-1 RD 3 – Planning Team

Name	Position/Title	How Participated
Daniel Wilson	President	Evaluated District issues and developed solutions
Dave Robinson	District Manager	Evaluated District issues and developed solutions
Joey Sanchez	Trustee	Evaluated District issues and developed solutions
Gilbert Cosio/MBK	District Engineer	Evaluated District issues and developed solutions

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 3-2.

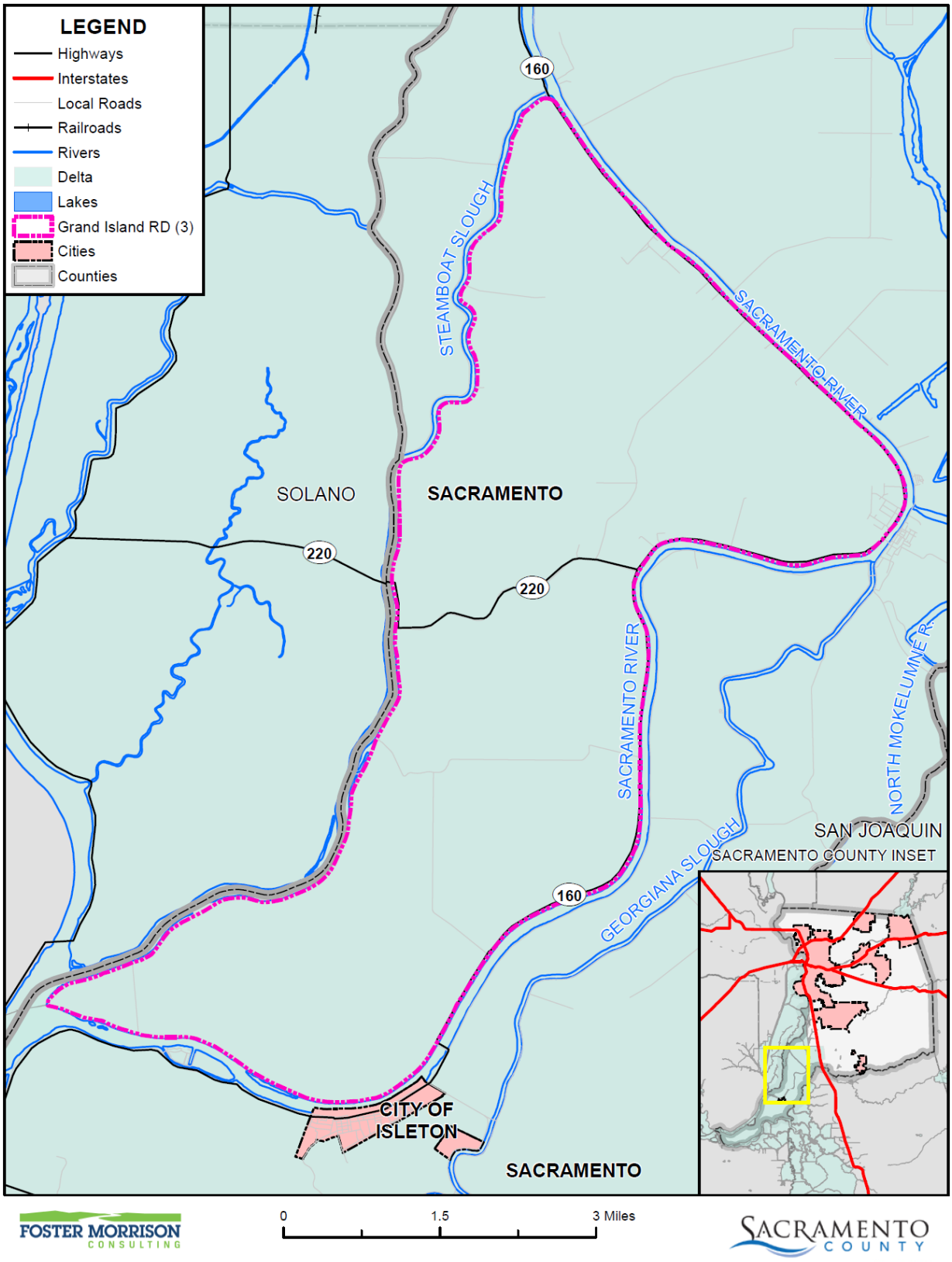
Table 3-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
N/A	No mitigation related planning mechanisms have been completed since 2016.

3.3 District Profile

The District profile for RD 3 is detailed in the following sections. Figure 3-1 displays a map and the location of the District within Sacramento County.

Figure 3-1 RD 3



Data Source: Grand Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

3.3.1. Overview and Background

Reclamation District No. 3, Grand Island, is the local public entity that provides flood control and drainage services to the landowners of Grand Island. These functions are provided in the most economical and environmentally sound manner, with the greatest consideration of the areas rich agrarian culture and heritage.

As one of the first reclamation districts formed in 1861, Grand Island was given the number Reclamation District No. 3. The area protected by Reclamation District No. 3 has remained the same for essentially the entire time of its existence. As described in Division of Water Resources, (currently known as Department of Water Resources) Bulletin No. 37, which was published in 1930, the Reclamation District is described as protecting 17,100 gross acres, with a net protected area of 16,245 acres.

The Reclamation District No. 3 levees are part of the Federal Sacramento River Flood Control Project. This federally authorized project reconstructed the levees of Grand Island in the late 1950s. As part of a Federal project, the State of California is the local sponsor with Reclamation District No. 3 acting as the local maintaining agency. In order to verify that the District is maintaining its levees properly, the State inspects the levees two times a year (spring and fall) and Reclamation District No. 3 inspects its levees twice a year (summer and winter). The key inspection is the fall inspection performed by the State of California. This inspection, which occurs just prior to the flood season, is used by the Corps of Engineers to determine whether the levee is being properly maintained in order for Reclamation District No. 3 to qualify for Federal emergency funding through Public Law 84-99. The Corps of Engineers also performs inspections periodically every 5 to 10 years.

Reclamation District No. 3 provides flood protection in the form of levee maintenance and rehabilitation. The District also provides interior island flood protection and drainage. The District operates and maintains all the levees that protect the landowners of Grand Island. These 28.8 miles of levees border the Sacramento River and Steamboat Slough. The District also maintains 37.2 miles of ditches and canals, and 3 pumping plants to drain the properties of Grand Island. The protected area includes the communities of Walnut Grove and Ryde.

3.4 Hazard Identification

RD 3 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 3-3).

Table 3-3 RD 3—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Occasional	Limited	Low	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Extensive	Occasional	Critical	Low	High
Earthquake	Extensive	Occasional	Limited	Low	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Low	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Significant	Likely	Critical	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Significant	Likely	Critical	High	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Low	Low
Subsidence	Significant	Likely	Limited	Low	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Limited	Unlikely	Negligible	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

3.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

3.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 3.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 3-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

3.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 3's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. The District protects two towns, West Walnut Grove and Ryde. The total population within the District is 1,465 with approximately 352 structures with a depreciated replacement value of $94.68 million

The District has approximately 15,676 acres dedicated to agriculture. The District supports a mixture of permanent crops such as orchards and vineyards, row crops, grain, and pasture. The total value of this is estimated to be $43.63 million.

Additionally, the District supports critical infrastructure that includes State Highway 160 and 220 as well as County roads, a ferry, local bridges, schools, fire station, water wells, gas wells, cell tower, solid waste facility, an oil/gas pipeline, and a PG&E substation.

With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 3-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 3's physical assets, valued at over $684 million, consist of the buildings and infrastructure to support the District's operations.

Table 3-4 RD 3 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Pumping Plant – Sac. River	Drain Pump	$2,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Pump Plant – Steamboat Sl (old)	Pump Plant	$2,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Pump Plant –Steamboat Sl (new)	Pump Plant	$2,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
District owned Facilities	Home, Buildings & Equipment	$2,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Levees	Flood Control	$576,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Total		**$684,000,000**	

Source: RD 3

Table 3-5 lists proposed projects that are planned in the next 5 to 10 years to increase the District's resilience to hazards. The District is currently estimated to have a 30 to 50 year level of flood protection. Once these projects are complete, the District is expected to get to a 70 to 80 year level of flood protection.

Table 3-5 RD 3 Proposed Maintenance and Improvement Projects

Proposed Projects	Levee Segment
2017 and 2019 Storm Damage, Waterside Erosion Repairs	Sacramento River
FSRP Critical Erosion Repair	Steamboat Slough
FSRP Seepage Cut Off Wall	Steamboat Slough
2017 and 2019 Storm Damage Waterside Erosion Repairs	Steamboat Slough
Seepage Repairs	Steamboat Slough
Interior Drainage Improvements	Sacramento River and Steamboat Slough

Source: RD 3

Natural Resources

RD 3 has a variety of natural resources of value to the District. In the past, RD 3 has protected a number of natural gas wells. Currently, there are no wells in operation on Grand Island. RD 3's levees support vegetation that provides fish and wildlife habitat. Agricultural ground and ditches also support wildlife.

Historic and Cultural Resources

RD 3 has a variety of historic and cultural resources of value to the District. Since the land has been settled for over 150 years, there are many historic structures on Grand Island. These include the Ryde Hotel, the Grand Island Mansion and the Beaver Union School.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Development since 2016

No District facilities have been constructed since 2016. As such, vulnerability is assumed to be unchanged.

Future Development

Grand Island is within the Primary Zone of the Delta. Therefore, in addition to Sacramento County, development is controlled by a State agency, the Delta Protection Commission. Therefore, there is little, if any, potential for growth beyond that allowed by agricultural zoning. None of these planned repairs listed in Table 3-5 are intended to induce growth due to land use regulations.

3.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 3-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.

- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

The District has experienced power outages, typically related to high winds and storms that damage the power lines. The District can utilize generators as needed but do not have a backup power source otherwise.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

The District is not located within an area that is subject to a PSPS and has not been affected by any activity.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

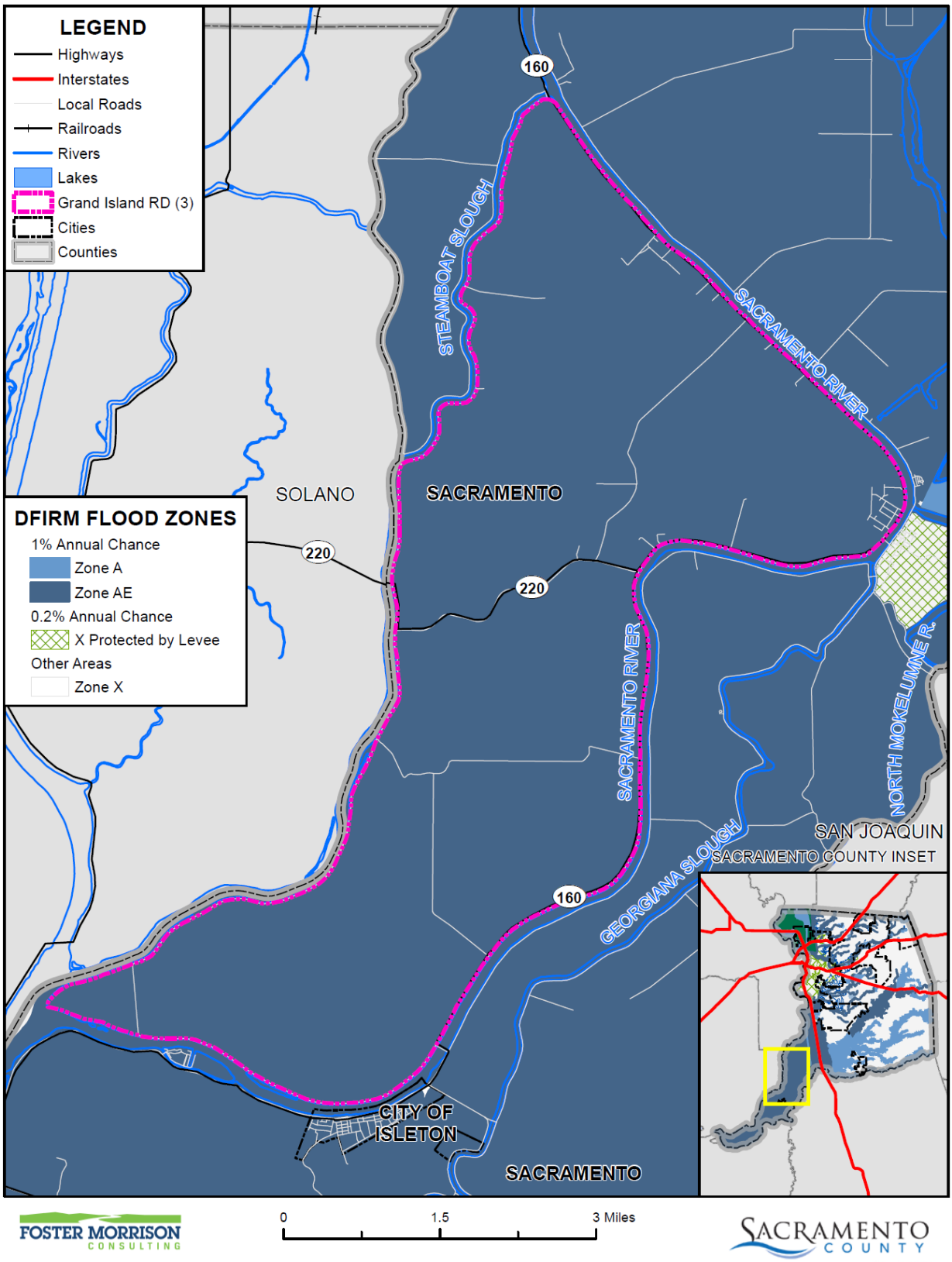
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and RD 3 have been subject to historical flooding.

Location and Extent

The RD 3 is primarily located in the 1% annual chance floodplain. This is seen in Figure 3-2.

Figure 3-2 RD 3 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Grand Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 3-6 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 3-6 RD 3– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	
X Unshaded	Areas outside flood zones	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 3-7. These events also likely affected the District to some degree.

Table 3-7 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Past river floods, most recently in 1986, 1995, 1997/1998, 2006 and 2017, have damaged the RD 3 levees in the form of erosion. Some of this erosion was repaired by RD 3 under flood fight conditions. Restoration erosion repair has typically been performed by the Corps of Engineers as authorized under PL 84-99. Repair work under PL 84-99 was performed by the Corps of Engineers on Grand Island levees following the recent floods of 1986, 1997, 1998, and 2006. Erosion experienced in other years was repaired by RD 3. The District temporarily lost eligibility in the PL84-99 program but has recently regained eligibility through the preparation and execution of a Systemwide Improvement Framework (SWIF). The District is now eligible to receive repair and recovery assistance from the Corps of Engineers.

Past floods, as previously listed, have also required flood fighting by RD 3. This flooding fighting has consisted of seepage control and emergency erosion repair. Seepage control is critical in levee breach prevention. The levees and levee foundations of Grand Island are very porous and subject to flood water seeping through, and under, the levee. If left uncontrolled, this seepage could accelerate to the point that it has the force to move levee material. This phenomenon is called piping, or internal erosion of the levee. Once enough material is moved out of the levee section, a levee breach occurs.

Most recently, high water events in 2017 and 2019 have resulted in considerable waterside erosion and exacerbated sites that have experienced erosion over time throughout the District levees.

The flood event of 2017 also resulted in increased vegetation removal, levee patrols, and pumping costs.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Flooding of Delta islands has the potential to negatively impact water quality both locally and statewide. The largest of California's drinking water sources is the Sacramento-San Joaquin Delta and its tributaries. The Delta provides water throughout the state via the State and Federal water projects. During a flood, there is a higher potential for the waters in the Delta to be exposed to chemicals, fuel, oil, and multiple other constituents of concern that can quickly degrade water quality. Flooding can also disturb soil and soil-borne materials such as mercury and organic matter that can degrade water quality. If the flood water rushing into a Grand Island levee breach is large enough in volume, the surge of water into the island will cause saltwater to be pulled from San Francisco Bay and into the Delta, thus impacting the water quality of the Delta and water users who export water out of the Delta.

Assets at Risk

Should a flood breach the levees, the entirety of the assets of RD 3 would be at risk. These assets include the small communities of Ryde and Walnut Grove. All of the RD 3 drain pumps would be flooded and therefore, RD 3 could not drain the flooded areas with their existing pumps; auxiliary pumps would have to be brought in.

A flood event could also deteriorate the District levees on waterside slopes causing significant erosion as seen in the aftermath of the 2017 event. If a breach were to occur, the levees could experience erosion on the landside slopes from wave wash.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

TRD 3 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. Stormwater flooding occurs every few years. In most years, it is not significant enough to be a problem. For the most part, past flooding has damaged alfalfa and winter wheat. However, in 2006 overbank flooding came very near to flooding homes along Highway 220 in Ryde. In addition, many acres of vineyards and orchards have been planted in the past few years, so it is anticipated that these recently planted permanent crops may be damaged by future canal bank flooding. The storm event of 2017 resulted in localized flooding in the center of the District in low areas adjacent to State Highway 220 and Poverty Road. These areas are mostly row crops, but recently permanent orchards have been established in historically wet areas on the District and may be lost in a localized flooding event depending on the floodwater residency time.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

During high rainfall events, the drainage system is not capable of evacuating water from the interior of Grand Island without flooding some low lying properties. On properties that farm annual row crops, this is not a problem since crops are not normally planted until after the rainy season. However, winter wheat, perennial, or multi-year crops are susceptible to damage when water overflows the banks of the drain canals.

Assets at Risk

As stated above, stormwater flooding has the potential to result in significant damage due to the increased acreage of permanent crops. In addition, residences in the lower elevations of Walnut Grove and Ryde are at risk, particularly those adjacent to State Highway 220. Stormwater flooding can result in losses of less flood resistant crops planted at low elevations. Depending on timing and severity of flooding, some permanent crops will be lost and require reestablishment. Reestablishing a vineyard or orchard can take 5 years or more before there is a have a harvestable crop.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Extremely High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

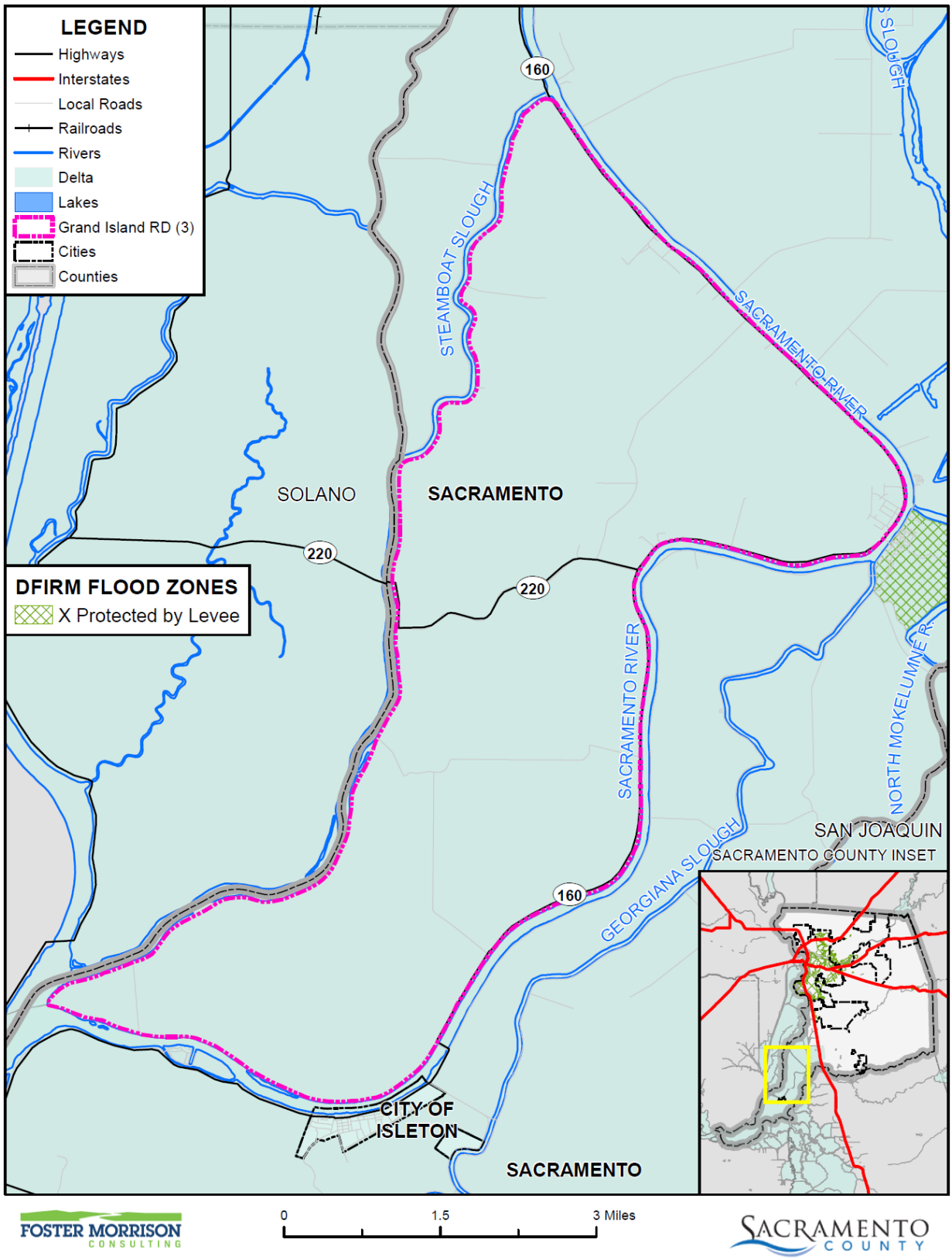
Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees.

Levee protected areas from the DFIRM in the District are shown on Figure 3-3. As shown, the levees were not certified by FEMA in the 2018 DFIRM as providing 1% annual chance flood protection.

Figure 3-3 RD 3 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Grand Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

To reduce the risk of flooding the District is planning to perform the repairs listed in Table 3-5 to reduce the likelihood of levee failure. To further reduce damages in the event of a levee failure, the District is planning for a relief cut near the bottom the District either on the Sacramento River Levee or Steamboat Slough levee. This action, if timed appropriately, can reduce flood depths up to 5 or 6 feet.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The RD 3 levees have not failed in over 100 years. Two floods over the past few decades (1986 & 1997) required extensive flood fighting by RD 3 forces in order to prevent a levee breach.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

District assets previously mentioned would experience significant damages in the event of a levee breach. A levee failure could result in the loss of both row crops and permanent crops. If a breach were to occur within the levees fronting the towns or areas north, there could be a potential loss of life due to limited evacuation time and disruptions in evacuation routes.

A levee failure and subsequent flooding on Reclamation District 3 could result in large wave fetch that could damage the interior slopes of the District's levee system as well as those of adjacent Districts.

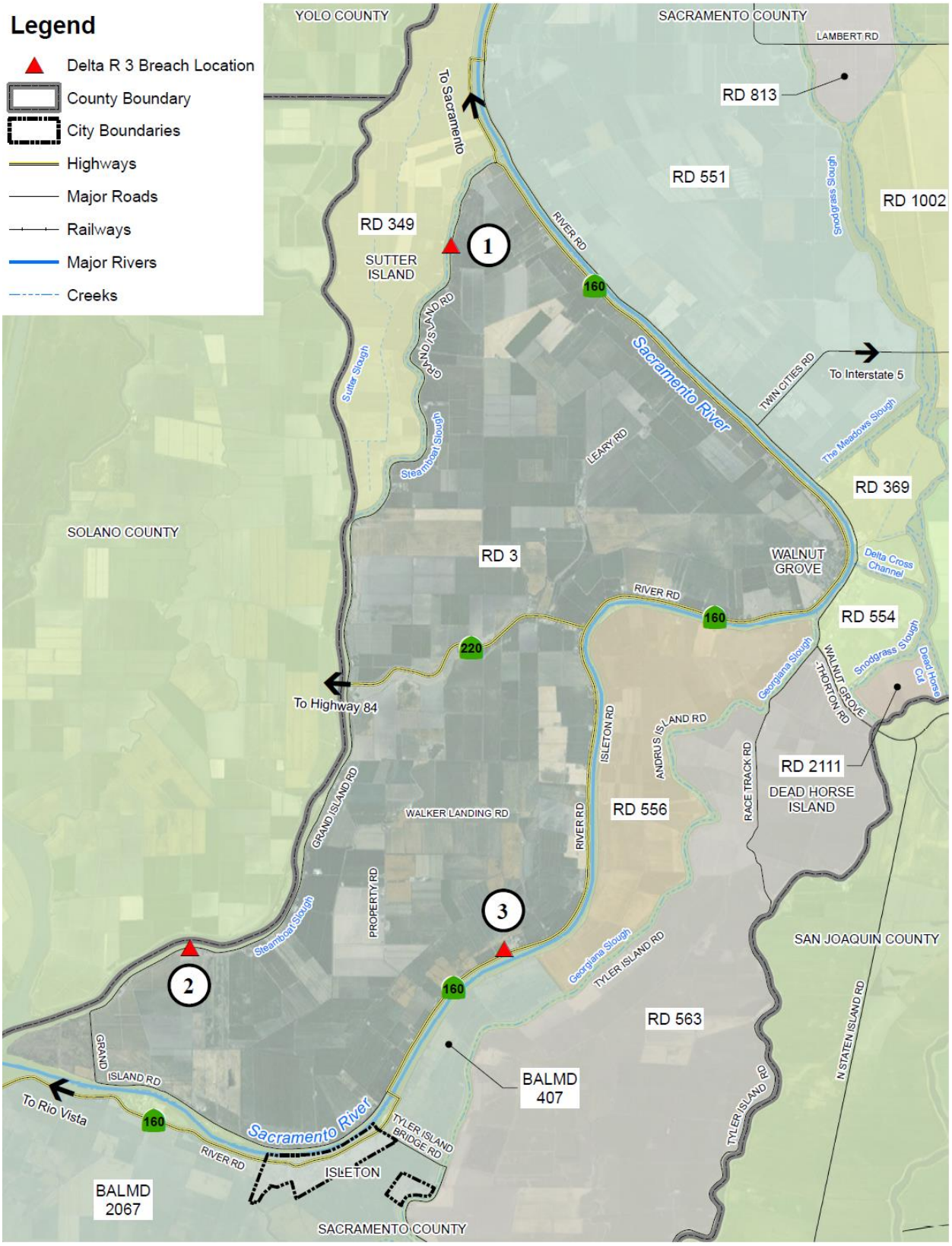
Scour at the breach area is another concern. Once the breach is repaired this location may prove to be too low to support any agriculture due to drainage difficulties.

StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

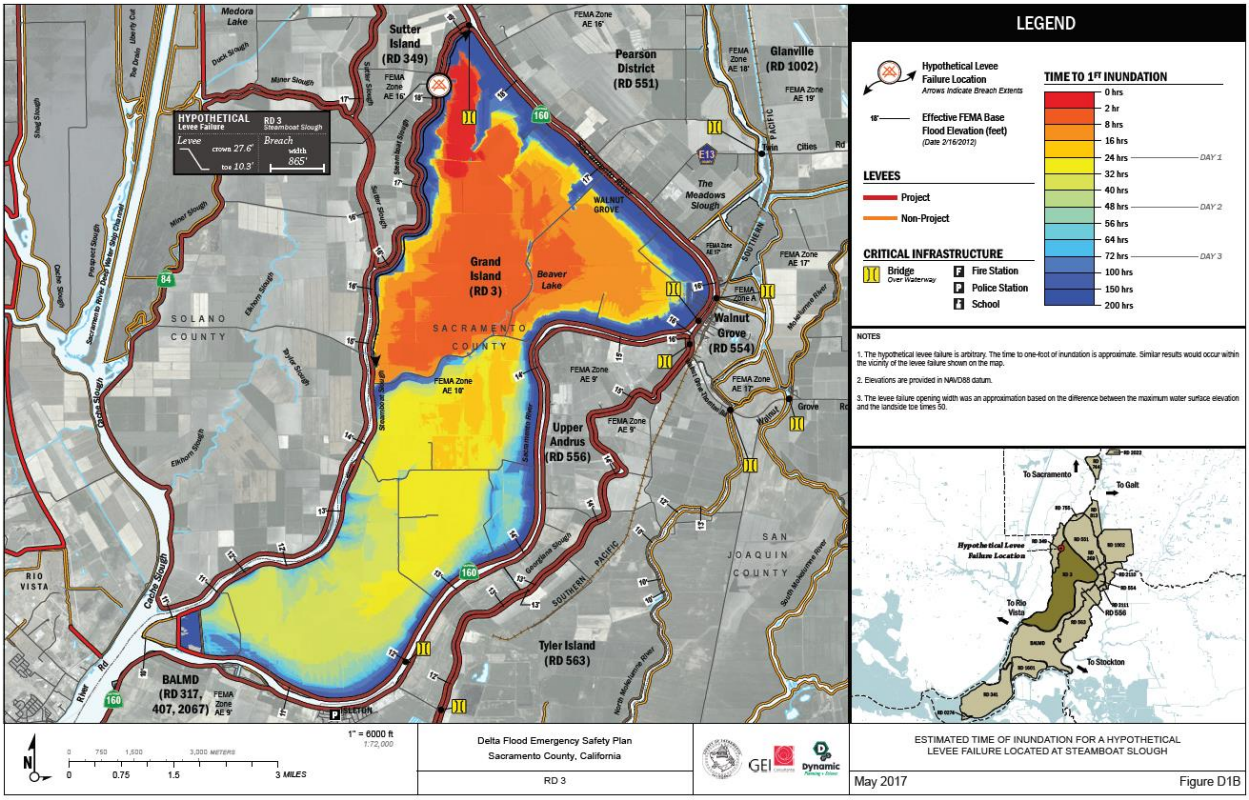
For RD 3, Figure 3-4 details the locations in the Delta within RD 3 where flooding could occur. The red triangles denote potential levee breach locations. RD 3 has three potential levee break scenarios. Maps for Scenario 1 regarding time to one foot inundation (Figure 3-5), estimated flood depths (Figure 3-6), and suggested evacuation routes (Figure 3-7) are displayed below. Maps for Scenario 2 and 3 can be found on the Sacramento County stormready.org website.

Figure 3-4 RD 3 – Potential Levee Breach Location



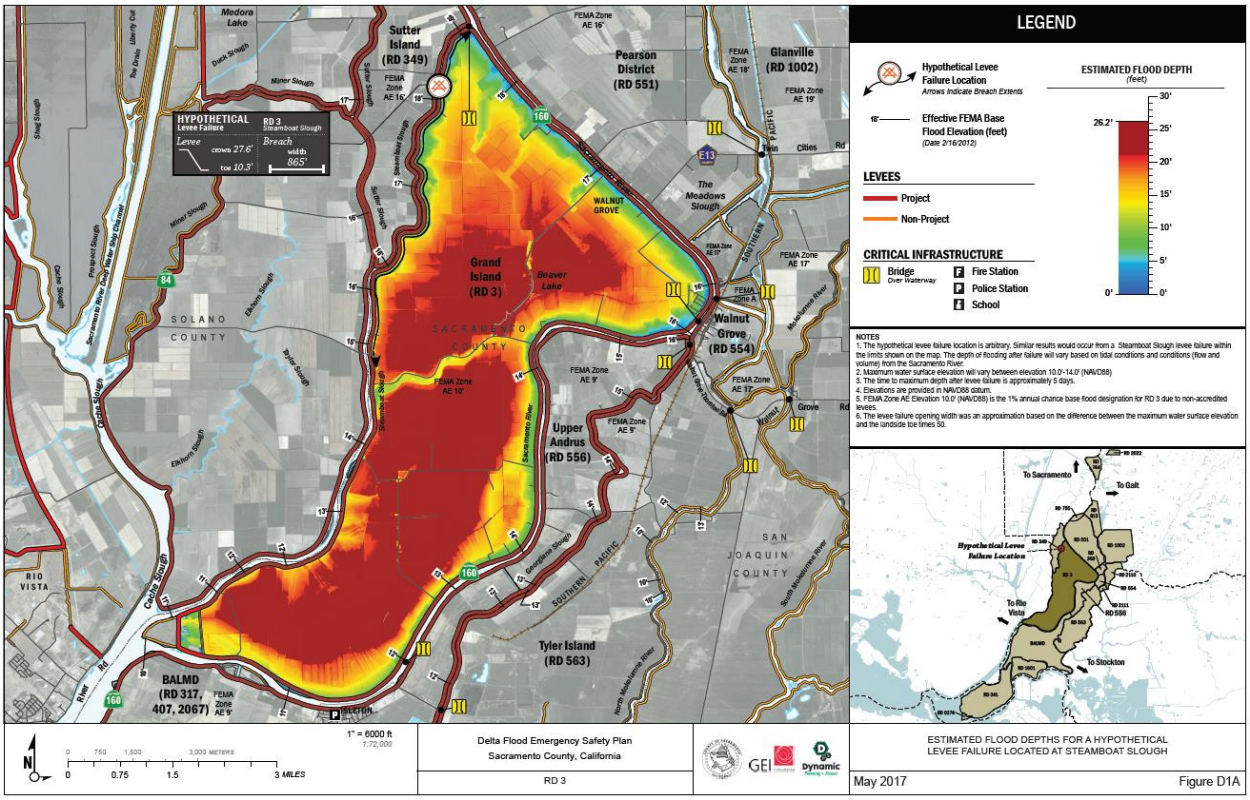
Source: Sacramento County Storm Ready – retrieved March 24, 2021

Figure 3-5 RD 3 – Time to One Foot Inundation after Levee Breach



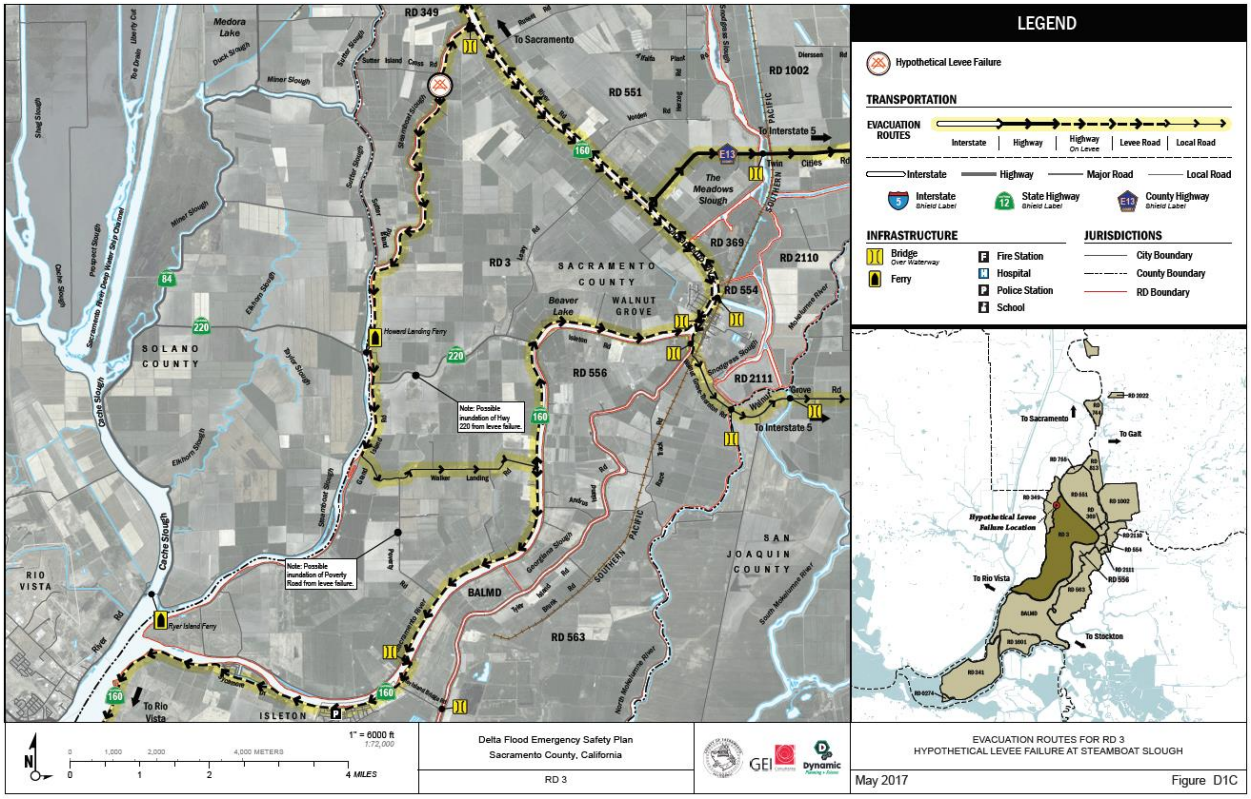
Source: Sacramento County Storm Ready – retrieved March 24, 2021

Figure 3-6 RD 3 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 24, 2021

Figure 3-7 RD 3 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 24, 2021

Assets at Risk

A levee failure would impact almost all the assets and critical facilities on Grand Island; including the small communities of Walnut Grove and Ryde. State Highways 160 and 220, as well as a number of county roads are at risk. Approximately 16,000 acres of agricultural land would be damaged and possibly rendered unfarmable for at least a year. There are many permanent crops on Grand Island, such as wine grapes, pears, apples and cherries that would be destroyed. Production of such permanent crops can take approximately 5 years to produce a viable harvest.

A levee failure could cause flooding that could damage the District's pumps and drainage system. A levee failure can also result in subsequent levee failures around the District and on adjacent islands due to increased fetch of the flooded area and subsequent erosion on exposed levee slopes.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur

each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding. In 1995 the District experienced a heavy rainfall event that overwhelmed the District's drainage system and left a substantial amount of acreage in the lower elevations inundated for at least a month. Recent above average years for rainfall, such as 2017 and 2019 have resulted in similar localized flooding and increased costs to power and run the Districts pumping facilities.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding.

Although water surface elevation is a major factor to levee seepage and overtopping, severe weather can cause significant damage, such as erosion, that puts the integrity of the Grand Island levee system at risk.

Assets at Risk

Heavy rain and thunderstorms are the most frequent type of severe weather occurrence in the area. Wind and lightning often accompany these storms and have caused damage in the past. Problems associated with the primary effects of severe weather include erosion, flooding, pavement deterioration, washouts, landslide/mudslides, and downed trees. However, it is the secondary effects of heavy rain and storms that are of concern to RD 3. Heavy rains can cause flooding, levee failure, and stream bank erosion. Flooding, levee failure, and stream bank erosion can cost RD 3 millions in damages as stated previously under a levee failure scenario.

High winds during storm events can knock down power lines and result in a loss of power to the District pumps. This will require the District to bring in diesel powered auxiliary pumps and will likely result in increased flooding within the District. Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

3.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

3.6.1. Regulatory Mitigation Capabilities

Table 3-8 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 3.

Table 3-8 RD 3 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y/2021	Five-year plan consisting of levee stability, seepage control and maintenance projects.
Capital Improvements Plan	Y/2021	Five-year plan consisting of levee stability, seepage control and maintenance projects can outlay a long term improvement plan.
Economic Development Plan	N	Not within the responsibilities of the Reclamation District

Local Emergency Operations Plan	Y/2017	Through a state grant, Sacramento County is funding revisions to the District's existing Emergency Action Plan for RD 3. The plan update will be complete in early 2022.This plan will also evaluate and create an action plan for a relief cut in the event of a levee failure.
Continuity of Operations Plan	N	No plan in place
Transportation Plan	N	Not within the responsibilities of the Reclamation District
Stormwater Management Plan/Program	Y/Ongoing	RD 3 is evaluating flooding of low areas and the need for improvements in its drainage system
Engineering Studies for Streams	N	No plan in place.
Community Wildfire Protection Plan	N	No plan in place.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Annual routine maintenance plans and participation in the state Delta Levees Subventions Program which assists in funding levee maintenance. RD 3 is also active in the Corps of Engineers PL84-99 program and is beginning to implement its System-Wide Improvement Framework (SWIF) to respond to maintenance and rehabilitation issues brought up by the Corps of Engineers Periodic Inspection Report
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Version/Year: Not within this jurisdiction's authority
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score: Not within this jurisdiction's authority
Fire department ISO rating:	N	Rating: Not within this jurisdiction's authority
Site plan review requirements	N	Not within this jurisdiction's authority
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	Not within this jurisdiction's authority
Subdivision ordinance	N	Not within this jurisdiction's authority
Floodplain ordinance	N	Not within this jurisdiction's authority
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	Not within this jurisdiction's authority
Flood insurance rate maps	N	Not within this jurisdiction's authority
Elevation Certificates	N	Not within this jurisdiction's authority
Acquisition of land for open space and public recreation uses	N	Not within this jurisdiction's authority
Erosion or sediment control program	Y	Erosion control measures on levee and canal slopes as necessary. Sediment removal from drainage system canals as necessary.
Other		

How can these capabilities be expanded and improved to reduce risk?
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. In implementation of the District's SWIF, the District will require increased coordination from permitting agencies as well as landowners. Many issues identified are going to require significant permitting and come at a high cost to landowners. Programmatic permitting capabilities as well as a grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure. The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The Districts capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund.

Source: RD 3

3.6.2. Administrative/Technical Mitigation Capabilities

Table 3-9 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 3.

Table 3-9 RD 3's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	Not within this jurisdiction's authority
Mitigation Planning Committee	N	Not within this jurisdiction's authority
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	RD 3 annually performs over $500,000 in maintenance. In addition, it periodically constructs projects to repair deficiencies in the levee such as planned erosion and seepage repairs.
Mutual aid agreements	N	None formally established with adjacent Reclamation Districts. Informally resources will be shared in the event of an emergency.
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	Not a position within this jurisdiction
Floodplain Administrator	N	Not a position within this jurisdiction
Emergency Manager	Y	David Robinson - District Manager
Community Planner	N	Not a position within this jurisdiction
Civil Engineer	Y	Gilbert Cosio, Michael Moncrief and the staff at MBK Engineers has served as District Engineer for over 40 years and has participated in many flood fight actions.
GIS Coordinator	N	Not a position within this jurisdiction
Other		
Technical		

Warning systems/services (Reverse 911, outdoor warning signals)	Y	There are sirens at fire houses in adjacent towns. The process of using these as flood warnings should be revisited by local volunteer fire departments. District has a phone list, but does not have staffing beyond the trustees, civil engineer, and secretary.
Hazard data and information	Y	Civil Engineer has hazard data and information to aide district
Grant writing	N	Not a position within this jurisdiction
Hazus analysis	N	Not a position within this jurisdiction
Other		
How can these capabilities be expanded and improved to reduce risk?		
Consistent and available funding opportunities can aide in planning and outlaying substantial improvement projects.		

Source: RD 3

3.6.3. Fiscal Mitigation Capabilities

Table 3-10 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 3-10 RD 3's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	RD 3's annual assessment includes funding for future anticipated capital projects
Authority to levy taxes for specific purposes	Y	Yes, RD 3 modified its benefit assessment roll in 1996 and it provides authority and flexibility
Fees for water, sewer, gas, or electric services	N	Not within this jurisdiction's authority
Impact fees for new development	N	Not within this jurisdiction's authority
Storm water utility fee	N	Not within this jurisdiction's authority
Incur debt through general obligation bonds and/or special tax bonds	Y	RD 3 has the ability to levy special assessments
Incur debt through private activities	N	Not within this jurisdiction's authority
Community Development Block Grant	N	Not within this jurisdiction's authority
Other federal funding programs	Y	The District has developed a SWIF and is eligible in the Corps of Engineers PL84-99 program
State funding programs	Y	The District participates in the Delta Levees Subventions program that provides a 75/25 state to local cost share.
Other		
How can these capabilities be expanded and improved to reduce risk?		

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Substantial funding will be required both publicly and privately in implementation of the District's SWIF. A grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure. The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The Districts capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund. Furthermore the District has utilized other funding opportunities such as the Flood System Repair Program to address critical issues. Continued funding of such programs would greatly benefit the District's ability to perform necessary repairs and improvements.		

Source: RD 3

3.6.4. Mitigation Education, Outreach, and Partnerships

Table 3-11 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 3-11 RD 3's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	No formal program currently exists within this jurisdiction
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	RD 3 maintains a web page with appropriate information to educate the public. With SWIF implementation, the District will perform outreach to landowners for education and assistance in addressing encroachment issues.
Natural disaster or safety related school programs	N	No formal program currently exists within this jurisdiction
StormReady certification	Y	The RD 3 manager, trustees, and District Engineer have been, or soon will be, trained in SEMS and NIMS
Firewise Communities certification	N	No formal program currently exists within this jurisdiction
Public-private partnership initiatives addressing disaster-related issues	N	No formal program currently exists within this jurisdiction
Other		

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
How can these capabilities be expanded and improved to reduce risk?		
Many risks to the integrity of the levee system can come from noncompliant and aging encroachments such as pipes through the levee. Repair and replacement of encroachments, particularly pipes can place a large financial burden on landowners leading to deferred maintenance and ultimately a dangerous situation within the flood control system. It would be beneficial if a program were established that would create a local agency/private landowner partnership that provides funding and permitting assistance to address these issues before they result in levee failure.		

Source: RD 3

3.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

As stated previously, RD 3 modified its benefit assessment roll in 1996, adding a tremendous amount of flexibility, while still complying with Proposition 218 legal requirements. In addition, RD 3 has been a very active participant in the state's Delta Levee Subventions Program for about 20 years. These 2 factors have proven useful and have enabled RD 3 to react financially if a non-routine cost arises.

3.7 Mitigation Strategy

3.7.1. Mitigation Goals and Objectives

The RD 3 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

3.7.2. Mitigation Actions

The planning team for the RD 3 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-

years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The high water events of 2017 and 2019 resulted in 16 areas that had experienced erosion on the waterside slope of the Sacramento River and Steamboat Slough levees. Some areas had experienced erosion in previous high water events (1986 and 1997) that became worse following these events.

Project Description: Repairing waterside erosion at various locations along Sacramento River and Steamboat Slough that resulted from the 2017 and 2019 high water events. Utilizing rip rap material to re-establish the existing levee slope.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 3 Five Year Plan, Storm Damage DWR Emergency Rehabilitation (SDDER) Program

Responsible Agency/ Department/Partners: Reclamation District 3, Department of Water Resources

Cost Estimate: $2.5 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of $214 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program and Flood System Repair Project (FSRP)

Timeline: Scheduled to be completed by 2026

Project Priority (H, M, L): High

Action 2. FSRP Critical Erosion Repair

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: As part of the California Department of Water Resources' (DWR) Flood System Repair Project (FSRP) a critical erosion site was identified, meriting repair under the FSRP program. The DWR evaluation and inspection found sloughing, caving, and near vertical waterside slopes along with leaning trees showing most of their root systems exposed. The twin tide gates associated with the U.S. Army Corps of Engineers (USACE) navigation project were noted as within the Project and a potential hazard due to blockage of the flap gates and visible corrosion of the aged pipes

Project Description: The District plans to perform an erosion repair along approximately 2,000 feet of the left bank of Steamboat Slough between Levee Mile (LM) 10.78 and LM 11.02. The Project will address bank loss and waterside slope instability and erosion by flattening the waterside levee slope, placing rock on the waterside levee slope, and reconstructing a section of the bank with a soil planting berm and rock containment berm. If feasible, the Project will consider abandoning in-place the two USACE tide gates that penetrate through the levee centerline.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 3 Five Year Plan, Flood System Repair Project (FSRP)

Responsible Agency/ Department/Partners: Reclamation District 3, Department of Water Resources

Cost Estimate: $1 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of $214 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Flood System Repair Project

Timeline: Scheduled to be completed by Fall 2021

Project Priority (H, M, L): High

Action 3. Steamboat Slough Seepage Repairs

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Several historic seepage areas have been identified by the District during past high water events along Steamboat Slough.

Project Description: Repair seepage sites either through the use of berms or cut off walls.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 3 Five Year Plan

Responsible Agency/ Department/Partners: Reclamation District 3, Department of Water Resources

Cost Estimate: $2.5 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of $214 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program

Timeline: Scheduled to be completed by 2026

Project Priority (H, M, L): High

Action 4. Interior Drainage Improvements

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The District has been studying the interior drainage system and issues with the intent to include a new pump to resolve localized flooding issues.

Project Description: Install a new pumping facility within the existing District drainage system to improve efficiency and reduce residency time of flood waters. This could also include the acquisition of an ancillary diesel pump to use in the event of pump damage or power outages.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 3 Five Year Plan, Storm Damage DWR Emergency Rehabilitation (SDDER) Program

Responsible Agency/ Department/Partners: Reclamation District 3, Department of Water Resources

Cost Estimate: $2 million

Benefits (Losses Avoided): Assists with dewatering the island which could result in losses of up to $214 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program

Timeline: Scheduled to be completed by 2030

Project Priority (H, M, L): High

Action 5. Relief Cut Plan

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: In the event of a levee breach, the District is planning on a relief cut near the bottom of the District to help drain the island quicker and reduce damages to property.

Project Description: A relief cut plan will be established by the District and coordinated with various emergency planning agencies and adjacent reclamation districts in the event of a levee breach in the northern portion of the District

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Small Community Flood Risk Reduction Feasibility Study, Sacramento County Flood Safety Plan Update

Responsible Agency/ Department/Partners: Reclamation District 3, Sacramento County Office of Emergency Services

Cost Estimate: $2 million

Benefits (Losses Avoided): Reduces the amount of time floodwaters impact the District which could cause an estimated $214 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program and Flood System Repair Project

Timeline: Scheduled to be completed by 2023

Project Priority (H, M, L): Medium

Action 6. Implement recommendations in West Walnut Grove Flood Risk Reduction Plan

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Sacramento County conducted studies to evaluate risk in each small legacy community located within Sacramento County in the Delta. The study proposed and recommended several remediation actions to reduce to risks from flooding.

Project Description: The study recommended a suite of potential management actions that included:

1) Repair of DWR FSRP Sites and Address Erosion Sites 2) Repair and Strengthen in Place the Sacramento River Right Bank Levee Adjacent to West Walnut Grove and Ryde 3) All-Weather Access Road/Flood Fight Berm around West Walnut Grove 4) Ring Levee and FEMA Certification for the community of West Walnut Grove 5) Repair and Strengthen-In Place Steamboat Slough Levee north of Highway 220 6) Repair and Strengthen-In Place Sacramento River Levee Between Steamboat Slough and Georgiana Slough 7) Repair and Strengthen-In Place Sacramento River Levee north of Highway 220 8) Repair and Strengthen-In Place Steamboat Slough Levee south of Highway 220 9) Repair and Strengthen-In Place Sacramento Levee south of Highway 220 10) Secure 100-Year FEMA Certification for Sacramento River and Steamboat Slough Levee north of Highway 220 Paired with a Highway 220 Cross Levee

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Small Community Flood Risk Reduction Feasibility Study, Sacramento County Flood Safety Plan Update

Responsible Agency/ Department/Partners: Sacramento County, Reclamation District 3, Sacramento County Office of Emergency Services

Cost Estimate: $5 million to $400 million

Benefits (Losses Avoided): Proposed actions will reduce the risk of flooding to the town of Walnut Grove that is located on the west side of the Sacramento River. As well as any damages to surrounding property and agricultural crops depending on the management action.

Potential Funding: Delta Levees Subventions Program, Flood System Operations and Maintenance Program, Small Community Flood Risk Reduction Program

Timeline: Dependent on qualification for outside funding

Project Priority (H, M, L): Medium

Action 7. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The USACE Sacramento District identified ten Unacceptable deficiency categories in its PIR, four of which affect PL 84-99 eligibility: encroachments, slope stability, animal control and erosion/bank caving. All four items would likely prevent the system from performing in the next flood

event, and would lead to an Unacceptable system rating. RD 3 will also address Unacceptable items, which include vegetation, sod cover, depression/rutting, cracking, riprap revetment and bank protection, and seepage, although these items do not affect system status in the RIP. Based on a review of the USACE PIR data, the USACE identified 1,109 Unacceptable items in the GILS. Of these items, 741 are classified as those that could seriously impair function of the system.

Project Description: Addressing these unacceptable items to maintain eligibility in the PL84-99 program with a worst first approach. If an item in one of the lower priority categories poses a greater risk it will be addressed sooner. Once the unacceptable items are addressed the District will continue to correct items listed in the USACE Periodic Inspection Report in its effort to achieve an acceptable rating.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 3 Five Year Plan, System Wide Improvement Framework

Responsible Agency/ Department/Partners: Reclamation District 3, Department of Water Resources

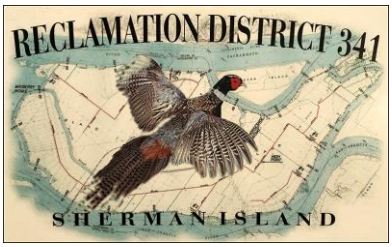
Cost Estimate: $15 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of $214 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program, Deferred Maintenance Program

Timeline: Schedule for completion 2050

Project Priority (H, M, L): High



Delta Annex Chapter 4 Reclamation District 341

4.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 341 (RD341), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 341 with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

4.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 4-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 4-1 RD 341 – Planning Team

Name	Position/Title	How Participated
Robert C. Wagner, P.E.	District Engineer	Reviewed draft documents
Patrick W. Ervin, P.E.	Engineer	Collected data, drafted text

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 4-2.

Table 4-2 2016 LHMP Incorporation

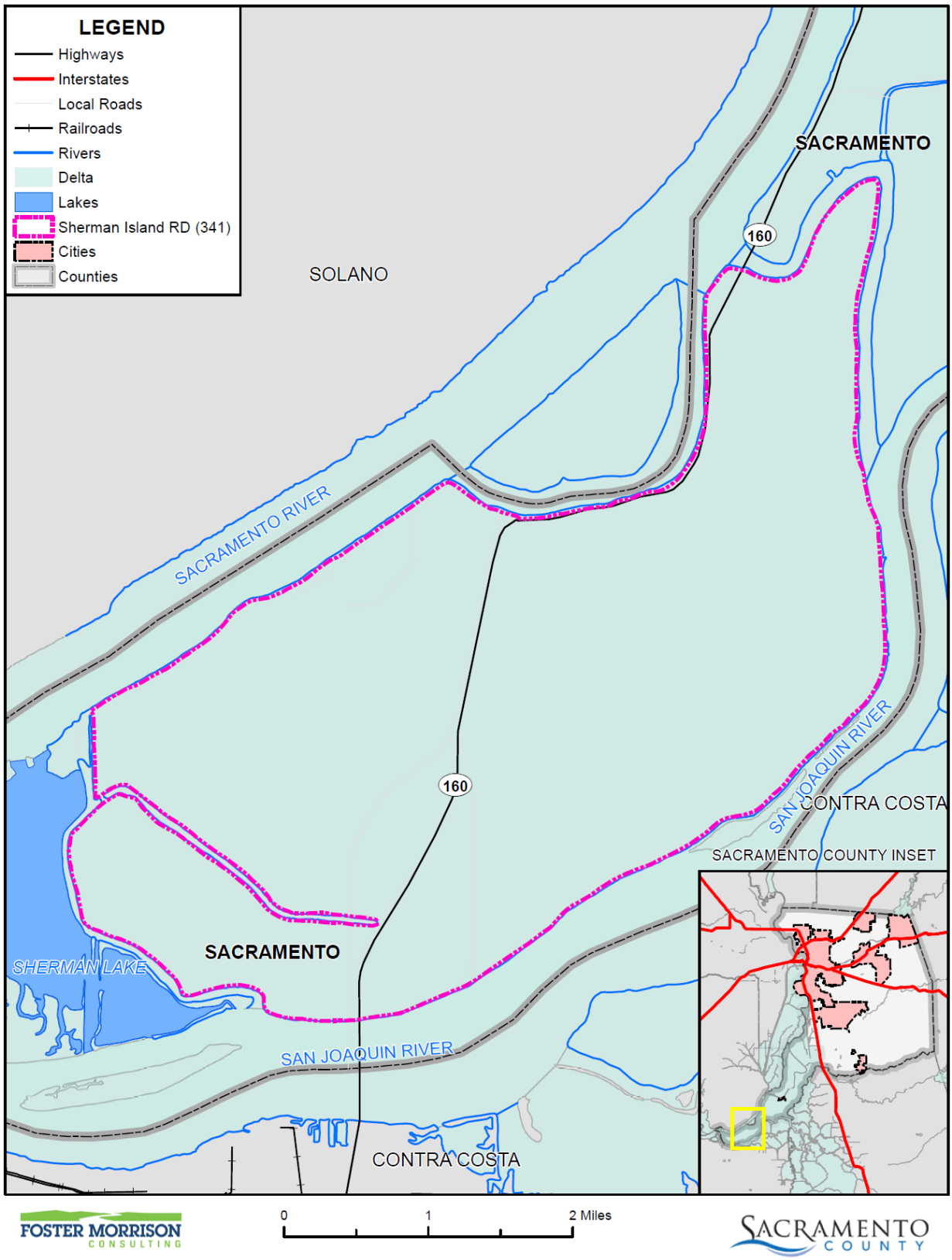
Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
None	See below text

The District Planning Team noted that they did not directly incorporate or implement the LHMP document into any planning mechanisms. The District did however complete projects that were part of our strategy to improving mitigation and have ongoing projects as well. For example, the Scour Lake Habitat Restoration Project has been completed and the District is working on the long term maintenance plan for the habitat. The Sherman Island Levee Improvement Project for "Little Baja" and "Manzo Ranch" Fish Release Sites Project (SH-14-DCP) and the Sherman Island PL 84-99 Levee Repair Project – Phase 2 (SH-10-1.0) have also been completed.

4.3 District Profile

The District profile for the RD 341 is detailed in the following sections. Figure 4-1 displays a map and the location of the District within Sacramento County.

Figure 4-1 RD 341



Data Source: Sherman Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

4.3.1. Overview and Background

In the Delta, for the last 5,000 years to the 1850s, relative sea-level rise was balanced by vertical marsh growth through biomass accumulation and sediment deposition. A transition from deposition of organic silt-clay to peat formation in the Delta largely reflects the decline in inundation frequency and the maturation of the marsh plain towards mean higher high water elevations. The resulting freshwater tidal marshes developed because a relatively large freshwater inflow compared to the size of the tidal prism sustained a low salinity, which supported highly productive organic peat formation through tule growth. The large roots of the tule created an organic fabric that supported and aided rapid vertical growth. The living surface was maintained within the intertidal zone (natural habitat), and marsh organic accretion (injection of roots and rhizomes, and incorporation of surface litter) was able to sustain vertical growth at rates in excess of relative sea-level rise. The gradual accumulation of the organic and inorganic sediment must have also offset the loss and compaction of existing peat.

The development of today's Delta began in late 1850 when the Swamp and Overflow Land Act conveyed ownership of tall swamp and overflow land, including Delta marshes from the federal government to the State of California. Reclamation of Sherman Island began shortly thereafter, and by 1859, local property owners had constructed small peat levees of three to four feet in height, with a base width of about eight feet, along the banks of the Sacramento River and Mayberry Slough.

Today, Sherman Island is protected by approximately 18-miles of levee which encompass approximately 9,937 acres of land, according to the 1995 Sacramento Delta San Joaquin Atlas. Approximately 9 miles of levee are project levees, constructed by the US Army Corps of Engineers, and approximately 9 miles of levee are non-project levees. The entire levee system is maintained by RD 341. RD 341 maintains and operates five modern pumping stations on Sherman Island: three on the San Joaquin River (south) side; one on the Sacramento River (north) side; and one on Sherman Island's northwest corner. The pumps are part of a larger system of pumps, siphons irrigation ditches and canals used to circulate water and drain the Island.

4.4 Hazard Identification

RD 341 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 4-3).

Table 4-3 RD 341—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure					Medium
Drought & Water Shortage					High
Earthquake	Extensive	Likely	Limited	Medium	Low
Earthquake Liquefaction					Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater					Medium
Landslides, Mudslides, and Debris Flow					Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic					Medium
Severe Weather: Extreme Cold and Freeze					Medium
Severe Weather: Extreme Heat					High
Severe Weather: Heavy Rains and Storms	Extensive	Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Occasional	Limited	Medium	Low
Subsidence					Medium
Volcano					Low
Wildfire					High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

4.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

4.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 4.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 4-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

4.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 341's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 4-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 341's physical assets, valued at over $65 million, consist of the buildings and infrastructure to support the District's operations.

Table 4-4 RD 341 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
District Levees	District Infrastructure	$54,000,000	Flood, Levee Failure
District Drain Ditches	District Infrastructure	$5,000,000	Flood, Levee Failure
Pump Stations (5 Stations)	Critical Facility	$3,000,000	Flood, Levee Failure
District Equipment (backhoe, tractors, pickups, etc.)	District Asset	$1,000,000	Flood, Levee Failure
District Office/Workshops	District Asset	$2,000,000	Flood, Levee Failure
Total		**$65,000,000**	

Source: RD 341

In addition to assets owned by RD 341, the District noted the following assets that are protected by RD 341 levees, but are owned by others. According to the 2010 census, Sherman Island has a population of 190 people, with 100 occupied dwelling units. The County General Plan designates approximately 500 acres of recreational land and about 10,000 acres of agricultural cropland/resource conservation area. Sherman Lake is designated as natural preserve.

In addition to agricultural uses, several recreational vehicle parks and marinas for local and public use are located on Sherman Island including Rio Viento on the Sacramento River side, Eddos Harbor and RV park which includes a 70 berth marina on the San Joaquin River side, Sherman Lake Marina on Sherman Lake, and the Outrigger Marina located on the Island's northeast corner. In total, the Island provides 368 marina berths, a boat launch maintained by the County and one fishing access site.

According to the DRMS, the Sherman Island levee system protects approximately $110,416,000 in local assets. Accounting for inflation, the levee system currently protects approximately $138,000,000 in local assets.

Natural Resources

RD 341 has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Historic and Cultural Resources

RD 341 has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Sherman Island has seen little to no growth since 2011. The State of California owns a large portion of the island, limiting potential development, and there are very few economic drivers on-island.

Development since 2016

Since 2016, the District has completed the following projects:

- Sherman Island Levee Improvement Project for "Little Baja" and "Manzo Ranch" Fish Release Sites. Significantly improved the stability of approximately 4,000 linear feet of Project Levee.
- Sherman Island PL 84-99 Levee Repair Project – Phase 2. Improved 7,800 linear feet of levee to meet PL 84-99 standard.
- Sherman Island Flood System Repair Project STA 945+50 to 951+00. Repaired approximately 550 linear feet of severe waterside erosion of Project Levee along HWY 160.
- Sherman Island Pump Station #2 Repair and Rehabilitation. Replaced existing pump and motor, improved pump platform, replaced wooden piles with steel piles, replaced trash rack and trash rack platform.

The District noted it has not seen any steep or sudden declines in facilities. It has seen basic wear and tear of District facilities and ongoing erosion. As such, a change in vulnerability is unlikely.

Future Development

Future development in these areas generally parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

The District proposes to construct the following projects over the next five years:

- San Joaquin River PL 84-99 Rehabilitation Project. Rehabilitate San Joaquin River levee from Sta. 330+00 – 368+00 to the PL 84-99 Standard and reconstruct Sherman Island East Levee Road to County Rural Road Standards.
- San Joaquin River Multi-Benefit Project – Phase II. Rehabilitate San Joaquin River levee from Sta. 199+00 – 368+00 to the PL 84-99 Standard and reconstruct Sherman Island East Levee Road to County Rural Road Standards.
- Flood System Repair Project (FSRP) Repair erosion along the Highway 160 levee at various sections from STA 875+00 to 990+00.
- Highway 160 Levee Seepage Repair Project. Construction of a levee drain system from STA 870+00 to 940+00.

4.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 4-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

According to the District Superintendent, the District has experienced a PSPS one time. We can't say for sure how likely they are to happen in the future. High winds are a regular occurrence on and near Sherman Island, but the terrain surrounding the island is not typical of areas where PSPS's are regularly issued. The District office is the only District facility with backup power.

Climate Change

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Climate change adaptation is a key priority of the State of California. The 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Sea level rise and increased storm intensities are of particular concern to the District moving forward. Sea level rise reduces levee freeboard, (the distance between the water surface and the levee crest) while increased storm intensities resulting in heavy precipitation over short periods of time cause rapid rises in river stage. Both of these events have a direct effect on the levee's ability to prevent flooding, especially when happening concurrently. In the future, Sherman Island levees will need to be built to a higher flood standard to combat the effects of climate change.

Location and Extent

Climate change is a global phenomenon. It is expected to affect the whole of the District, Sacramento County, and State of California. There is no scale to measure the extent of climate change. Climate change exacerbates other hazards, such as drought, extreme heat, flooding, wildfire, and others. The speed of onset of climate change is very slow. The duration of climate change is not yet known, but is feared to be tens to hundreds of years.

Past Occurrences

Climate change has never been directly linked to any declared disasters. While the District noted that climate change is of concern, no specific impacts of climate change could be recalled. The District and HMPC members did, however, note that in Sacramento County, the strength of storms does seem to be increasing and the temperatures seem to be getting hotter.

Vulnerability to and Impacts from Climate Change

The 2014 California Adaptation Planning Guide (APG) prepared by California OES and CNRA was developed to provide guidance and support for local governments and regional collaboratives to address the unavoidable consequences of climate change. California's APG: Understanding Regional Characteristics has divided California into 11 different regions based on political boundaries, projected climate impacts, existing environmental setting, socioeconomic factors and regional designations. Sacramento County falls within the North Sierra Region characterized as a sparsely settled mountainous region where the region's economy is primarily tourism-based. The region is rich in natural resources, biodiversity, and is the source for the majority of water used by the state. This information can be used to guide climate adaptation planning in the District and Sacramento County Planning Area.

The California APG: Understanding Regional Characteristics identified the following impacts specific to the North Sierra region in which the Sacramento County Planning Area is part of:

- Temperature increases
- Decreased precipitation
- Reduced snowpack
- Reduced tourism
- Ecosystem change
- Sensitive species stress
- Increased wildfire

Long term, the biggest impact of climate change to Sherman Island is an increased risk of levee failure for the reasons mentioned above in Hazard Profile and Problem Description. Average precipitation may decrease, but storm duration and intensity are projected to increase. Levee improvement projects (and the required funding) that raise levee crest elevations will need to keep pace with rising sea levels.

District operations include, but are not limited to, daily inspections of the levees, pump station maintenance, vegetation and rodent management, drainage ditch maintenance, etc. Climate change should not affect these day-to-day operations. District concerns with climate change are more related to long term sea level rise as mentioned above.

Assets at Risk

All District assets are at risk from a levee failure caused by climate change with the least vulnerable being the fish release facilities and pump stations. The fish release facilities are all located on the levee crest and a failure would have to happen at, or directly adjacent to, their location to cause serious damage. Most of the District pump stations are built on piles at the approximately the same elevation as the levee crest. However, if levee failures or severe storms cause widespread power outages, the pump stations may be disabled, as they are powered by electric motors.

Earthquake

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time. Earthquakes on the Hayward, Calaveras, and San Andreas fault could also affect the Delta area.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. The District is located in an area where few earthquakes of significant magnitude occur, so both magnitude and intensity of earthquakes are expected to remain low. Seismic shaking maps for the area show Sacramento County and the District fall within a low to moderate shake risk, with most of the moderate risk in the Delta area of the County.

Past Occurrences

There have be no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquakes or that affected the District in any meaningful way.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured buildings can be very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings. None of these exist in the District.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. The RD 341 is within the less hazardous Zone 3.

Impacts from earthquake in the District will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life.

The most significant vulnerability of RD 341 to earthquake is potential damage to or failure of the levees, including overtopping of levees, erosion, boils, seepage, and other damage to the levees compromising its function. This can result in significant inundation of areas protected by the levees creating life safety issues and damaging property, infrastructure and crops.

Assets at Risk

District levees are at-risk from a seismic event, although the level of risk is still being studied. The District owns two steel buildings that are used as workshops, storage of materials and equipment, and equipment maintenance. Retrofitting of these buildings likely is not necessary do their low risk categorization as low-occupancy agriculture buildings. The District office sits adjacent to the main workshop at the toe of the levee. The office is a converted shipping container and since it is essentially a steel box, retrofitting would not be required. The largest risk to the District shops and office are likely flooding due to a levee failure caused by an earthquake, not the structural failure of the buildings themselves. The District pump stations are also at risk, however two of the stations have been rehabilitated using seismically designed steel piles that should protect the pump stations during a seismic event.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred within the 1% annual chance floodplains and in other localized areas.

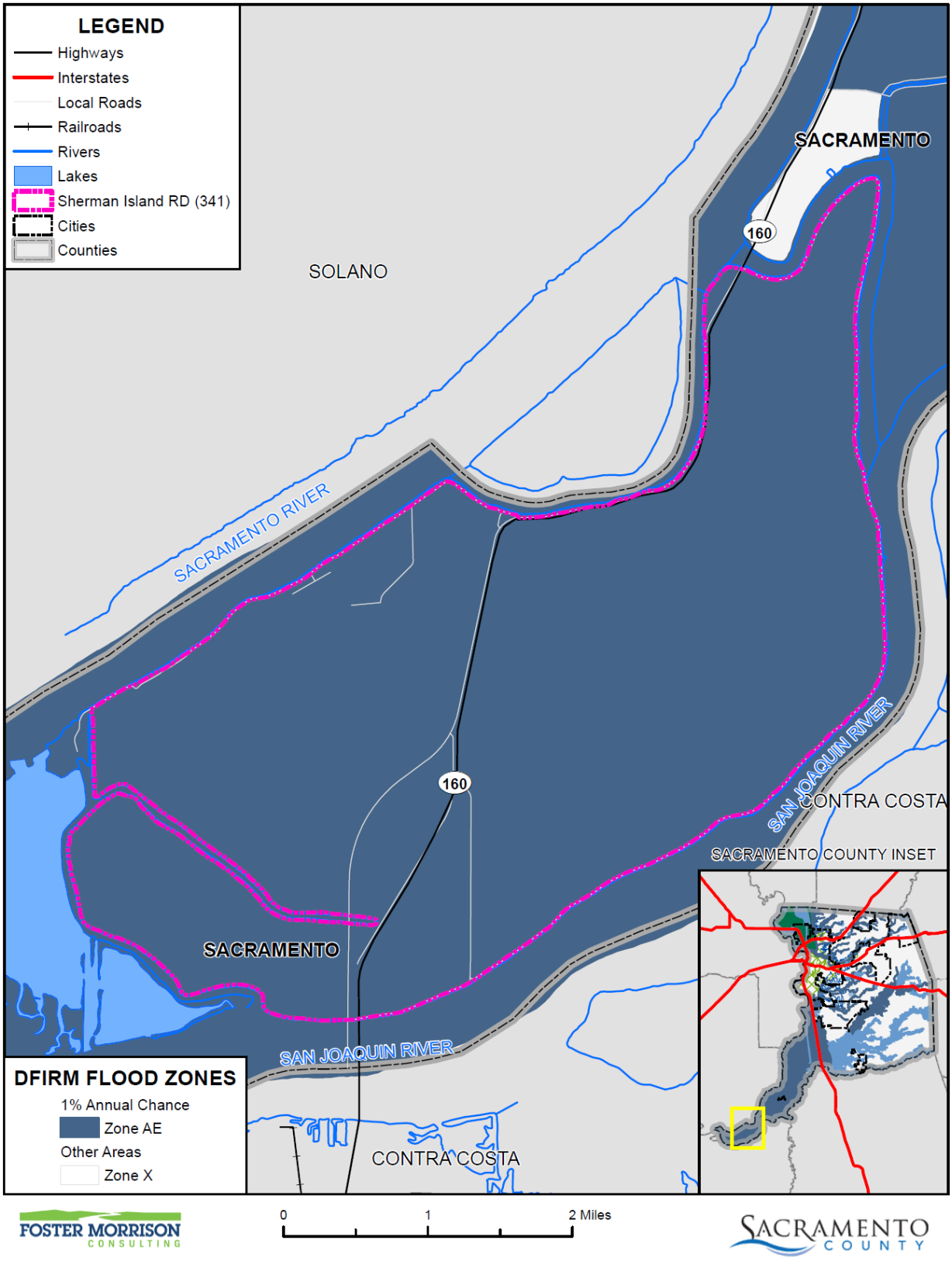
Through discussion of the visual inspections, the District Board members, District superintendent and District engineer have determined that Sherman Island levees are most vulnerable to failure cause by flooding.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the RD 341 have been subject to historical flooding.

Location and Extent

The RD 341 has areas located in the 1% annual chance floodplain. This is seen in Figure 4-2.

Figure 4-2 RD 341 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sherman Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 4-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 4-5 RD 341– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 4-6. These events also likely affected the District to some degree.

Table 4-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The first significant flooding affecting Sherman Island agriculture occurred during the 1861/62 season and caused wide-spread damage throughout the delta's river islands, and Sherman Island farmers lost most of

their livestock as a result when the Sacramento River breached the low levees constructed along its banks. After completion of the levee system in 1869, Sherman Island suffered several floods. Sherman Island levees failed during the winters of 1871/72, 1874/75, 1876, and 1878. Several crevasses cut through the north and south levees west of Mayberry Slough in the 1874 levee failure, resulting in the loss of all but 100 acres of cropland in the western portion of the island. The subsequent levee reconstruction featured a 12-foot high peat levee with 120 feet widths at the base. Even so, the 1876 flood covered the western portion of the island again. The flood of 1878 devastated the entire island.

Subsequent levee breaks on the San Joaquin River submerged most of the land and Sherman Island's 700 inhabitants fled to higher ground. The beleaguered reclamation districts were faced with underwriting thousands of dollars in assessments to replace most of the levee system. Landowners regrouped, and in March 1878, Reclamation District 252 formed out of a portion of RD 54. Sherman Island landowners reorganized again, and RD 54 and RD 252 combined to form Reclamation District No. 341 (RD 341) on June 17, 1879. Although reclamation efforts continued in RD 50 west of Mayberry Slough for several years after the 1879 floods, landowners eventually dropped reclamation efforts, and after the land flooded during the 1940s, ownership of the land reverted to the State for taxes.

By spring 1880, most of the new RD 341 was again under cultivation until high waters collapsed levee sections again in August later that year. Although an assessment of $13,141 was made for levee repair following the 1880 break, most of the land remained under water until 1894 when reclamation efforts were renewed.

In 1894, RD 341 encompassed 10,303.71 acres of land east of Mayberry Slough and the 3,000-foot cross-levee between Sacramento River and Mayberry Slough. The Sacramento and San Joaquin rivers are connected by Threemile Slough, which forms the eastern and northern boundary of the Island. The district included 24.76 miles of levee, much of it at the time destroyed by previous floods. At the time, much of Sherman Island had been underwater for fifteen years. Although some stretches of levee were intact, much of the levee had had sunk to the ground level of the island or below. The Horse Shoe Bend area of the Sacramento River had several breaks; one about 500 feet in width, with resulting scar holes measuring about 75 feet deep. The San Joaquin River levees on the south side of the island were essentially destroyed from Gallagher Slough, near the modern day location of Eddo's Resort, to the mouth of Mayberry Slough.

During the first decade of the twentieth century, RD 341 conducted frequent levee upgrading and restoration projects on Sherman Island. RD 341 leased four dredges in 1900 that worked in tandem around Sherman Island. Flooding occurred in some section of the Delta almost annually during the period from 1900 to 1910, and serious levee breaks and major flooding of RD 341 occurred during 1904 when a crevasse opened on Mayberry Slough, and in 1906 and 1909, when water again inundated the island. RD 341 trustees contracted with Franks Dredging Company for levee construction and repair work between 1908 and 1920.

The southern levee on the San Joaquin River side failed and flooded the Island on January 20, 1969, at approximate levee station 520+00. Upon finding the break, a large quantity of rock was placed on the upstream and downstream ends of the levee to protect against further erosion from high velocities into and out of the break due to tide. Without placement of the rock, the break which was approximately 275 feet wide and about 45 feet below mean sea level, would have been greatly enlarged. After the break, the water inside the island and in the San Joaquin River was at the same level. The flooding created a deep hole in

the channel on the waterside and a deep lake on the landside toe of the levee at the site of the break. Pumps to dewater the Island were rented (District pumps were entirely submerged). Pumping with the rented equipment commenced February 28, 1969, and continued through August 9, 1969, at which point District pumps continued to remove the remaining water from the Island. All 93,000 feet of District drainage ditches were cleaned and/or excavated, primarily by drag line and ditcher operations before District ditches were operable. The Corps of Engineers spent approximately $600,000 in emergency funds to repair, reslope, and regrade the levee break area after the 1969 break. Seepage and settlement in the area of the break have been ongoing issues requiring constant levee improvements.

There have been no recent floods on Sherman Island. The only issues were the boils on the levee toe during Jan 2017.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

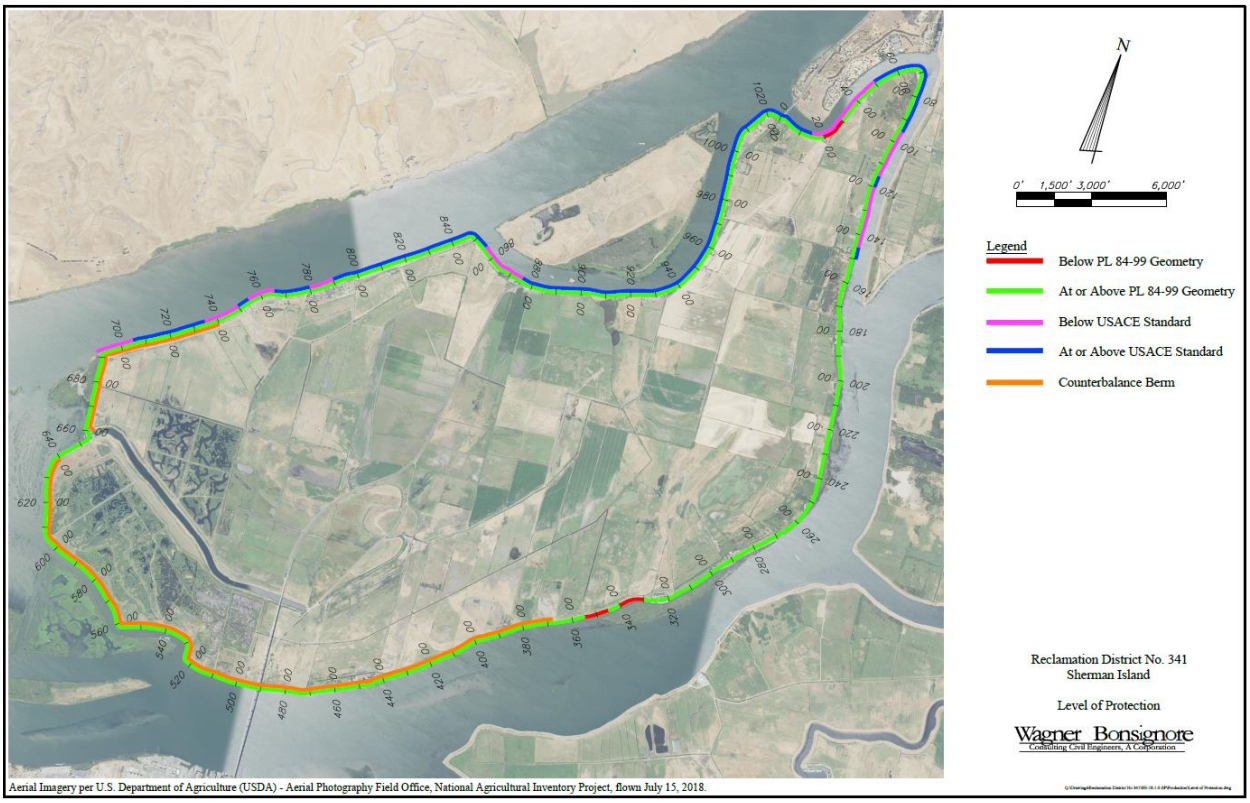
Should a high water flood event cause levees to collapse, Sherman Island would be fully inundated, risking the $12.7 million in district assets discussed in Table 4-4.

Areas of the existing levee system most susceptible to overtopping are those which do not meet the PL 84-99 height standard. An inventory of levee sections and their respective heights is maintained by the District. Analysis of this inventory shows that the levee along the San Joaquin River from about levee station 330+00

to 350+00, and Three Mile Slough from about 20+00 to 40+00 contains stretches which are below the PL 84-99 height standard (1.5 feet above 1:100 year flood event) and therefore are susceptible to overtopping. Figure 4-3 depicts levee flood protection levels for each individual section of the Sherman Island levees.

While future development may occur in the areas protected by levee, the District does not control this development. The District only can control whether the levees meet certification standards and can protect against floods. The District Planning Team noted that the State of California has purchased the majority of the land on Sherman Island over the last several years with the intent of not developing the island. It's leased as grazing land or being converted back to natural habitat.

Figure 4-3 Level of Levee Flood Protection in Reclamation District 341



Source: Reclamation District 341

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Extremely High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Floods can threaten the District from several sources. Usually, the possibility of flooding can be anticipated from eight to twenty hours before the "Emergency Period" is reached. However, as demonstrated in Linda, California, in February 1986, it is possible for a levee to collapse with little or no warning when there are still four or more feet of freeboard available.

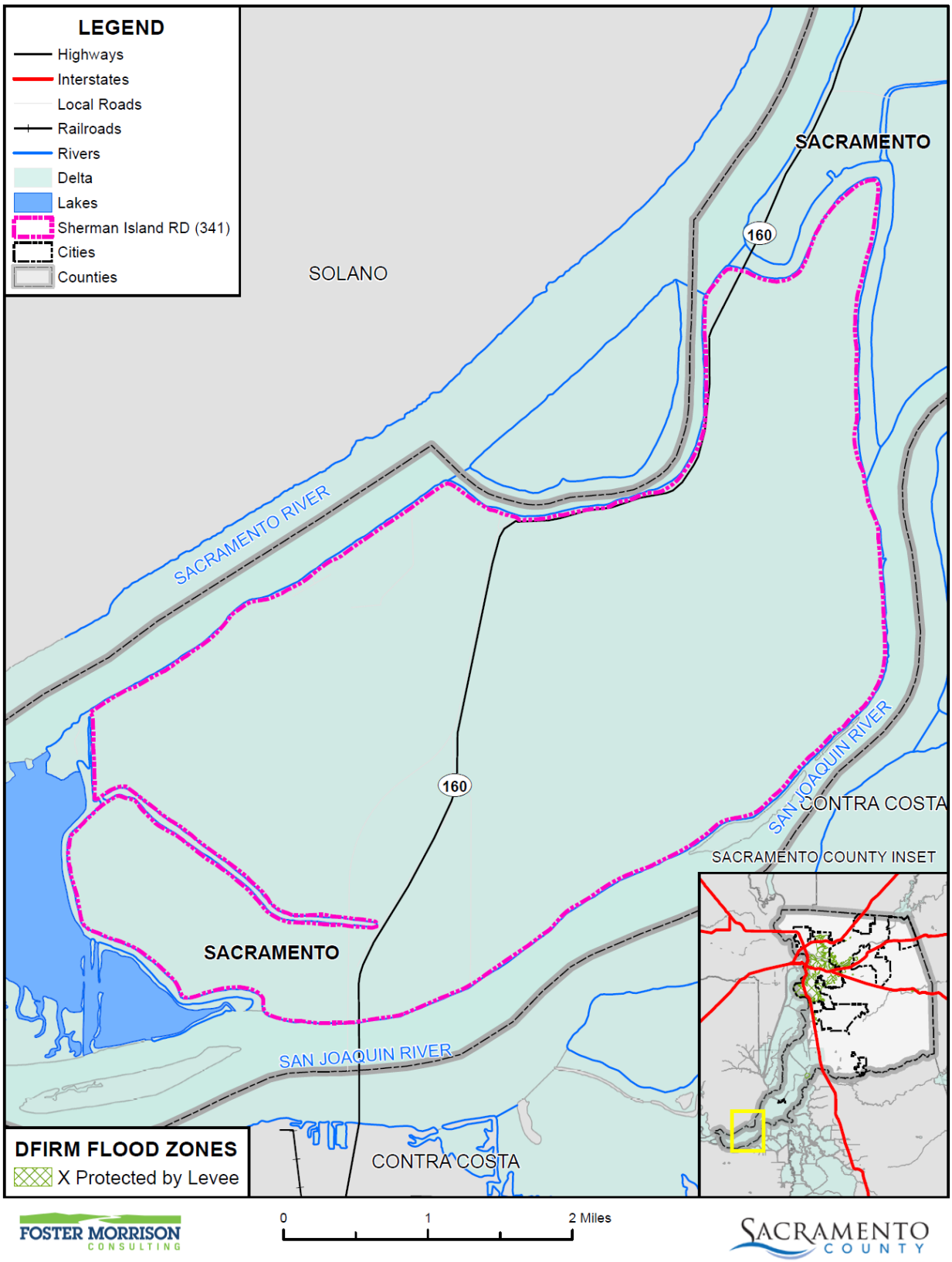
Generally, levees fail due to overtopping or collapse. A catastrophic levee failure resulting from collapse probably will occur very quickly with relatively little warning. Such a failure would occur where the levee is saturated and the high hydrostatic water pressure on the river side, coupled with erosion of the levee from high water flows or an inherent defect in the levee, causes an almost instant collapse of a portion of the levee. Under such circumstances, structures located relatively near the break will suffer immediate and extensive damage. Several hundred yards away from the break the energy of the flood waters will be dispersed sufficiently to reduce, but not eliminate, flooding damage to structures in its path. The flood water will flow in a relatively shallow path toward any low point in the affected area. Flood water will collect in these low areas and the levels will rise as the flow continues. When the rivers are high, it is not possible to close or repair a levee break until the water surface in the river and the flooded area equalize.

A major overtopping of a levee, if flow persists, will result in severe erosion of the levee crowns on the landward side and cause levee failure over a period of minutes to several hours. A severe levee overtopping can, therefore, be considered as a levee break for the purpose of determining the extent of flooding that any area will suffer. Generally, overtopping can be predicted based on river stages and the warning given depending on the source of the flood waters.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 4-4. As shown, the levees in the District are not currently shown as certified on the FEMA DFIRMs.

Figure 4-4 RD 341 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Sherman Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Past Occurrences

Commencing January 6, 2017, Reclamation District #341 was notified of a potential flood emergency as the Sacramento River stage measured at Rio Vista Bridge rose above the flood monitoring level of 7.4 feet. The river level continued to rise over the next six days. Possible dangers to the levee system protecting Sherman Island, due to the high river level, were seepage, boils, erosion, and potential for levee overtopping.

On January 12, during the peak of the tide which occurred around 2:30 p.m., the levee section between Sta. 335+00 –445+00 had spots where the remaining freeboard at the top of the levee appeared to be less than 1 foot.

On January 13, at approximately 3:00 pm, the District Superintendent, Joel McElroy, received a call from Caltrans (California Department of Transportation) regarding the sighting of two (2) boils on the portion of the levee system that supports Highway 160. The boils were located behind the District Office at approximately Sta. 960+00. At approximately 8:00 pm, the situation was worsening. The section of levee was becoming more saturated, the boils were not stabilizing and a third boil was developing near the existing boils. On the morning of January 14, the third boil that had developed in close proximity to the others was identified by District personnel, but it was not seeping water.

On January 15, District Engineer Robert C. Wagner, P.E., Henry Matsunaga, District President Juan Mercado, Mr. McElroy and Patrick W. Ervin, P.E., met at the District office to inspect the seepage area. It was determined that, as a result of the precipitation events, high river stage and high tides during January, and the forecast for additional rainfall, there was potential for levee failure in this section.

Catastrophic levee failure would result in an immediate threat to life, public health and safety, and significant damage to improved public and private property.

A trench drain was installed properly and by the end of the fourth day of construction, all cover material was in place, with water flowing from the drain as expected. The following day, Asta placed jute mesh rolls over all exposed soil to prevent erosion, which completed the Project. Additional information is referenced in the flood section of this document for a history of flooding and levee failure.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

According to the 2010 census, Sherman Island has a population of 190 people, with 100 occupied dwelling units. The County General Plan designates approximately 500 acres of recreational land and about 10,000 acres of agricultural cropland/resource conservation area. Sherman Lake is designated as natural preserve. In addition to agricultural uses, several recreational vehicle parks and marinas for local and public use are located on Sherman Island including Rio Viento on the Sacramento River side, Eddos Harbor and RV park which includes a 70 berth marina on the San Joaquin River side, Sherman Lake Marina on Sherman Lake, and the Outrigger Marina located on the Island's northeast corner. In total, the Island provides 368 marina berths, a boat launch maintained by the County and one fishing access site.

The Sherman Island levee system also protects non-local assets which provide a public benefit, including infrastructure, utilities, water quality and water supply reliability. Below is a list of the non-local assets protected by the levee system:

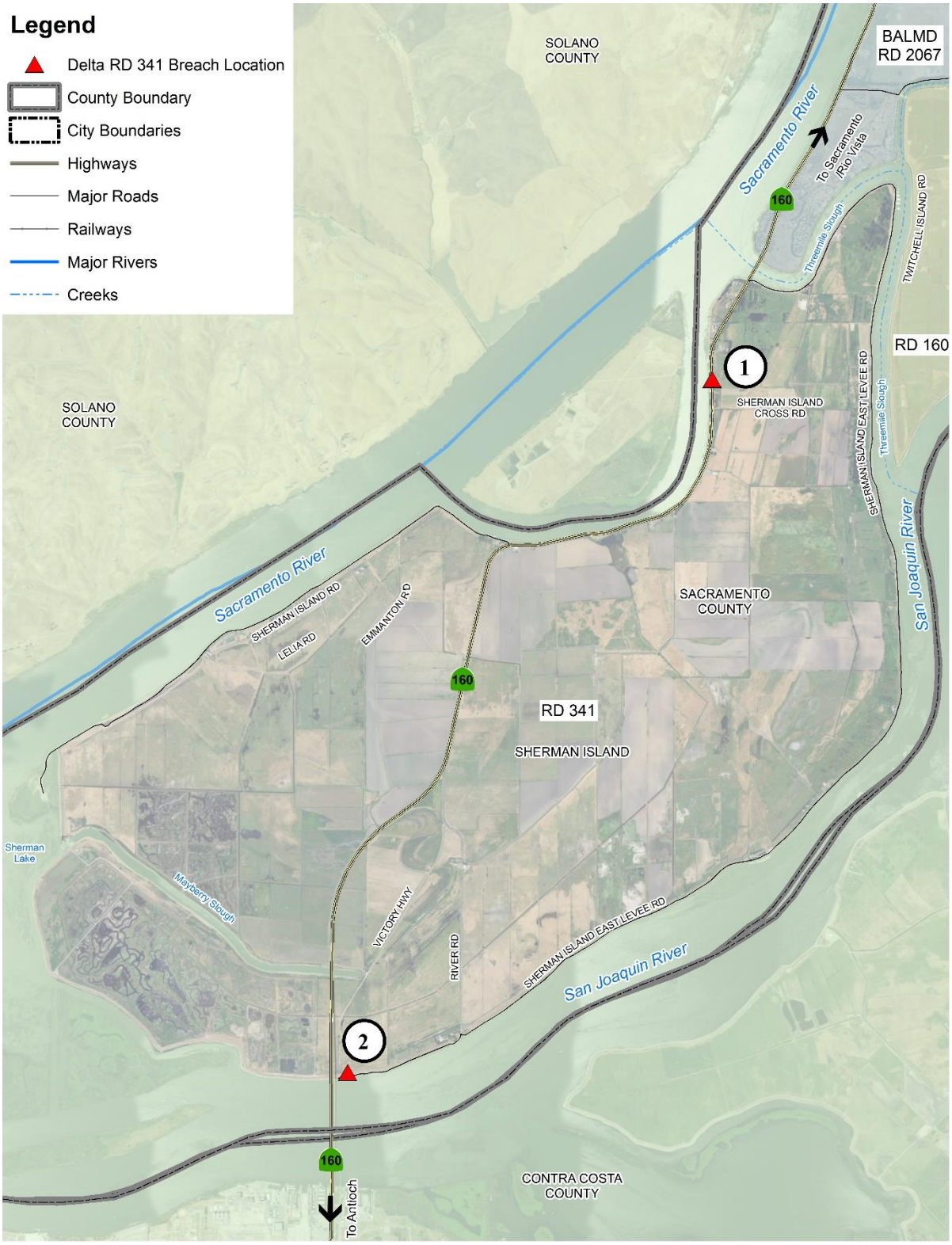
- Water Delivery System
  - ✓ State Water Project
  - ✓ Federal Central Valley Water Project (CVP)
  - ✓ Miscellaneous Diversions Directly from the Delta
- Infrastructure
  - ✓ State Route 160
  - ✓ Highway 160 Draw Bridge
  - ✓ Dam (Forms Mayberry Canal)
- Utilities
  - ✓ Major 500kV Transmission Lines
  - ✓ Natural Gas Resources
  - ✓ Telecommunication and fiber optic lines
  - ✓ US Geological Survey accelerometers

StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

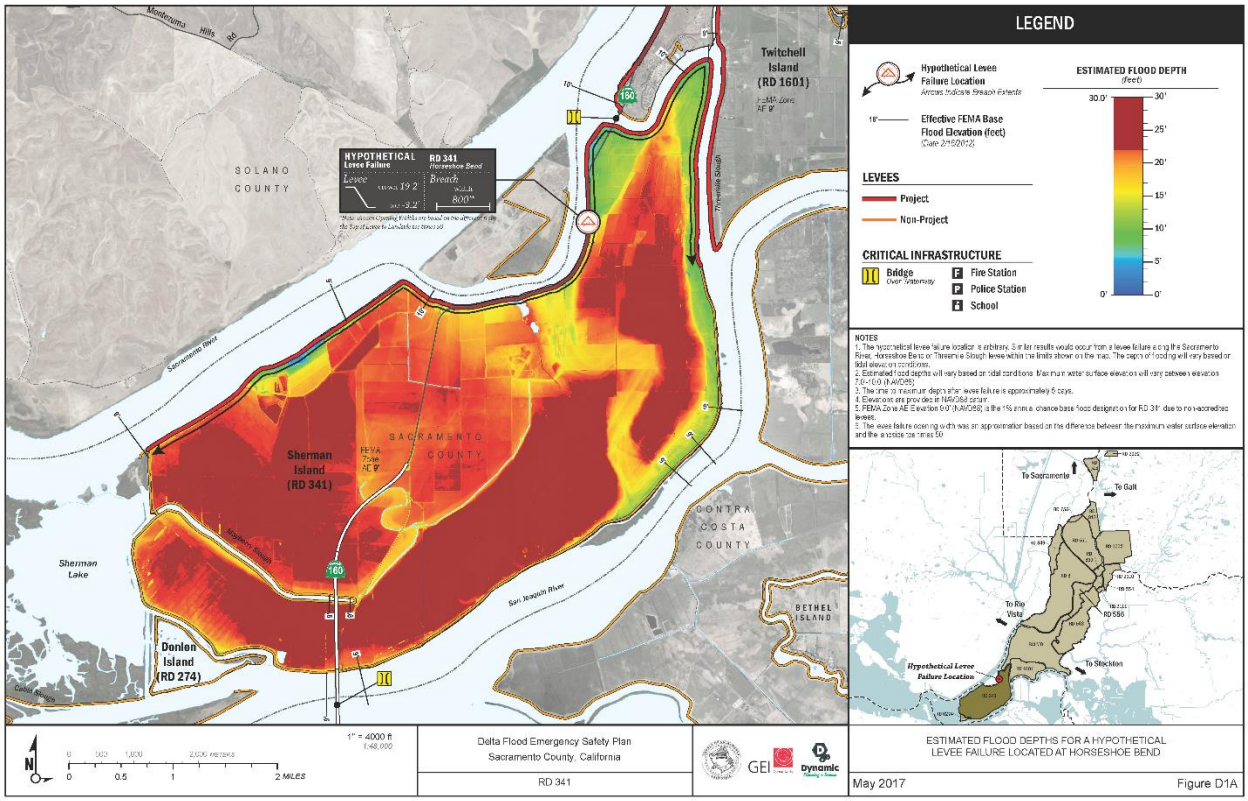
For RD 341, Figure 4-5 details the locations in the Delta within Reclamation District 341 where flooding could occur. The red triangles denote potential levee breach locations. RD 341 has two potential levee break scenarios. Maps for Scenario 1 regarding time to one foot inundation (Figure 4-6), estimated flood depths (Figure 4-7), and suggested evacuation routes (Figure 4-8) are displayed below. Maps for Scenario 2 can be found on the Sacramento County stormready.org website.

Figure 4-5 RD 341 – Potential Levee Breach Location



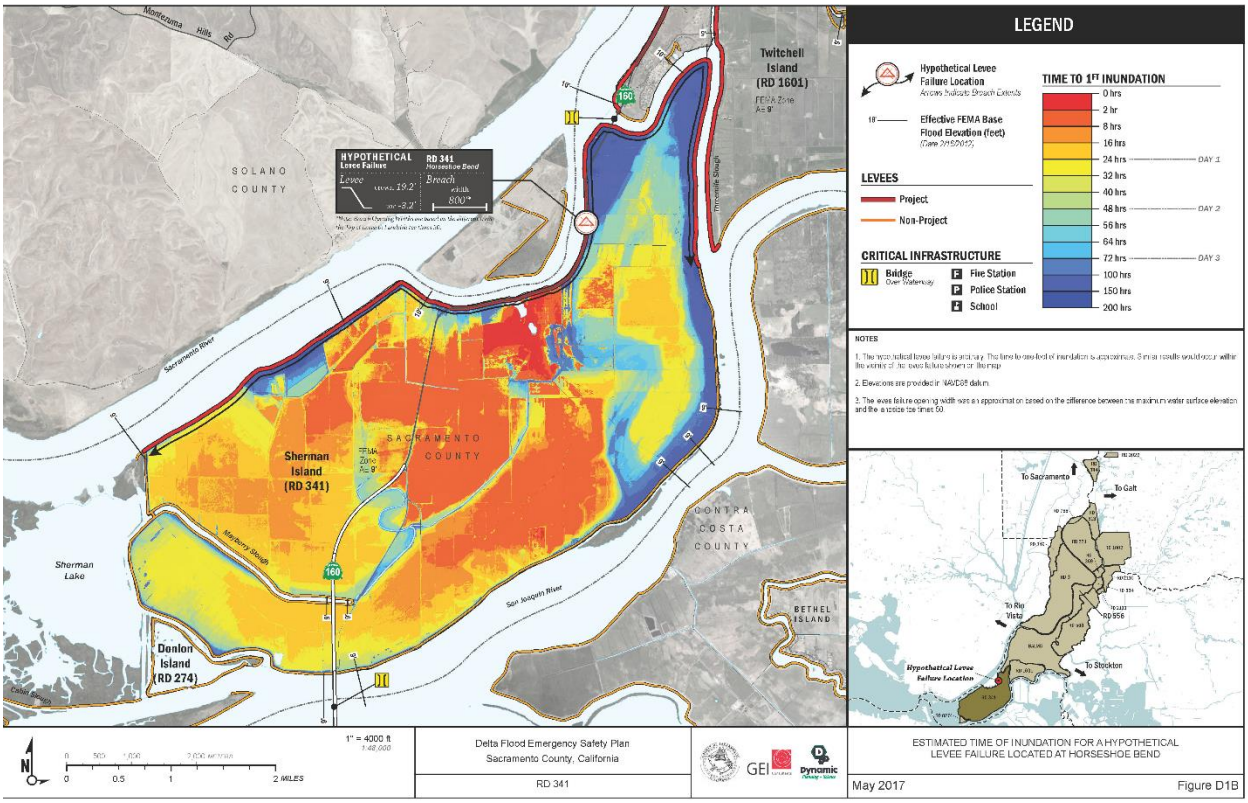
Source: Sacramento County Storm Ready – retrieved March 24, 2021

Figure 4-6 RD 341 – Time to One Foot Inundation after Levee Breach



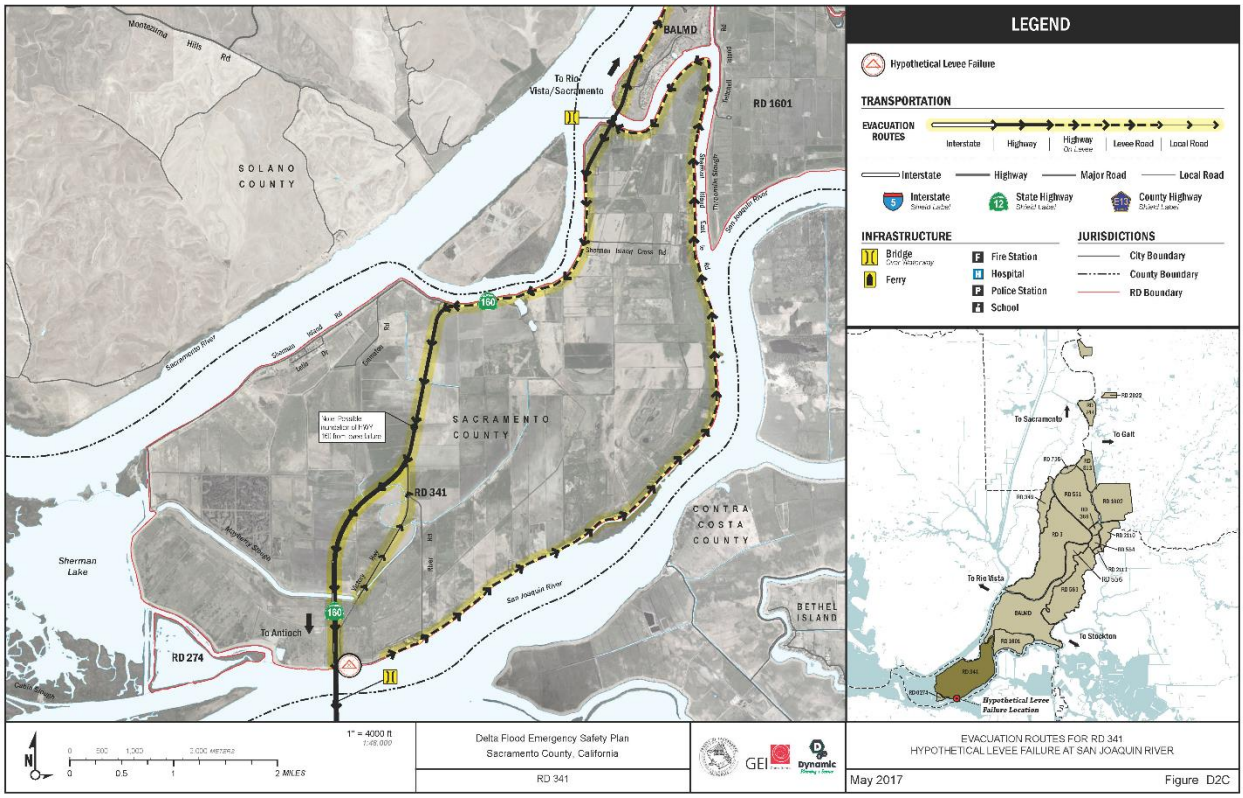
Source: Sacramento County Storm Ready – retrieved March 24, 2021

Figure 4-7 RD 341 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 24, 2021

Figure 4-8 RD 341 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 24, 2021

Assets at Risk

All District assets are at risk from a levee failure with the least vulnerable being the fish release facilities and pump stations. The fish release facilities are all located on the levee crest and a failure would have to happen at, or directly adjacent to, their location to cause serious damage. Most of the District pump stations are built on piles at the approximately the same elevation as the levee crest. However, if levee failures or severe storms cause widespread power outages, the pump stations may be disabled, as they are powered by electric motors.

In addition to the costs incurred to repair or replace the assets destroyed by a Sherman Island levee failure, an immediate cost would be pumping out the island. To estimate the cost of restoring Sherman Island, we considered the 2004 failure of the Upper Jones Tract, an island of 6,259 acres which cost approximately $120 million to restore. This equates to about $19,100 per acre. Accounting for inflation, the per acre cost would be $23,800. Accordingly, it would cost approximately $238 million to pump out and restore Sherman Island (10,000 acres X $23,800 per/acre = $238,000,000). This estimate is conservative in that it does not account for the elevations on the interior of Sherman Island, which are up to 20 feet below sea level. Sherman Island would likely impound a greater volume of water per acre than Upper Jones Tract, and per acre restoration costs will therefore be greater.

Electrical Infrastructure Affected

In addition to the dewatering costs, three major electric transmission lines (greater then 500kV) cross Sherman Island: the California Oregon Transmission Project, operated by the Western Area Power Administration, the Pacific Gas and Electric Company (PG&E) Table Mountain-Tesla line, and the PG&E Vaca-Dixon-Tesla line. These lines work mainly to interconnect California loads and generation with loads and generation in the Pacific Northwest. The three lines through the Delta are operated as a coordinated grouping, with maximum imports or exports limited to provide some joint redundancy to help ensure reliability.

The combined load on these three lines is typically around 4,000 MW, though under some circumstances it can be as high as 4,800 MW (Mirzadeh 2006). This is approximately ten percent of statewide summer loads, which is less than the required planning reserve margin of 15 percent. However, other outages may occur at the same time as this disruption, so under some circumstances the loss of all three lines due to the failure of the Sherman Island levee system could cause operating problems.

PG&E also operates two other lines with less than 500kV capacity to provide local service to Sherman Island and nearby Delta Islands. Failure of the Sherman Island levee system would impact the ability of PG&E to serve the local delta community. The DRMS report estimates the cost of a two-month outage of two 500 kV lines to be $42,000,000, which equates to $46,300,000 in 2016 dollars.

Oil and Gas Production Affected

Sherman Island has 60 natural gas and oil wells, and approximately 1,082 acres of gas and oil production fields. In addition, the levees protect 145,514 feet of a natural gas pipeline which originates in Canada and crosses Sherman Island. Failure of the Sherman Island levee system would interrupt gas service through the pipeline and gas production and storage occurring on Sherman Island.

Civil Infrastructure Affected

Sherman Island levees also protect State Highway 160 and the drawbridge at Three Mile Slough. State Route 160 connects Sherman Island to the mainland Sacramento County on the northeast corner via Threemile Slough Bridge (Bridge 24-0121), and to Contra Costa County on the island's west side, via the Antioch Bridge (Bridge 28-0009). Failure of the Sherman Island levee system and resulting loss of State Route 160 and access to the Antioch Bridge would severely impact truck and vehicular traffic relying on this roadway. The Sherman Island Five Year Plan (2009) estimated that the closure of State Highway 160 would cost approximately $70,000 per day.

Sherman Island levees also provide a public benefit by maintaining water quality and water supply reliability for cities and farms in the San Francisco Bay area, San Joaquin Valley, and Southern California. Sherman Island is situated where fresh river water and salty bay water meet and mix. Under typical summer salinity conditions in the lower Sacramento River, salinity rises sharply in the area of Sherman Island. Consequently, the island's levees are critical to controlling salinity intrusion to the interior Delta. A levee break would increase the rate and area of mixing and would allow the saline bay water to move further upstream, jeopardizing the fresh water supply taken from the Delta for the Central Valley Project water supply, the State Water Project and the Contra Costa intake.

The presence of the western Delta islands, Sherman Island in particular, is believed to effectively inhibit the inland migration of the salinity interface between the Bay and Delta. If Sherman Island were to become permanently inundated with saline water, the water available to the massive pumping facilities near the Clifton Court Forebay might become too saline to use. The timing of levee breaks and flooding is critical in this regard. Fortunately, most flooding occurs in winter and spring when major saltwater intrusion is less likely. However, there are occasional levee failures under low-flow conditions. These failures can cause major short-term water-quality problems, even if the flooded areas are later reclaimed. During one such incident, which occurred in summer of 1972, the Andrus Island levee failed, flooding an area slightly larger than Sherman Island. Salt concentrations in the central and western Delta quickly showed an increase up to six hundred percent. It took a large volume of extra reservoir releases to flush the salty water from the west Delta. The Andrus Island levee break may also have been a contributing factor in high mortality of juvenile bass that year. Similar impact could occur if one of Sherman Island's levees were to fail under low flow conditions.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding. The District noted no events since 2016 except for the boils that showed up in Jan 2017.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding.

Heavy rains can cause localized flooding on the interior of the island. Typically, the water from localized flooding finds its way into one of the District drains where it can be pumped off-island by one of the five District pump stations. If severe weather were to cause District-wide power outages, the pump stations would be unable to pump water. Localized flooding could affect Highway 160, agriculture operations and local residents living on the interior of the island.

Assets at Risk

Localized flooding caused by heavy rains could potentially cause flooding of the District workshops and office.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power shortage and failure can be found at the beginning of Section 4.5.3 above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Erosion impacts to levees from wave action
- Occasional building damage, primarily to roofs

The District's waterside levee slopes are protected with rock slope protection (riprap) to prevent erosion. In some areas, the levee has a "splash cap" made of riprap specifically design to protect the levee crest from overtopping waves. Severely high winds, combined with a high river stage, high tide, or both, can cause

large waves that hit the levee so hard they remove the rock slope protection and splash cap. Once the riprap is gone, the waves can cause severe erosion.

Assets at Risk

The District levees are at risk from severely high winds because of the impacts mentioned above.

4.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

4.6.1. Regulatory Mitigation Capabilities

Table 4-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 341.

Table 4-7 RD 341 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	N	
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	Y	Emergency Response and Evacuation Plan Plan addresses hazards, does not include projects, can be used for mitigation action. Flood Preparedness Report Plan addresses hazards, does not include projects, can be used for mitigation action.
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	5-year plan, California DWR Emergency Safety Plan Plan addresses hazards, identifies projects, can be used for mitigation actions.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**

Building Code	N	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	Y	Erosion control measures on levee and canal slopes as necessary
Other		
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. The District does not have control over most of the areas tabulated above, as they are the responsibility of other agencies. The most effective way to expand the capabilities of the District would be increased funding for levee projects, reducing flood risk.		

Source: RD 341

Emergency Response and Evacuation Plan (2006)

As part of the hazard mitigation effort, the following emergency response and evacuation plan will be implemented by Reclamation District No. 341 (RD 341) when an emergency flood event is anticipated or is imminent. An emergency flood event typically occurs in one of two ways: 1) the Federal/State Flood Center, based on weather forecasts, predict~ that high tide river stages at the Rio Vista Bridge are expected to reach Monitor Stage or Flood Stage; or 2) the RD 341 trustees, based on levee monitoring conducted by RD personnel, declare an emergency due to potential flooding of the lands within the District as a result of a combination of high tides, inclement weather, and levee conditions.

Flood Preparedness Report (2017)

Reclamation District No. 341 (District) has prepared this report to demonstrate its readiness to respond to a major flood, or any event that threatens the levee system protecting Sherman Island. This report identifies the assets on hand for flood fighting and the locations on-island, of stockpiles of rock and sand, the sections

of levee considered most at-risk during a large storm event and an emergency response and evacuation plan if flooding is anticipated or imminent.

4.6.2. Administrative/Technical Mitigation Capabilities

Table 4-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in the District.

Table 4-8 RD 341's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	The District participated in the Delta Levee Subventions program which funds levee maintenance.
Mutual aid agreements	N	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	N	
Community Planner	N	
Civil Engineer	Y	Engineering staffing is adequate, trained and coordination is effective.
GIS Coordinator	N	
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	N	
Hazard data and information	N	
Grant writing	N	
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
More funding would allow the District to increase maintenance programs, as well as possibly add additional staff.		

Source: RD 341

4.6.3. Fiscal Mitigation Capabilities

Table 4-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 4-9 RD 341's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	Y	Landowners are assessed annually; it is specifically used for mitigation.
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	N	
State funding programs	Y	The District utilizes a variety of State funding programs to fund mitigation.
Other		
How can these capabilities be expanded and improved to reduce risk?		
Additional funding will be sought from local, state, and federal sources. This will help the District to perform levee related activities.		

Source: RD 341

4.6.4. Mitigation Education, Outreach, and Partnerships

Table 4-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 4-10 RD 341's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	N	
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The District may choose to seek partners on mitigation education for those in the District. This would expand capabilities and help reduce risk in RD 341.		

Source: RD 341

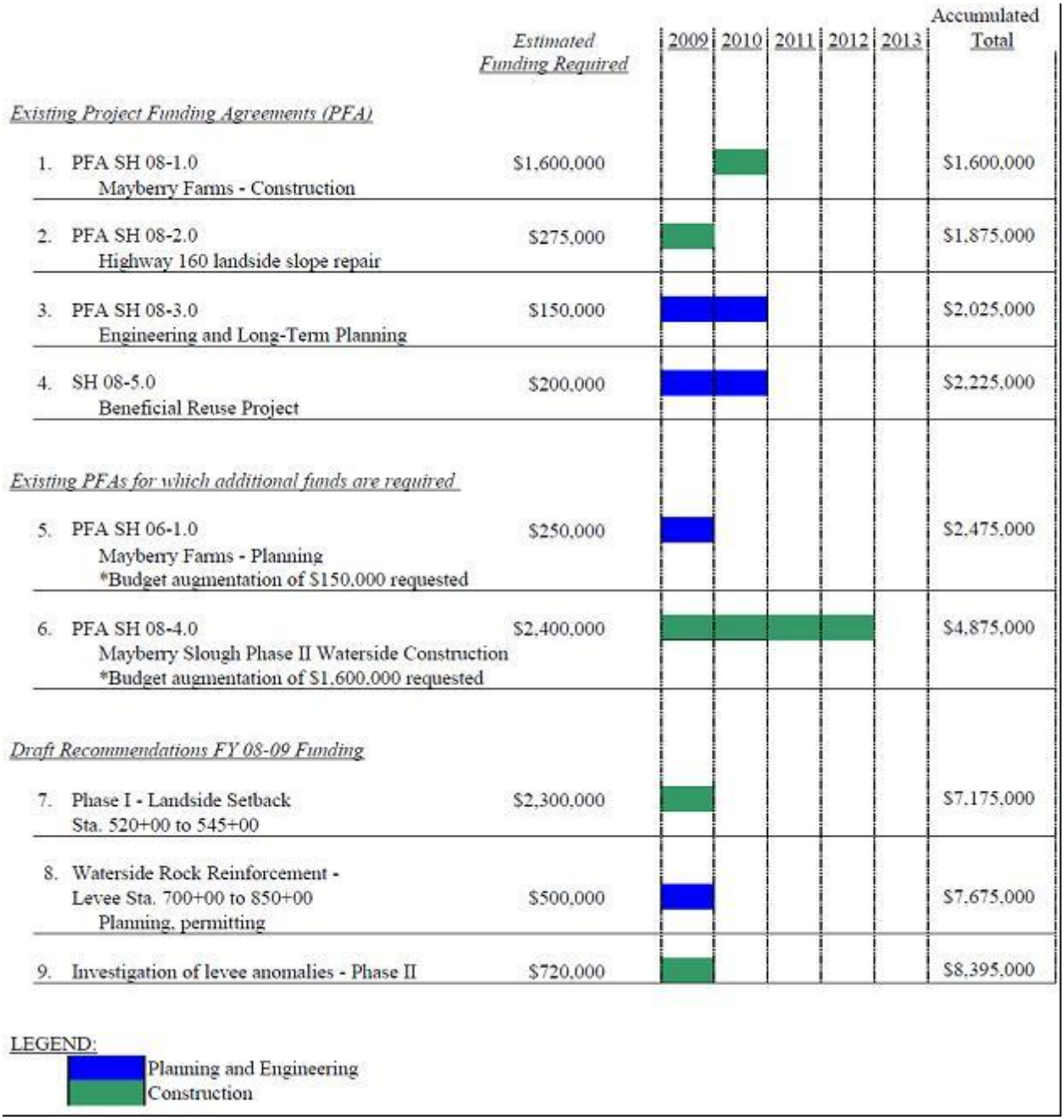
4.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

RD 341 has completed the Scour Pond Habitat Enhancement and Levee Stability Project, Mayberry Farms Construction, both part of the District's Five Year Plan. The District has also continued its Levee Stability Monitoring Program.

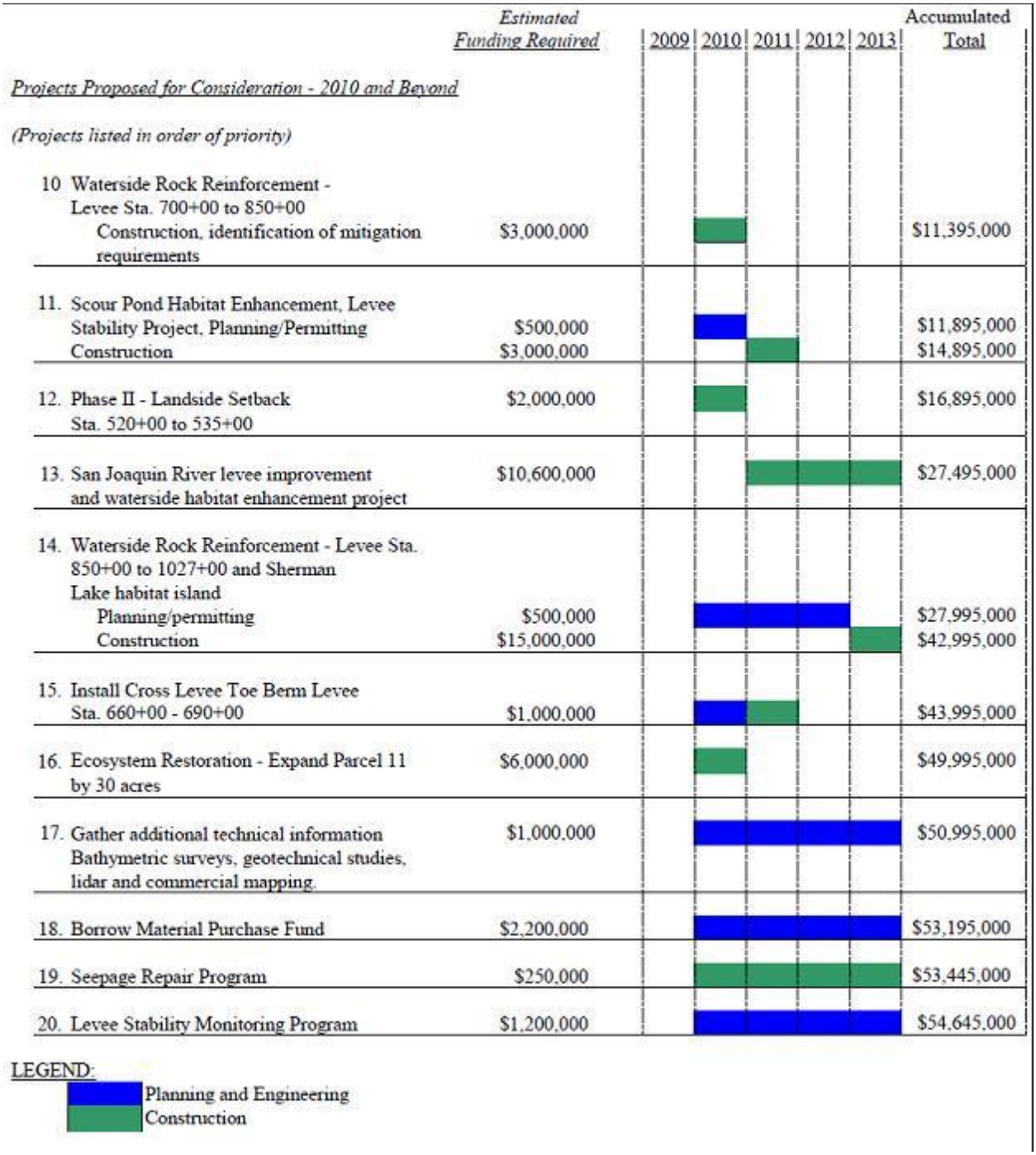
The Reclamation District 341 5 Year Plan (2009) lists may mitigation projects and efforts. These are shown in Figure 4-9 and Figure 4-10.

Figure 4-9 Reclamation District 341 Strategy to Meet Desired Levels of Protection



Source: RD 341 Five Year Plan (2009)

Figure 4-10 Reclamation District 341 Strategy to Meet Desired Levels of Protection (cont.)



	Estimated Funding Required	2009	2010	2011	2012	2013	Accumulated Total
Projects Proposed for Consideration - 2010 and Beyond							
(Projects listed in order of priority)							
10 Waterside Rock Reinforcement - Levee Sta. 700+00 to 850+00 Construction, identification of mitigation requirements	$3,000,000						$11,395,000
11. Scour Pond Habitat Enhancement, Levee Stability Project, Planning/Permitting	$500,000						$11,895,000
Construction	$3,000,000						$14,895,000
12. Phase II - Landside Setback Sta. 520+00 to 535+00	$2,000,000						$16,895,000
13. San Joaquin River levee improvement and waterside habitat enhancement project	$10,600,000						$27,495,000
14. Waterside Rock Reinforcement - Levee Sta. 850+00 to 1027+00 and Sherman Lake habitat island Planning/permitting	$500,000						$27,995,000
Construction	$15,000,000						$42,995,000
15. Install Cross Levee Toe Berm Levee Sta. 660+00 - 690+00	$1,000,000						$43,995,000
16. Ecosystem Restoration - Expand Parcel 11 by 30 acres	$6,000,000						$49,995,000
17. Gather additional technical information Bathymetric surveys, geotechnical studies, lidar and commercial mapping.	$1,000,000						$50,995,000
18. Borrow Material Purchase Fund	$2,200,000						$53,195,000
19. Seepage Repair Program	$250,000						$53,445,000
20. Levee Stability Monitoring Program	$1,200,000						$54,645,000

Source: RD 341 Five Year Plan (2009)

Since 2016, the District has completed the following projects:

- Sherman Island Levee Improvement Project for "Little Baja" and "Manzo Ranch" Fish Release Sites. Significantly improved the stability of approximately 4,000 linear feet of Project Levee.
- Sherman Island PL 84-99 Levee Repair Project – Phase 2. Improved 7,800 linear feet of levee to meet PL 84-99 standard.

- Sherman Island Flood System Repair Project STA 945+50 to 951+00. Repaired approximately 550 linear feet of severe waterside erosion of Project Levee along HWY 160.
- Sherman Island Pump Station #2 Repair and Rehabilitation. Replaced existing pump and motor, improved pump platform, replaced wooden piles with steel piles, replaced trash rack and trash rack platform.

4.7 Mitigation Strategy

4.7.1. Mitigation Goals and Objectives

The RD 341 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

4.7.2. Mitigation Actions

The planning team for the RD 341 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Climate Change
- Earthquake
- Floods: 1%/0.2% annual chance
- Levee Failure
- Severe Weather: Heavy Rains and Storms
- Severe Weather: Wind and Tornado

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. San Joaquin River Multi-Benefit Project

Hazards Addressed: Climate Change, Earthquake, Flood, Levee Failure, Heavy Rains and Storms, Wind and Tornadoes

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The levee between stations 175+00 to 199+00 along the San Joaquin River needs to be improved to PL 84-99 standard due to stability issues. This will protect the levees from the natural hazards listed above.

Project Description: The Project will consist of constructing a setback levee and counterbalance berm to improve levee stability and create intertidal habitat along San Joaquin River. The Project consists of two (2) phases of work: landside levee work and waterside levee work. Generally, the work on the landside of the levee consists of the removal of the existing Sacramento County (County) road, placement of fill as compacted embankment, and construction of a new County road. The new levee roadway will incorporate two 10-foot travel lanes with two 2-foot shoulders. Generally, the work on the waterside of the levee consists of excavation of the levee section to construct a habitat bench, the placement of riprap armoring, and the planting of native species on the habitat bench and setback levee waterside slope. The Project will increase levee safety by constructing a wider levee with less porous material than the existing levee. Furthermore, a wider levee roadway will allow the passage of multi-directional flood flight equipment and provide an improved evacuation route for residents of Sherman Island.

Other Alternatives: None

Existing Planning Mechanism(s) through which Action Will Be Implemented: N/A

Responsible Agency/ Department/Partners: Reclamation District No. 341 / CA Dept. of Water Resources

Cost Estimate: $9,600,000

Benefits (Losses Avoided): Reduces the likelihood of levee failure.

Potential Funding: Reclamation District No. 341 / CA Dept. of Water Resources

Timeline: 48 months

Project Priority (H, M, L): H

Delta Annex Chapter 5 Reclamation District 349

5.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 349 (RD 349 or District), a new participating jurisdiction to the 2021 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 349, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

5.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 5-1. Additional details on plan participation and District representatives are included in Appendix A.

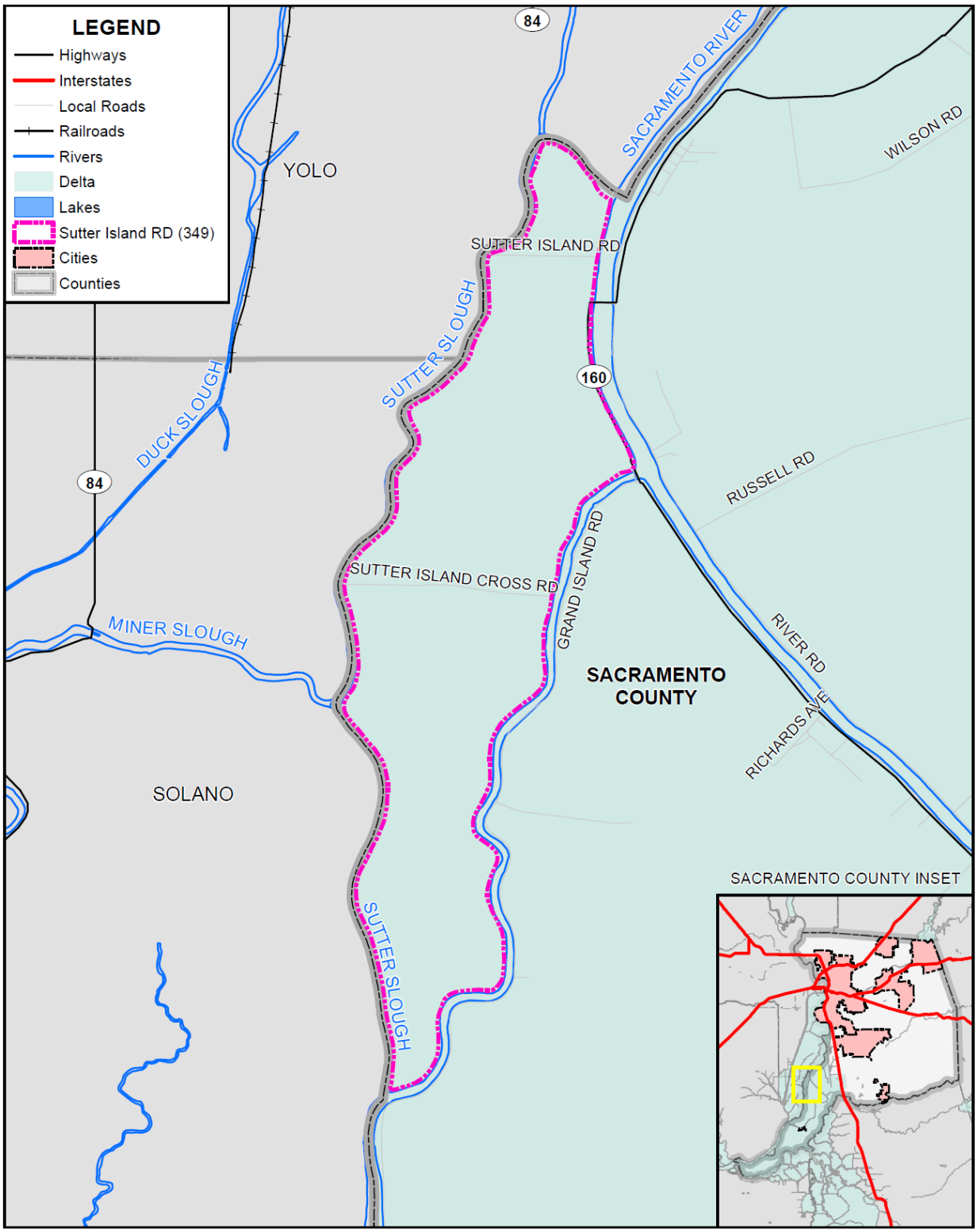
Table 5-1 RD 349 – Planning Team

Name	Position/Title	How Participated
Richard Elliot	President	Evaluated District issues and developed solutions
Matt Hemly	Trustee	Evaluated District issues and developed solutions
Joe Salman	Secretary	Evaluated District issues and developed solutions
Gilbert Cosio/MBK	District Engineer	Evaluated District issues and developed solutions

5.3 District Profile

The District profile for the RD 349 is detailed in the following sections. Figure 5-1 displays a map and the location of the District within Sacramento County.

Figure 5-1 RD 349



Data Source: Sutter Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

5.3.1. Overview and Background

Reclamation District 349, Sutter Island, is the local public entity that provides flood control and drainage services to landowners of Sutter Island. These functions are provided in the most economical and environmentally sound manner, with the greatest consideration of the areas rich agrarian culture and heritage.

Established in 1880, Sutter Island was given the number Reclamation District No. 349. The area protected by Reclamation District No. 349 has remained the same for essentially the entire time of its existence. The Reclamation District protects 2,383 (or 2533) acres.

The Reclamation District No. 349 levees are part of the Federal Sacramento River Flood Control Project. As part of a Federal project, the State of California is the local sponsor with Reclamation District No. 349 acting as the local maintaining agency. In order to verify that the District is maintaining its levees properly, the State inspects the levees two times a year (spring and fall) and Reclamation District No. 349 inspects its levees twice a year (summer and winter). The key inspection is the fall inspection performed by the State of California. This inspection, which occurs just prior to the flood season, is used by the Corps of Engineers to determine whether the levee is being properly maintained in order for Reclamation District No. 349 to qualify for Federal emergency funding through Public Law 84-99. The Corps of Engineers also performs inspections periodically every 5 to 10 years.

Reclamation District No. 349 provides flood protection in the form of levee maintenance and rehabilitation. The District also provides interior island flood protection and drainage. The District operates and maintains all the levees that protect the landowners of Sutter Island. The District's project levees include 6.55 miles along Sutter Slough, 4.35 miles along Steamboat Slough, and 1.59 miles along the Sacramento River for a total of 12.49 miles. The District also maintains ditches and canals, and 1 pumping plant to drain the properties of Sutter Island.

5.4 Hazard Identification

RD 349 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 5-2).

Table 5-2 RD 349—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Occasional	Limited	Low	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Extensive	Occasional	Critical	Low	High
Earthquake	Extensive	Occasional	Limited	Low	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Low	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Significant	Likely	Critical	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Significant	Likely	Critical	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Low	Low
Subsidence	Significant	Likely	Limited	Low	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Limited	Unlikely	Negligible	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

5.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

5.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 5.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 5-2) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

5.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 349's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 5-3 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 349's physical assets, valued at over $251 million, consist of the buildings and infrastructure to support the District's operations.

Table 5-3 RD 349 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Pumping Plant – Sutter Slough	Drain Pump	$2,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Levees	Flood Control System	$249,800,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Total		**$251,800,000**	

Source: RD 349

Natural Resources

RD 349 has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan. Sutter Island is one of the few in the Delta that still has substantial riverine and freshwater forested/shrub wetland habitat on the waterside slopes of its levees. Agricultural ground and ditches also support wildlife.

Historic and Cultural Resources

RD 349 has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan. Sutter Island is located within the Legal Delta which is now considered to be a National Heritage Area. The majority of the acreage on Sutter Island is considered to be Prime Agricultural land. Some of that acreage is dedicated to pear orchards that date back almost a century.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Future Development

Future development in these areas generally parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

Grand Island is within the Primary Zone of the Delta. Therefore, in addition to Sacramento County, development is controlled by a State agency, the Delta Protection Commission. Therefore, there is little, if any, potential for growth beyond that allowed by agricultural zoning. There are no current plans to add any new District facilities. The District is planning upgrades to District facilities. This is shown on Table 5-4. None of these planned repairs listed in Table 5-4 are intended to induce growth due to land use regulations.

Table 5-4 RD 3 Proposed Maintenance and Improvement Projects

Proposed Projects	Levee Segment
2017 Storm Damage, Waterside Erosion Repairs	Steamboat Slough
2017 Storm Damage Waterside Erosion Repairs	Sutter Slough
Interior Drainage Improvements	Sacramento River and Steamboat Slough

5.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 5-2 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that

plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

The District has experienced power outages, typically related to high winds and storms that damage the power lines. The District can utilize generators as needed but do not have a back-up power source otherwise.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

The District is not located within an area that is subject to a PSPS and has not been affected by any activity.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

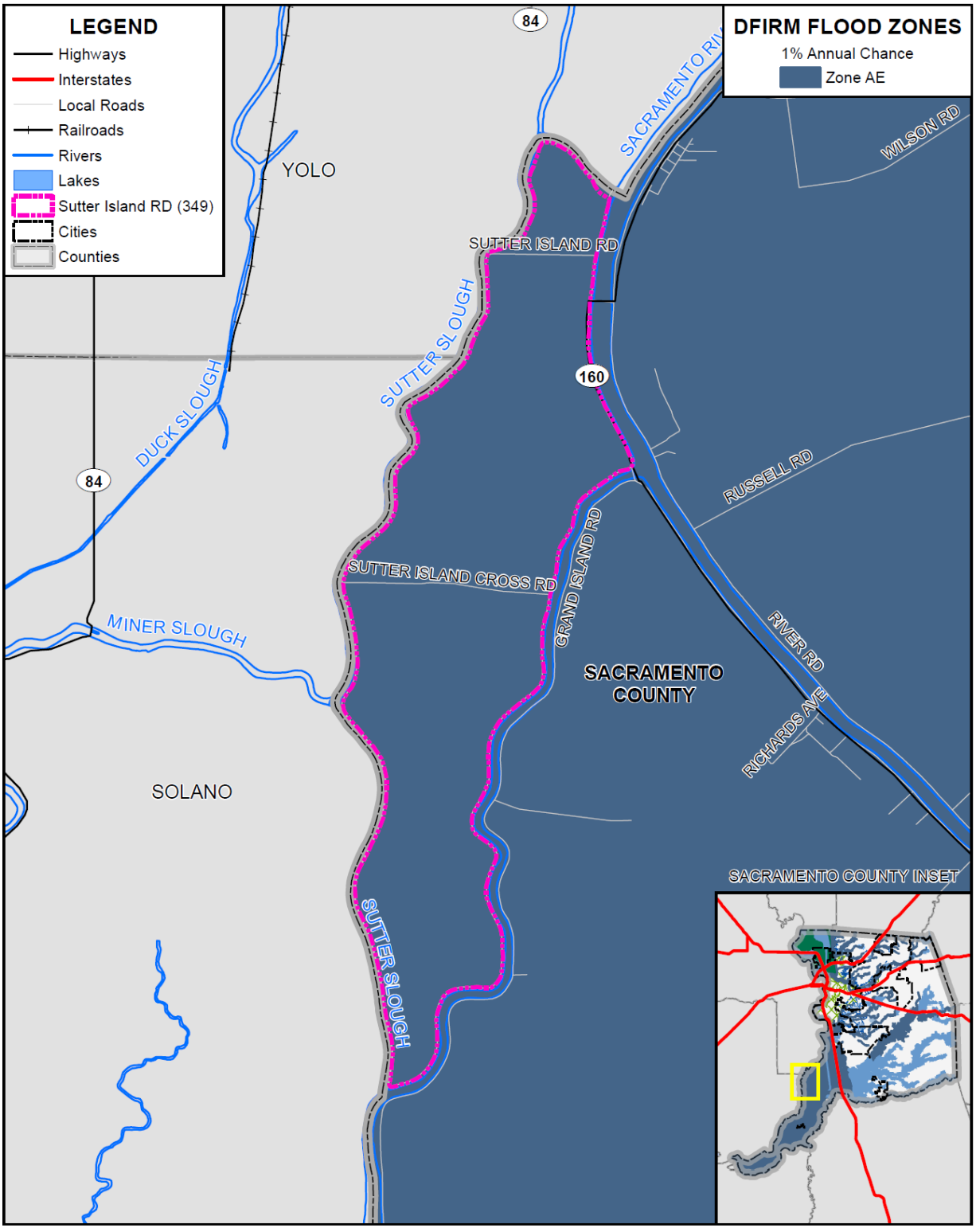
Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the RD 349 have been subject to historical flooding.

Location and Extent

The RD 349 has areas located in the 1% annual chance floodplain. This is seen in Figure 5-2.

Figure 5-2 RD 349 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Sutter Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

Table 5-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 5-5 RD 349– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 5-6. These events also likely affected the District to some degree.

Table 5-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Past river floods, most recently in 1986, 1997/1998, 2006 and 2017, have damaged the RD 349 levees in the form of erosion. Restoration erosion repair has typically been performed by the Corps of Engineers as authorized under PL 84-99. Repair work under PL 84-99 was performed by the Corps of Engineers on Sutter Island levees following the recent floods of 1986, 1997, 1998, and 2006. The District temporarily lost eligibility in the PL84-99 program is hoping to regain eligibility through the preparation and execution of a Systemwide Improvement Framework (SWIF).

Most recently, high water events in 2017 and 2019 have resulted in considerable waterside erosion and exacerbated sites that have experienced erosion over time throughout the District levees. The flood event of 2017 also resulted in increased levee patrols and pumping costs.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Namely, orchard crops and vineyards on the District can be completely lost if they are inundated for an extended period of time. Crop losses will continue years after as it will take at least 5 years to produce a viable orchard or vineyard crop. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

Should a flood breach the levees, the entirety of the assets and population of RD 349 would be at risk. There are approximately 62 people that live on Sutter Island, given the small size of the District, a failure would fill up the island relatively quickly impacting evacuation. These assets include approximately 2,500 acres of crops grown within the District. RD 349's drain pump would be flooded and therefore, RD 349 could not drain the flooded areas with their existing pumps; auxiliary pumps would have to be brought in.

A flood event could also deteriorate the District levees on waterside slopes causing significant erosion as seen in the aftermath of the 2017 event. If a breach were to occur, the levees could experience erosion on the landside slopes from wave wash.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The RD 349 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted the following past occurrences of localized flooding: In past flood events, boils formed on the landside of the levee. Animal burrows, abandoned or unmaintained pipes, and vegetation can increase the likelihood of seepage during high water events that can result in localized flooding. No specific damages were recorded.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected

with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Assets at Risk

As stated above, stormwater flooding has the potential to result in significant damage due to the increased acreage of permanent crops. Stormwater flooding can result in losses of less flood resistant crops planted at low elevations.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Extremely High

Hazard Profile and Problem Description

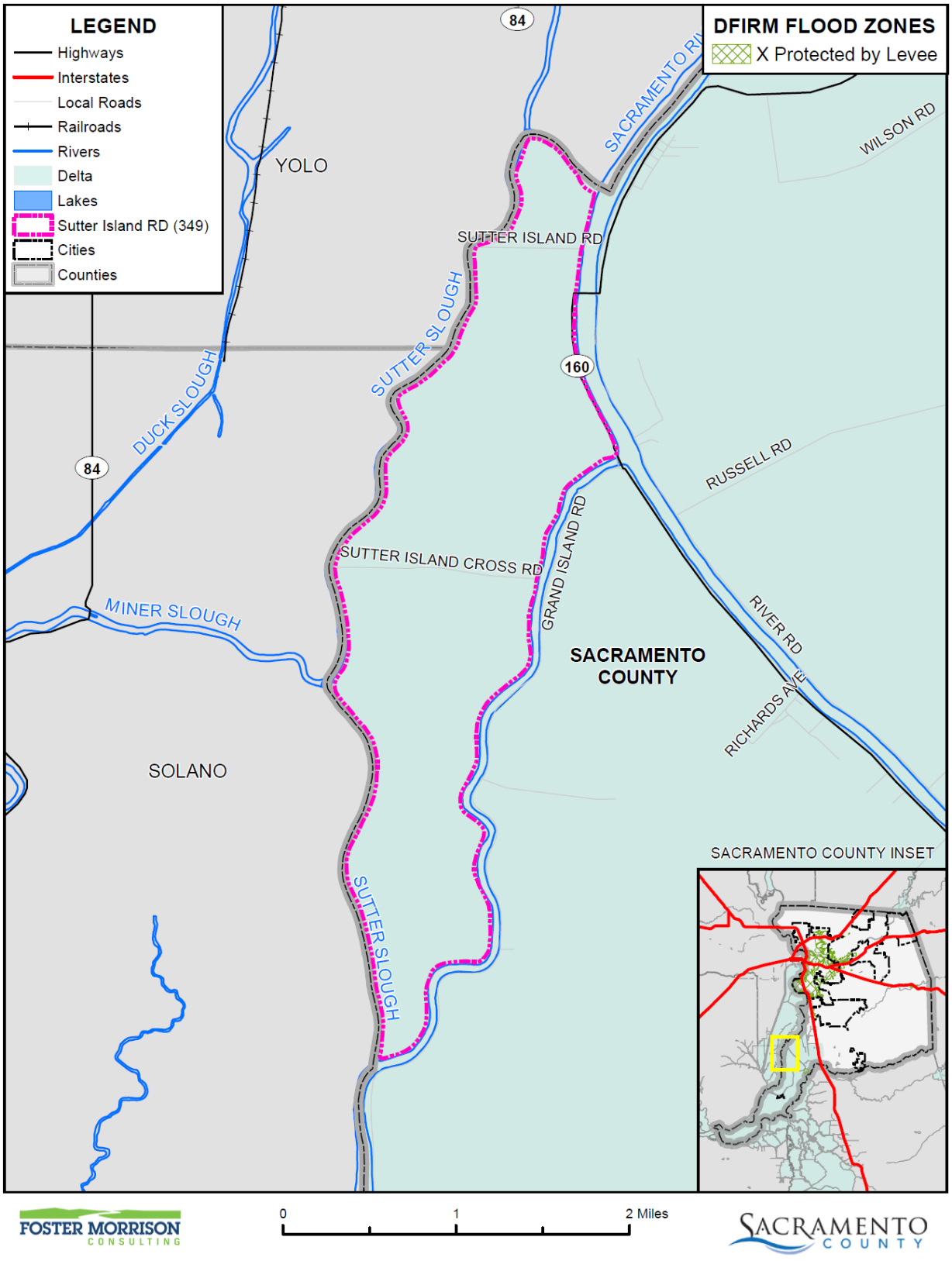
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 5-3.

Figure 5-3 RD 349 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Sutter Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 03/2021.

To reduce the risk of flooding the District is planning to perform the repairs listed in Table 5-4 to reduce the likelihood of levee failure. To further reduce damages in the event of a levee failure, the District could perform a relief cut near the bottom the District either on the Sutter Slough Levee or Steamboat Slough levee. This action, if timed appropriately, can reduce flood depths and inundation timing.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

District assets previously mentioned would experience significant damages in the event of a levee breach. A levee failure could result in the loss of both row crops and permanent crops. If a breach were to occur there could be a potential loss of life due to limited evacuation time and disruptions in evacuation routes.

A levee failure and subsequent flooding on Reclamation District 349 could result in wave fetch that could damage the interior slopes of the District's levee system as well as those of adjacent Districts.

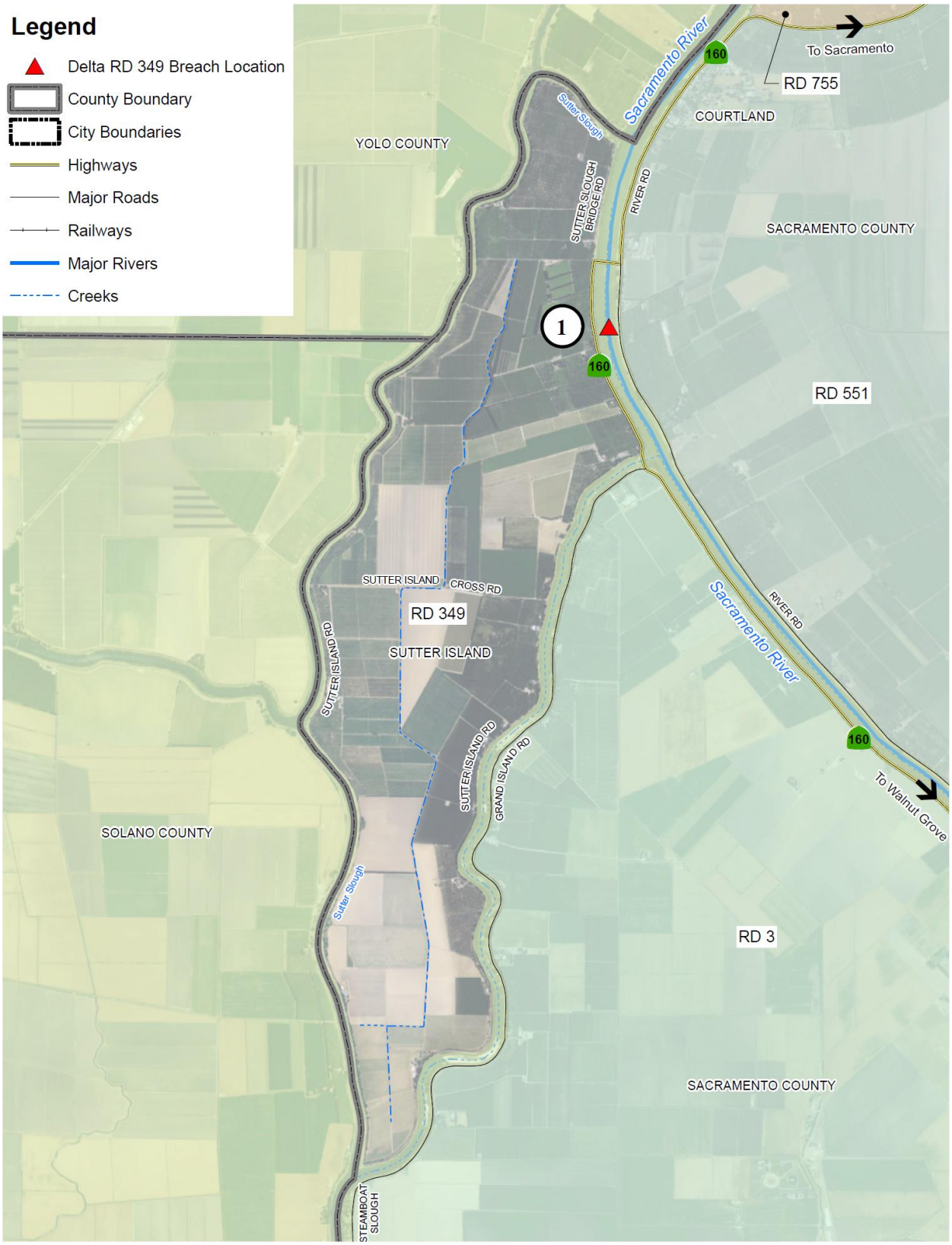
Scour at the breach area is another concern. Once the breach is repaired this location may prove to be too low to support any agriculture due to drainage difficulties.

StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

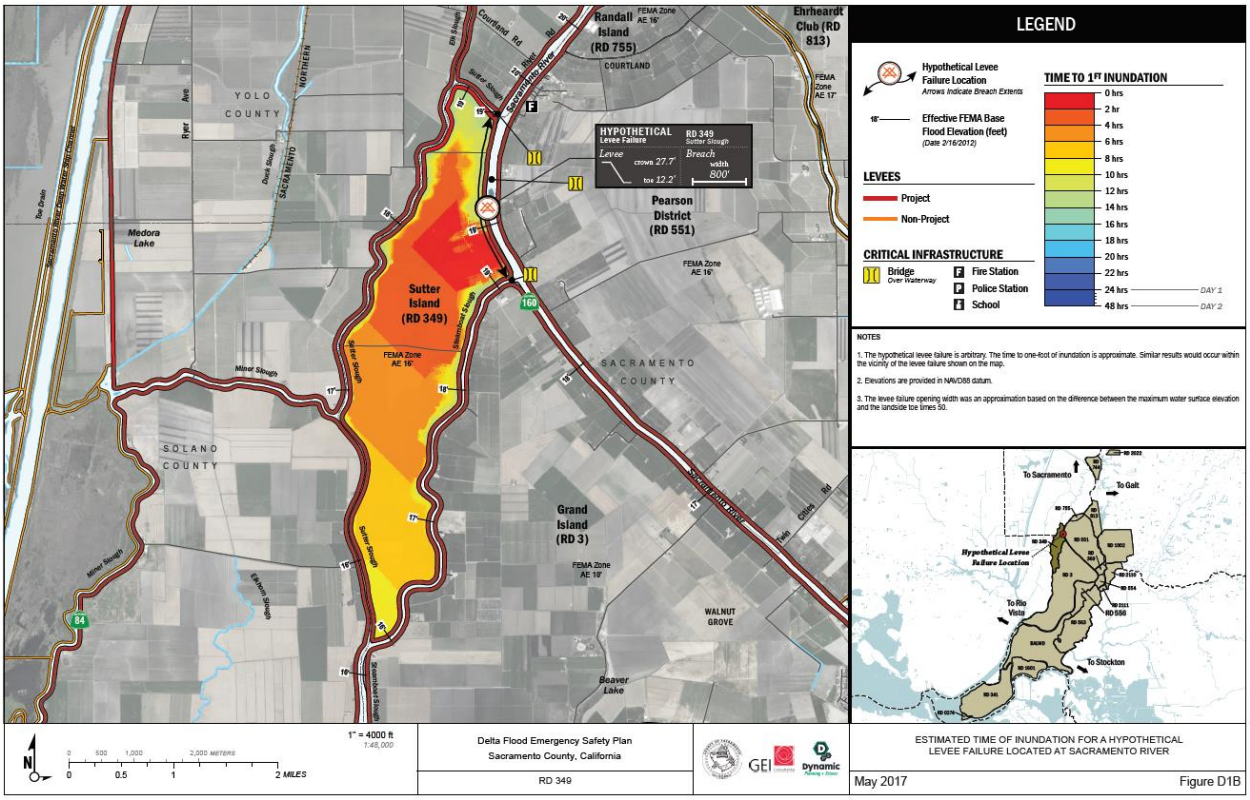
For RD 349, Figure 5-4 details the locations in the Delta within RD 349 where flooding could occur. The red triangles denote potential levee breach locations. RD 349 has a potential levee break scenario. Maps regarding time to one foot inundation (Figure 5-5), estimated flood depths (Figure 5-6), and suggested evacuation routes (Figure 5-7) are displayed below.

Figure 5-4 RD 349 – Potential Levee Breach Location



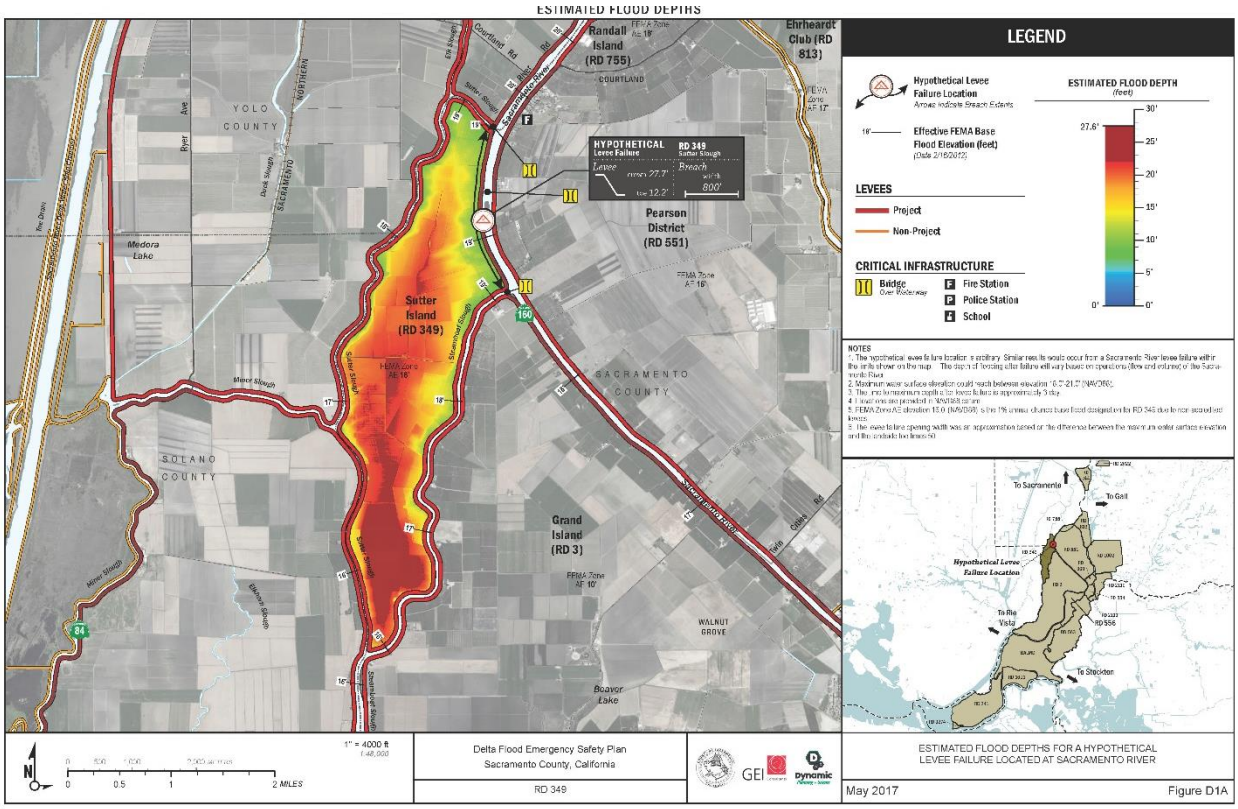
Source: Sacramento County Storm Ready – retrieved April 29, 2021

Figure 5-5 RD 349 – Time to One Foot Inundation after Levee Breach



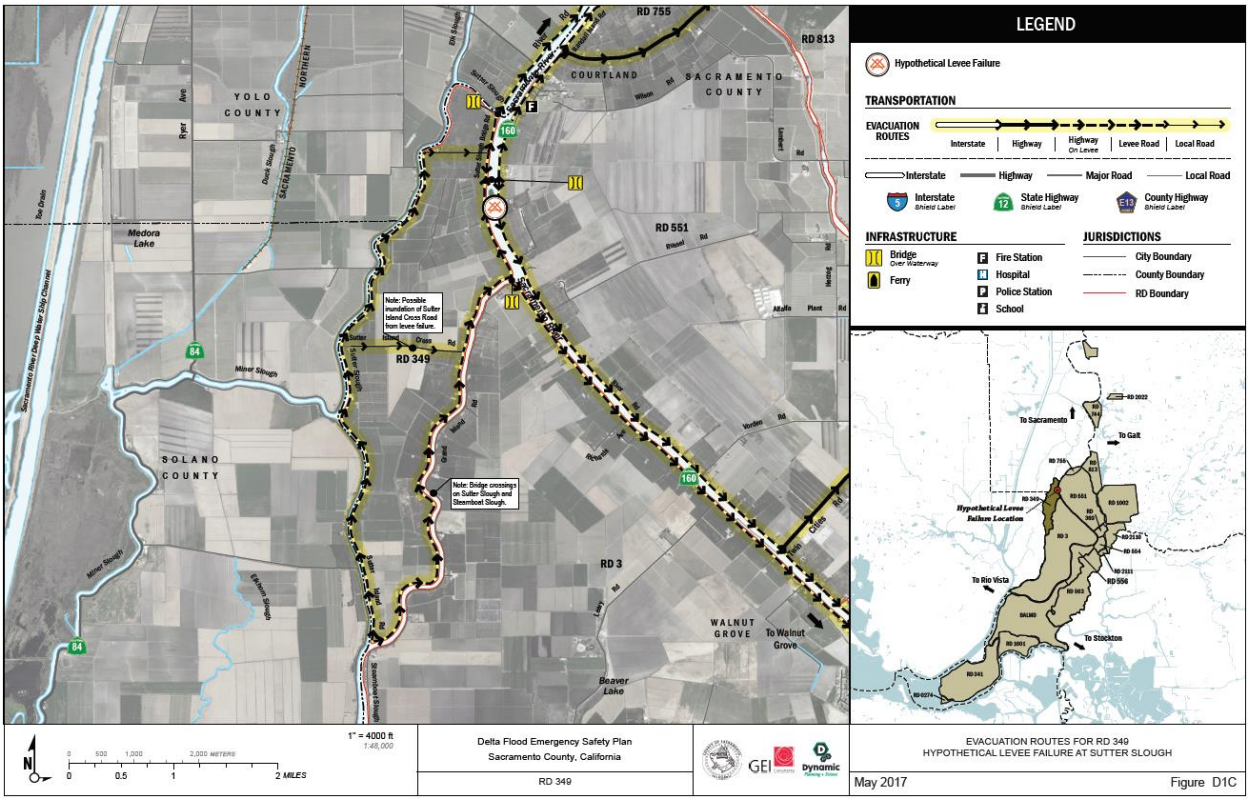
Source: Sacramento County Storm Ready – retrieved April 29, 2021

Figure 5-6 RD 349 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved April 29, 2021

Figure 5-7 RD 349 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved April 29, 2021

Assets at Risk

A levee failure would impact almost all the assets and critical facilities on Grand Island; including the small State Highway 160 as well as a several county roads are at risk. Approximately 2,500 acres of agricultural land would be damaged and possibly rendered unfarmable for at least a year. There are many permanent crops on Sutter Island, such as wine grapes and pears that would be destroyed. Production of such permanent crops can take approximately 5 years to produce a viable harvest.

A levee failure could cause flooding that could damage the District's pump and drainage system. A levee failure can also result in subsequent levee failures around the District and on adjacent islands due to increased fetch of the flooded area and subsequent erosion on exposed levee slopes.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it

contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding. In 2017, heavy rains resulted in additional pumping and subsequent costs to ensure adequate drainage.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services. During periods of heavy rains and storms, power outages can also occur. These power outages can affect pumping stations that help alleviate flooding.

Problems associated with the primary effects of severe weather include erosion, flooding, pavement deterioration, washouts, landslide/mudslides, and downed trees. However, it is the secondary effects of heavy rain and storms that are of concern to RD 349. Heavy rains can cause flooding, levee failure, and stream bank erosion. Flooding, levee failure, and stream bank erosion can cost RD 349 millions in damages. Although water surface elevation is a major factor to levee seepage and overtopping, severe weather can cause significant damage, such as erosion, that puts the integrity of the Grand Island levee system at risk.

Assets at Risk

Heavy rain and thunderstorms are the most frequent type of severe weather occurrence in the area. Wind and lightning often accompany these storms and have caused damage in the past. Problems associated with the primary effects of severe weather include erosion, flooding, pavement deterioration, washouts, landslide/mudslides, and downed trees. However, it is the secondary effects of heavy rain and storms that are of concern to RD 349. Heavy rains can cause flooding, levee failure, and stream bank erosion. Flooding, levee failure, and stream bank erosion can cost RD 349 millions in damages as stated previously under a levee failure scenario.

High winds during storm events can knock down power lines and result in a loss of power to the District pumps. This will require the District to bring in diesel powered auxiliary pumps and will likely result in increased flooding within the District.

5.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

5.6.1. Regulatory Mitigation Capabilities

Table 5-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 349.

Table 5-7 RD 349 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	N	Not within this jurisdiction's authority
Capital Improvements Plan	N	Not within this jurisdiction's authority
Economic Development Plan	N	Not within this jurisdiction's authority
Local Emergency Operations Plan	Y/2021	Through a state grant, Sacramento County is funding revisions to the District's existing Flood Emergency Safety Plan for RD 349. The plan update will be complete in early 2022.This plan will also evaluate and create an action plan for a relief cut in the event of a levee failure.
Continuity of Operations Plan	N	Not within this jurisdiction's authority
Transportation Plan	N	Not within this jurisdiction's authority
Stormwater Management Plan/Program	Y	RD 349 consistently evaluates flooding of low areas and the need for improvements in its drainage system

Engineering Studies for Streams	N	Not within this jurisdiction's authority
Community Wildfire Protection Plan	N	Not within this jurisdiction's authority
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Annual routine maintenance plans and participation in the state Delta Levees Subventions Program which assists in funding levee maintenance. RD 349 is also preparing a Letter of Intent to participate in the Corps of Engineers PL84-99 program through the development of a System-Wide Improvement Framework (SWIF) to respond to maintenance and rehabilitation issues brought up by the Corps of Engineers Periodic Inspection Report
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Version/Year: Not within this jurisdiction's authority
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score: Not within this jurisdiction's authority
Fire department ISO rating:	N	Rating: Not within this jurisdiction's authority
Site plan review requirements	N	Not within this jurisdiction's authority
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	Not within this jurisdiction's authority
Subdivision ordinance	N	Not within this jurisdiction's authority
Floodplain ordinance	N	Not within this jurisdiction's authority
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	Not within this jurisdiction's authority
Flood insurance rate maps	N	Not within this jurisdiction's authority
Elevation Certificates	N	Not within this jurisdiction's authority
Acquisition of land for open space and public recreation uses	N	Not within this jurisdiction's authority
Erosion or sediment control program	Y	Erosion control measures on levee and canal slopes as necessary. Sediment removal from drainage system canals as necessary.
Other	N	
How can these capabilities be expanded and improved to reduce risk?		

Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database.
In implementation of the District's SWIF, the District will require increased coordination from permitting agencies as well as landowners. Many issues identified are going to require significant permitting and come at a high cost to landowners. Programmatic permitting capabilities as well as a grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure.
The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The Districts capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund.

Source: RD 349

5.6.2. Administrative/Technical Mitigation Capabilities

Table 5-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 349.

Table 5-8 RD 349's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	Not within this jurisdiction's authority
Mitigation Planning Committee	N	Not within this jurisdiction's authority
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	RD 349 annually performs $40,000 in maintenance. In addition, it periodically constructs projects to repair deficiencies in the levee such as planned erosion and seepage repairs.
Mutual aid agreements	N	None formally established with adjacent Reclamation Districts. Informally resources will be shared in the event of an emergency.
Other	N	
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	Not a position within this jurisdiction
Floodplain Administrator	N	Not a position within this jurisdiction
Emergency Manager	Y	Matt Hemly
Community Planner	N	Not a position within this jurisdiction
Civil Engineer	Y	Gilbert Cosio, Michael Moncrief and the staff at MBK Engineers has served as District Engineer for over 40 years and has participated in many flood fight actions.
GIS Coordinator	N	Not a position within this jurisdiction
Other		
Technical		

Warning systems/services (Reverse 911, outdoor warning signals)	Y	There are sirens at fire houses in adjacent towns. The process of using these as flood warnings should be revisited by local volunteer fire departments. District has a phone list, but does not have staffing beyond the trustees, civil engineer, and secretary.
Hazard data and information	Y	Civil Engineer has hazard data and information to aide district
Grant writing	N	Not a position within this jurisdiction
Hazus analysis	N	Not a position within this jurisdiction
Other		
How can these capabilities be expanded and improved to reduce risk?		
Consistent and available funding opportunities can aide in planning and outlaying substantial improvement projects.		

Source: RD 349

5.6.3. Fiscal Mitigation Capabilities

Table 5-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 5-9 RD 349's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	RD 349's annual assessment includes funding for future anticipated capital projects
Authority to levy taxes for specific purposes	Y	RD 349 calls assessments based on the budgetary needs of the District
Fees for water, sewer, gas, or electric services	N	Not within this jurisdiction's authority
Impact fees for new development	N	Not within this jurisdiction's authority
Storm water utility fee	N	Not within this jurisdiction's authority
Incur debt through general obligation bonds and/or special tax bonds	Y	RD 349 has the ability to levy special assessments and also obtain warrants to perform unanticipated repairs
Incur debt through private activities	N	Not within this jurisdiction's authority
Community Development Block Grant	N	Not within this jurisdiction's authority
Other federal funding programs	Y	The District is preparing a Letter of Intent to become eligible for the Corps of Engineers PL84-99 program
State funding programs	Y	The District participates in the Delta Levees Subventions program that provides a 75/25 state to local cost share.
Other		
How can these capabilities be expanded and improved to reduce risk?		

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Substantial funding will be required both publicly and privately in implementation of the District's SWIF. A grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure. The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The Districts capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund. Furthermore the District has utilized other funding opportunities such as the Flood System Repair Program to address critical issues. Continued funding of such programs would greatly benefit the District's ability to perform necessary repairs and improvements.		

Source: RD 349

5.6.4. Mitigation Education, Outreach, and Partnerships

Table 5-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 5-10 RD 349's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	No formal program currently exists within this jurisdiction
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	RD 349 maintains a web page with appropriate information to educate the public. With SWIF implementation, the District will perform outreach to landowners for education and assistance in addressing encroachment issues.
Natural disaster or safety related school programs	N	No formal program currently exists within this jurisdiction
StormReady certification	Y	The RD 349 manager, trustees, and District Engineer have been, or soon will be, trained in SEMS and NIMS
Firewise Communities certification	N	No formal program currently exists within this jurisdiction
Public-private partnership initiatives addressing disaster-related issues	N	No formal program currently exists within this jurisdiction
Other		
How can these capabilities be expanded and improved to reduce risk?		

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Many risks to the integrity of the levee system can come from noncompliant and aging encroachments such as pipes through the levee. Repair and replacement of encroachments, particularly pipes can place a large financial burden on landowners leading to deferred maintenance and ultimately a dangerous situation within the flood control system. It would be beneficial if a program were established that would create a local agency/private landowner partnership that provides funding and permitting assistance to address these issues before they result in levee failure.		

Source: RD 349

5.6.5. Other Mitigation Efforts

RD 349 has been an active participant in the state's Delta Levee Subventions Program. Along with development of a Systemwide Improvement Framework (SWIF) the District will reduce risk by leveraging state and federal resources to address levee deficiencies and respond to emergencies.

5.7 Mitigation Strategy

5.7.1. Mitigation Goals and Objectives

The RD 349 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

5.7.2. Mitigation Actions

The planning team for the RD 349 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to

implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The high water events of 2017 and 2019 resulted in 9 areas that had experienced erosion on the waterside slope of the Sacramento River and Steamboat Slough levees. Some areas had experienced erosion in previous high water events (1986 and 1997) that became worse following these events.

Project Description: Repairing waterside erosion at various locations along Sacramento River and Steamboat Slough that resulted from the 2017 and 2019 high water events. Utilizing rip rap material to re-establish the existing levee slope.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 349 Five Year Plan, Storm Damage DWR Emergency Rehabilitation (SDDER) Program

Responsible Agency/ Department/Partners: Reclamation District 349, Department of Water Resources

Cost Estimate: $2.5 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of $23 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program and Flood System Operations and Maintenance Program

Timeline: Scheduled to be completed by 2026

Project Priority (H, M, L): High

Action 2. Interior Drainage Improvements

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The District has been studying the interior drainage system and issues with the intent to include a new or upgrade existing pumps to resolve localized flooding issues.

Project Description: Install a new pumping facility or upgrade an existing facility within the existing District drainage system to improve efficiency and reduce residency time of flood waters. This could also include the acquisition of an ancillary diesel pump to use in the event of pump damage or power outages.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 349 Five Year Plan, Storm Damage DWR Emergency Rehabilitation (SDDER) Program

Responsible Agency/ Department/Partners: Reclamation District 349, Department of Water Resources

Cost Estimate: $2 million

Benefits (Losses Avoided): Assists with dewatering the island which could result in losses of up to $23 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program

Timeline: Scheduled to be completed by 2030

Project Priority (H, M, L): High

Action 3. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: USACE Sacramento District identified five Unacceptable deficiency categories in its PIR, four of which affect PL 84-99 eligibility: encroachments, slope stability, animal control, and erosion/bank caving. Although the depression/rutting category does not affect eligibility, RD 349 will also address those Unacceptable items.

Project Description: Addressing these unacceptable items to maintain eligibility in the PL84-99 program with a worst first approach. If an item in one of the lower priority categories poses a greater risk it will be addressed sooner. Once the unacceptable items are addressed the District will continue to correct items listed in the USACE Periodic Inspection Report in its effort to achieve an acceptable rating.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 349 Five Year Plan, System Wide Improvement Framework

Responsible Agency/ Department/Partners: Reclamation District 349, Department of Water Resources

Cost Estimate: $6 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of $120 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program, Deferred Maintenance Program

Timeline: Schedule for completion 2050

Project Priority (H, M, L): High

Action 4. Relief Cut Plan

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: In the event of a levee breach, the District is planning on a relief cut near the bottom of the District to help drain the island quicker and reduce damages to property.

Project Description: A relief cut plan will be established by the District and coordinated with various emergency planning agencies and adjacent reclamation districts in the event of a levee breach in the northern portion of the District

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Small Community Flood Risk Reduction Feasibility Study, Sacramento County Flood Safety Plan Update

Responsible Agency/ Department/Partners: Reclamation District 349, Sacramento County Office of Emergency Services

Cost Estimate: $2 million

Benefits (Losses Avoided): Reduces the amount of time floodwaters impact the District which could cause an estimated $120 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program and Flood System Repair Project

Timeline: No current schedule for completion

Project Priority (H, M, L): Medium

Delta Annex Chapter 6 Reclamation District 369

6.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 369 (RD 369), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 369, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

6.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 6-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 6-1 RD 369 – Planning Team

Name	Position/Title	How Participated
Clarence Chu	Landowner/Locke Town Board/RD 369 General Manager	Attended meetings, provided data and information, reviewed draft documents

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 6-2.

Table 6-2 2016 LHMP Incorporation

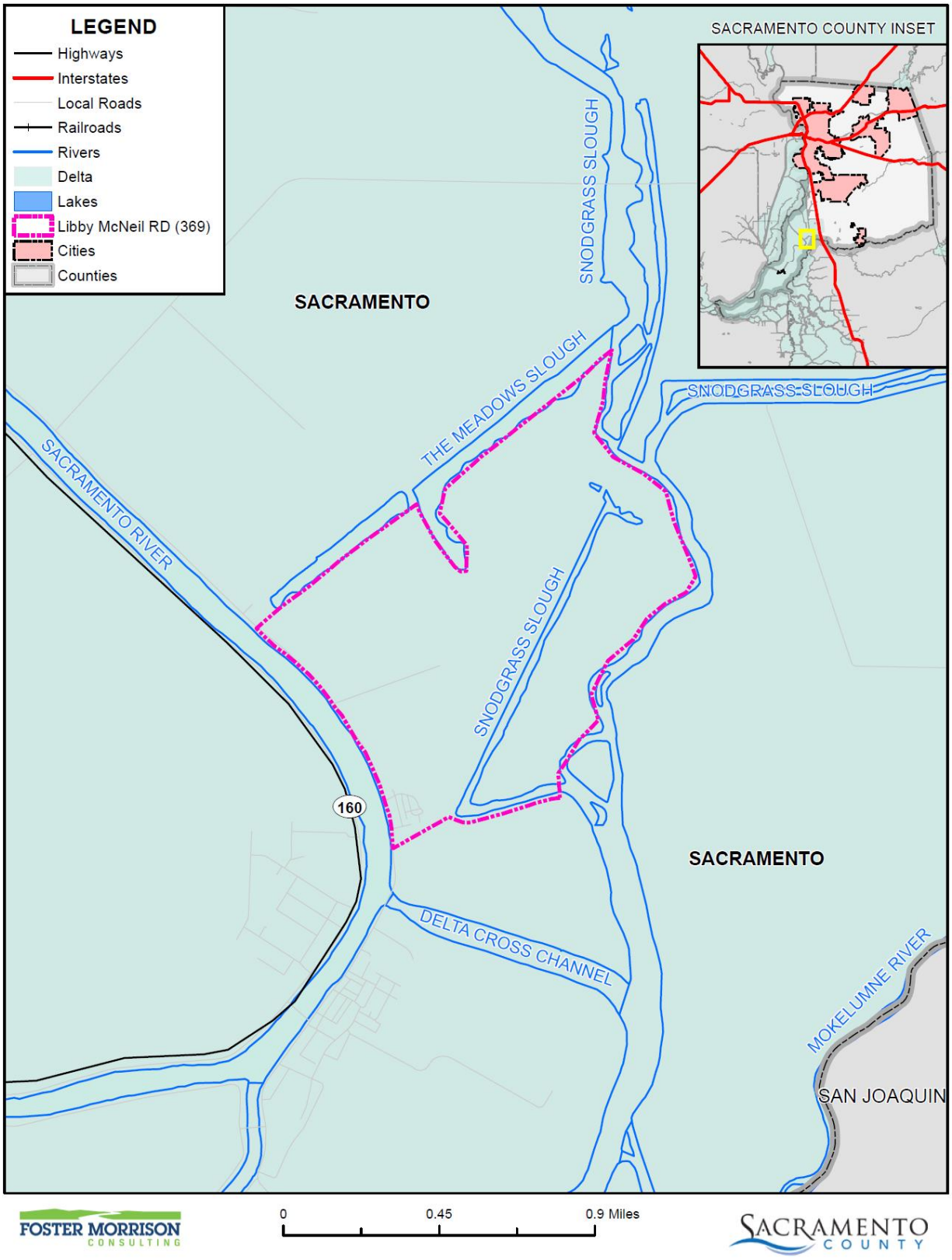
Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Products from Locke Small Communities project	While specific information from the 2016 LHMP was not specifically incorporated into the Small Communities Project for Locke, the consultant for that project was involved in the 2016 LHMP Update and recognizes the value for using this 2021 LHMP Update as a possible mechanism to implement the resulting mitigation actions from that project specific to RD 369.

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
RD 369 does not have any other planning mechanisms that the LHMP could be integrated into.	

6.3 District Profile

The District profile for the RD 369 is detailed in the following sections. Figure 6-1 displays a map and the location of the District within Sacramento County.

Figure 6-1 RD 369



Data Source: Libby McNeil Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

6.3.1. Overview and Background

Reclamation District No. 369 (RD 369), also known as Libby McNeil, is located in the Northern Delta, near the town of Walnut Grove and the Delta Cross Channel to the South, route 160 and the Sacramento River to the west, Snodgrass Slough to the east, and the Meadows waterway to the North.

The Town of Locke is south on the edge of RD 369 border. The District staff consists of a landowner and contract hires. The District is responsible for maintenance, repair, and improvements of Snodgrass Slough and Meadow Slough levees; Maintenance Area 9 (MA-9) is responsible for the levee maintenance, repair, and improvements along the left bank of the Sacramento River protecting the land under the District jurisdiction. Maintenance Areas take over in providing the maintenance on federal flood control levees. MA-9 is the only flood control Maintenance Area in the Sacramento County which the CVFPB governs. The District is also responsible for the drainage system providing flood protection. Additionally, the District maintains canals and ditches that provide drainage to the property owners. The levees protect about 586 acres of predominantly agricultural land from flooding; the primary orchard grown on the island is pear; there is also irrigated pasture for cattle and goats. According to the 2010 census, there are 20 households and with a population of 52 people. The island's current assets are estimated to be worth about $19.3 million.

According to Mr. Chu, the leveed area under the jurisdiction of RD 369 includes an approximate one mile stretch on the Sacramento River side, and a smaller area to the east of the District. RD 369's primary responsibility is to maintain the vegetation along the levee. This consists of using goats to eat down the vegetation and a semi-annual spraying. Cal DWR provides inspections to ensure adequate maintenance of vegetative areas.

Mr. Clarence Chu, purchased the original 490 acres which housed the Town of Locke and RD 369 in 1977 from the Locke heirs. Since then, approximately 200 acres was sold to the state for use as the Delta Meadows State Park and another 10 acres comprising the Locke Townsite was sold in 2002 to the Sacramento County Housing and Redevelopment Agency, which later sold the land back to the existing townsite building owners. Mr. Chu currently owns an approximate 280 acres which is primarily used for agricultural purposes, some of which is orchards, farmed by himself and some leased out for farming by others.

The Town of Locke, now the Locke Historic District, was built in 1915 by Chinese immigrants from Heungshan County in Guangdong Province, China. The Locke Historic District is the largest, most complete example of a rural, agricultural Chinese American community in the United States.

6.4 Hazard Identification

RD 369 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 6-3).

Table 6-3 RD 369—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Low	–
Dam Failure					Medium
Drought & Water Shortage	Extensive	Occasional	Critical	Low	High
Earthquake					Low
Earthquake Liquefaction	Significant	Occasional	Limited	Medium	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional/ Unlikely	Catastrophic	High	Medium
Floods: Localized Stormwater					Medium
Landslides, Mudslides, and Debris Flow					Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic					Medium
Severe Weather: Extreme Cold and Freeze					Medium
Severe Weather: Extreme Heat					High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Critical	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Medium	Low
Subsidence					Medium
Volcano					Low
Wildfire					High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

6.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

6.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 6.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 6-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

6.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 369's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility (a structure, infrastructure, equipment or service), that is adversely affected during a hazardous event may result in interruption of services and operations for the District at any time before, during and after the hazard event. A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials Facilities.***

Table 6-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 369's physical assets, valued at over $1.3 million, consist of the buildings and infrastructure to support the District's operations.

Table 6-4 RD 369 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Locke Ranch Ag Buildings and Infrastructure	Structures	$300K	Flood/Levee Failure
3 pumps (drinking water pump from well, pump water from river for fire protection/ irrigation, pump water from ditch to river during heavy rains)	Pumps	unknown	Flood/Levee Failure/ High Winds
Locke Property Orchards and Open Farmlands	Land	unknown	Flood/Levee Failure
Assets owned by others			
Levees	Levee	unknown	Flood/Levee Failure
Locke Town Assets: Residential and Commercial Buildings	Structures	$1M+	Flood/Levee Failure
Total		**$1.3+M**	

Source: RD 369

Natural Resources

RD 369 has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

According to the 2014 Lower Sacramento/Delta North Regional Flood Management Plan, this Region, which included RD 369, has significant natural resources such as: aquatic habitats, wetlands, riparian habitats, and wildlife foraging areas. Many of the more than 500 species of native plants and wildlife found in the Central Valley rely, to some extent, on habitat existing within the Region. Examples include the remnant riparian vegetation located along the banks of the Sacramento and American rivers, and along the tributaries of these major rivers. Agricultural areas within the Region also provide valuable habitat including wintering waterfowl within flooded rice fields and Swainson's hawk foraging habitat within alfalfa fields.

Also, within RD 369, the State of California operates the approximately 200 acre Delta Meadows State Park which contains valuable natural and habitat areas essential for many plant and wildlife species.

Historic and Cultural Resources

RD 369 has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

The Locke Historic District, which is comprised of the Town of Locke, was listed on the National Register of Historic Places on May 6,1971 and was further designated a National Historic Landmark District on December 14, 1990, due to its unique example of a historic Chinese American rural community.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

From its purchase in 1977, RD 369 was predominantly owned by one landowner, until its sell of the Town of Locke to the County in 2002 and its sale of approximately 200 acres to the State for the Delta Meadows State Park. The Town was later sold by the County to the residents that had been living in the town. Due to Lock's designation as a historic district, new development is not allowed. The District Planning Team notes that there has been no growth and/or development in the District in recent years with no planned development in the near future.

Development since 2016

No District facilities have been constructed since 2016.

Future Development

No future development is planned for RD 369. Development in the Town of Locke is limited due to its historic district designation. There are no known development plans for the remaining agricultural land and operations and state park. As such, a change in vulnerability is unlikely.

Future development in these areas generally parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

6.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 6-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.

- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

According to the District, power outages occur approximately 1-2 times per year and are generally associated with severe weather such as high wind events. The concern to RD 369 is when these power outages last for an extended period of time; the three pump stations do not have a backup power source.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E and SMUD), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan. RD 369's power is provided by SMUD. There have not been any PSPS events that have occurred in the Delta area affecting the District.

Earthquake: Liquefaction

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the County are rebuilt or leveed areas are dewatered, and the levees rebuilt. In Sacramento County, the Delta and areas of downtown Sacramento are at risk to liquefaction. The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand and silt in the levees and their foundations indicates that liquefaction is also a possibility.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquake liquefaction or other earthquake events that affected the District in any meaningful way.

There is no known history of earthquake liquefaction in the District. The recent Napa Earthquake in 2014 did not result in any damages to District Assets.

Vulnerability to and Impacts from Liquefaction

Earthquake is discussed in Chapter 4.3.9 of the Base Plan, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas. In Sacramento County, two of these areas have been identified: downtown Sacramento and the Delta area, which could lead to a possible collapse of delta levees and any above ground structures. While this levee failure differs from the levee failure discussion below which generally focuses on levee failure due to high water conditions or other types of structural failure, the resulting impacts would be similar and include

those related to a large flood event. Should the pump systems and levees fail, flooding could be significant throughout the District.

Assets at Risk

The levees, pump stations and residential and commercial structures in the Town of Locke are potentially at risk to an earthquake. All natural resources could be affected by flooding resulting from an earthquake event that caused failure of the levees or pump stations. Flooding destroys habitat and kills most terrestrial species present. The entire Locke Historic District is at risk to a damaging earthquake whether resulting from ground shaking alone or ground shaking combined with liquefaction. With much of the Town being constructed in the early 1900's, there is little protection against a damaging earthquake event.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–High

Hazard Profile and Problem Description

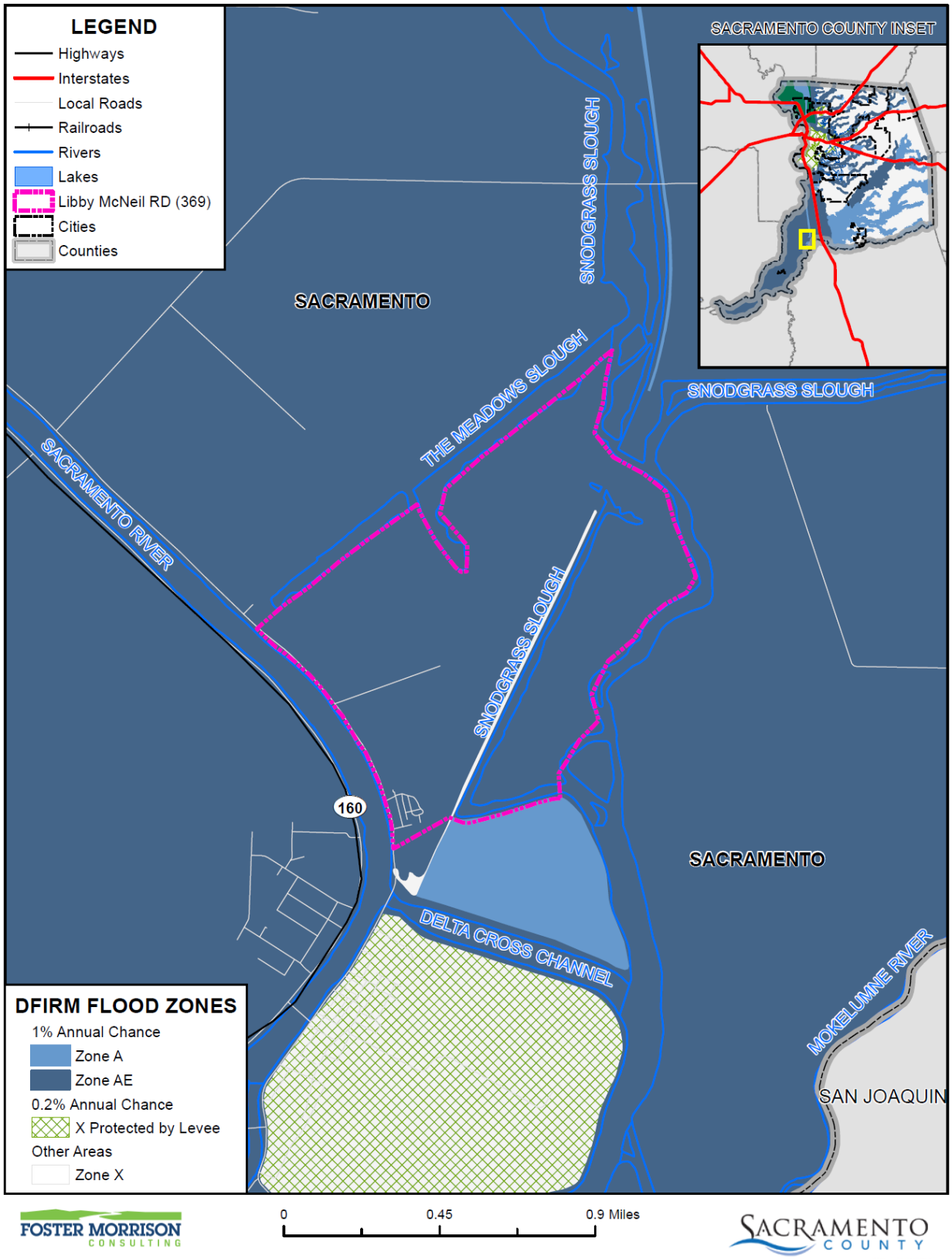
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding has occurred both within the 1% annual chance floodplains and in other localized areas.

Location and Extent

The RD 369 has areas located in the 1% annual chance floodplain. This is seen in Figure 6-2.

RD 369 is surrounded by numerous waterways, including the Sacramento River, the Delta Cross Channel, Snodgrass Slough and the Meadows waterway. Flooding of any of these waterways could cause problems for the District.

Figure 6-2 RD 369 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Libby McNeil Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 6-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 6-5 RD 369– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 6-6. These events also likely affected the District to some degree.

Table 6-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The District Planning Team noted that there has been no historic flooding to District lands since at least 1977 when Mr. Chu purchased the District land. The closet the District came to flooding was during historic flooding events that impacted other areas of the County, but did not cause significant flooding to RD 369. These events included the 1986 and the 1995/96 floods when nearby areas, such as Walnut Grove, were impacted, but the District was spared.

Vulnerability to and Impacts from Flood

The threat of flooding has been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County and RD 369. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Flooding of Delta islands also has the potential to negatively impact water quality both locally and statewide. The largest of California's drinking water sources is the Sacramento-San Joaquin Delta and its tributaries. The Delta provides water throughout the state via the State and Federal water projects. During a flood, there is a higher potential for the waters in the Delta to be exposed to chemicals, fuel, oil, and multiple other constituents of concern that can quickly degrade water quality. Flooding can also disturb soil and soil-borne materials such as mercury and organic matter that can degrade water quality.

Should a flood breach the levees, the entirety of the assets of RD 369 would be at risk. Levee failure is discussed later in this section. Flooding also causes erosion, which is also discussed later in this section.

Flooding of the Delta region can destroy habitat, kill terrestrial animals caught in the flood zones, and can entrain and strand large populations of fish species.

The entire Locke Historic District and RD 369 is at risk to damaging floods. One of the more significant vulnerability of people who live in the Town of Locke is the lack of affordable flood insurance; thus most residents are not covered. Should a large flood event occur, most residents would struggle to rebuild.

Assets at Risk

All of RD 369 is at risk to a significant flood event. Flooding of RD 369 could potentially impact the District owned assets, including agricultural operations, and the residential and commercial structures comprising the Town of Locke. Levee structures could also be damaged from flood waters and extensive flooding could create a life safety issue to area residents and visitors. The District Planning Team noted that if their pumps were damaged or failed during a flood, it would put the District at significant risk of substantial flooding.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

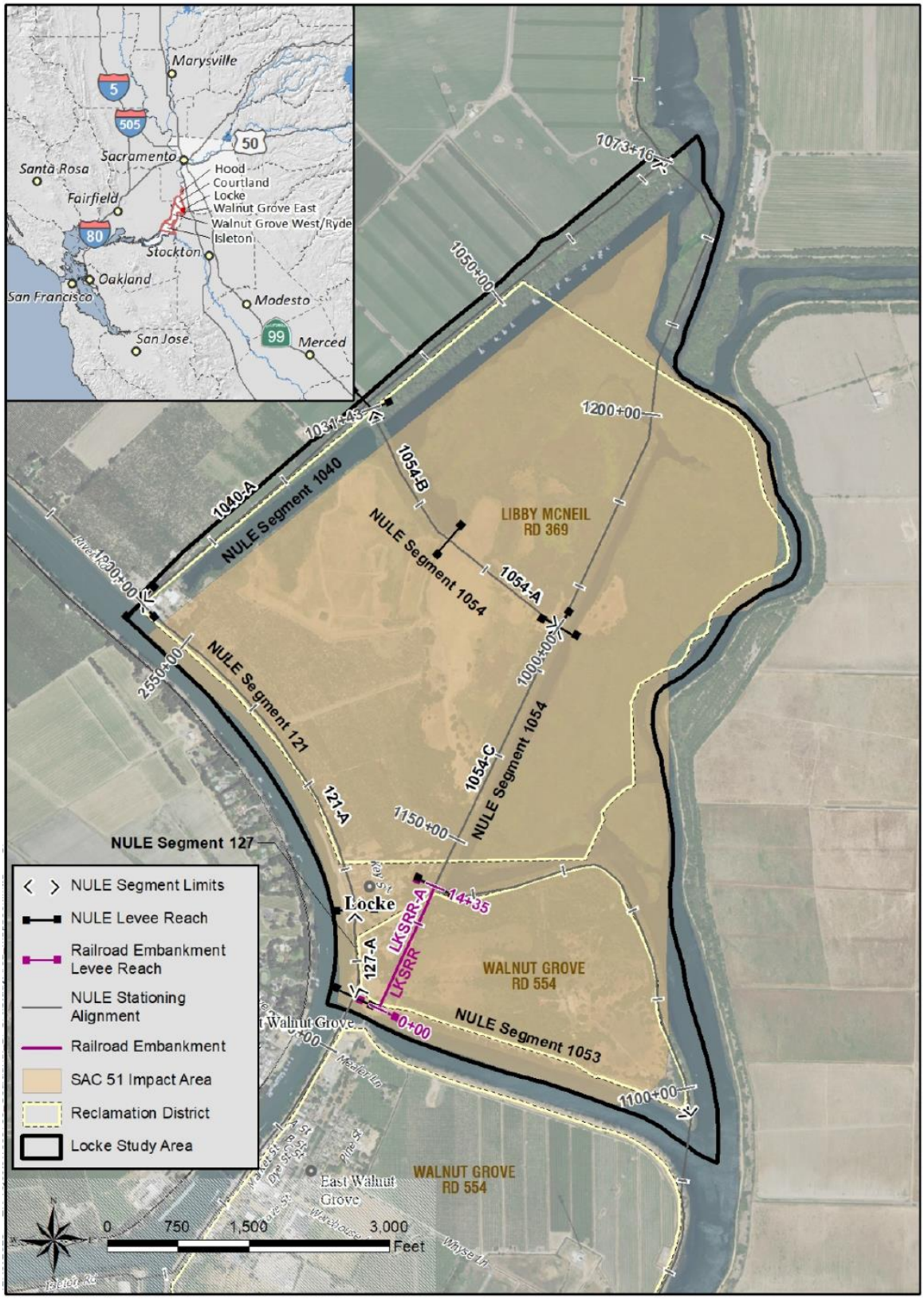
Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees.

Levees, which protect the tract of land known as Libby McNeil where the Delta Legacy Community of Locke is located, are primarily maintained by Reclamation District (RD) 369. The levees downstream from

the community of Locke are located on the tract of land known as Walnut Grove and are maintained by RD 554. In total, the collective Locke study area is protected by nearly 5.25 miles of levees which provide protection from flows in the Sacramento River on the west, Delta Meadows Slough to the north (maintained by RD 551 – Pearson District), and Snodgrass Slough to the east. Levees in the District are shown on Figure 6-3.

Figure 6-3 RD 369 – Levee Protected Areas



Source: RD 369

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures.

The District Planning Team noted that there have been no levee failures of RD 369 during his ownership since 1977. The District did indicate that the closest issues with levees have occurred in Walnut Grove.

However, in early 2021, during CA DWR bi-annual inspections, a small hole was found in the waterside of the River Road area levee as a result of a fallen tree. Engineers identified the issue and recommended repairs at a cost of $10,000.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

The majority of the levees surrounding Locke and maintained by RD 369 were initially constructed prior to 1906 by local interests and were generally built using materials dredged from the adjacent Sacramento River and the nearby adjoining Snodgrass Slough to the east, and Delta Meadows Slough to the north. Over time, various improvements have been made to the levees located along the left bank of the Sacramento River and they are now considered part of the State and federally-authorized Sacramento River Flood Control Project (SRFCP) and are now part of State Plan of Flood Control (SPFC) levees. The levees on the east and north sides of RD 369 adjoining Snodgrass Slough, Delta Meadows, and the Delta Cross Channel have also been improved over time but are not considered part of the federally and state authorized SRFCP nor a portion of the SPFC levee system. Based on levee accreditation requirements and updated DFIRMs mapping the District into the SFHA, the RD 369 levees do not provide a 100-year level of flood protection.

The town of Locke is located within the boundaries of RD 369, and a levee breach of the SPFC levees on the left bank of the Sacramento River within RD 369 or the northerly portion of RD 554 would very likely result in the inundation of RD 369 and the town of Locke.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Other vulnerabilities and impacts from a levee failure include those discussed in the Flood section above.

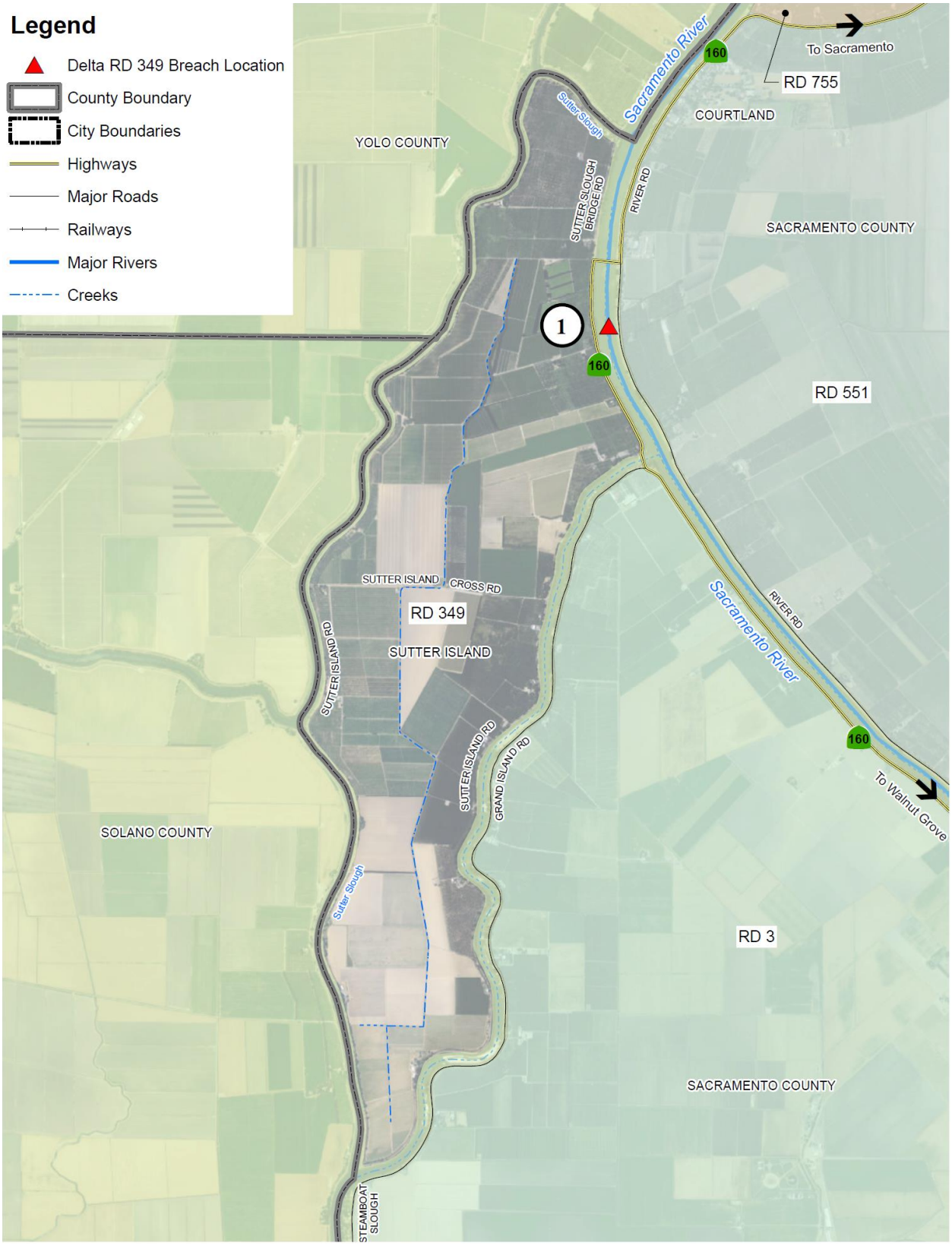
StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected

neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

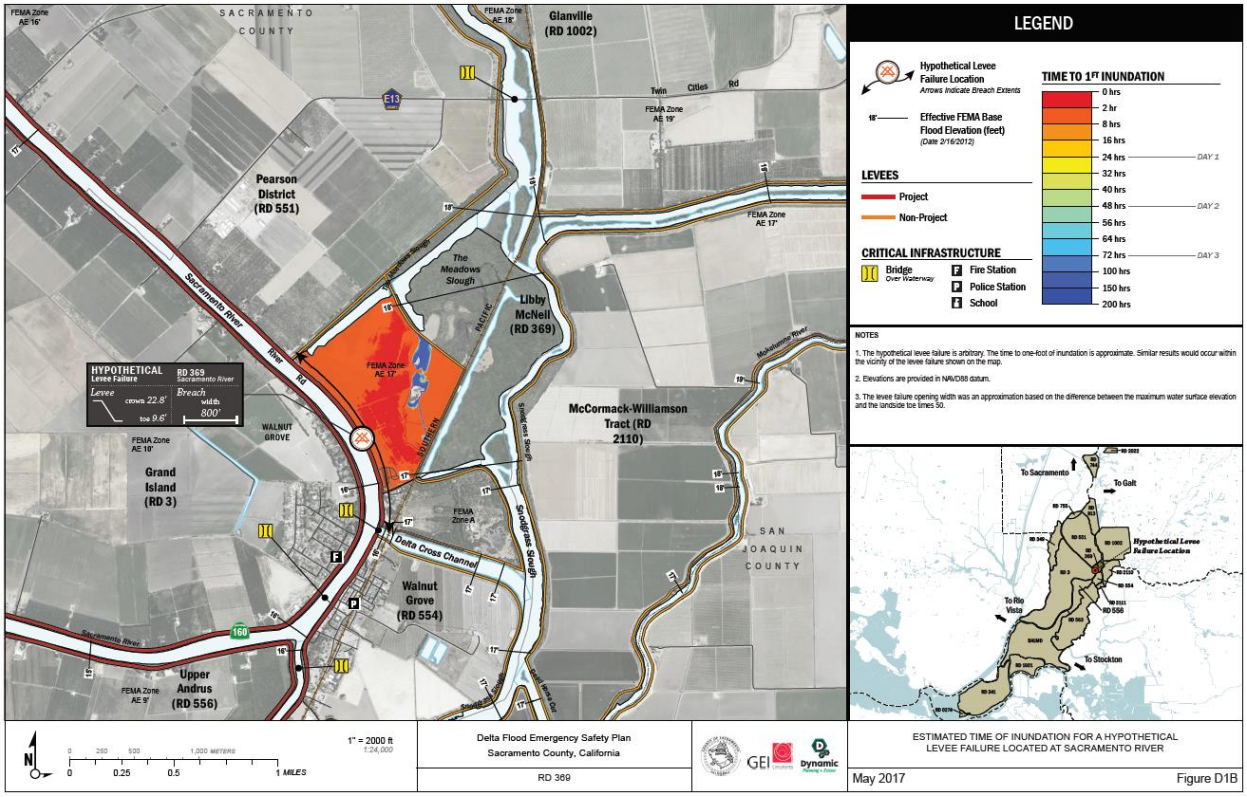
For RD 369, Figure 6-4 details the locations in the Delta within RD 369 where flooding could occur. The red triangles denote potential levee breach locations. RD 369 has a potential levee break scenario. Maps regarding time to one foot inundation (Figure 6-5), estimated flood depths (Figure 6-6), and suggested evacuation routes (Figure 6-7) are displayed below.

Figure 6-4 RD 369 – Potential Levee Breach Location



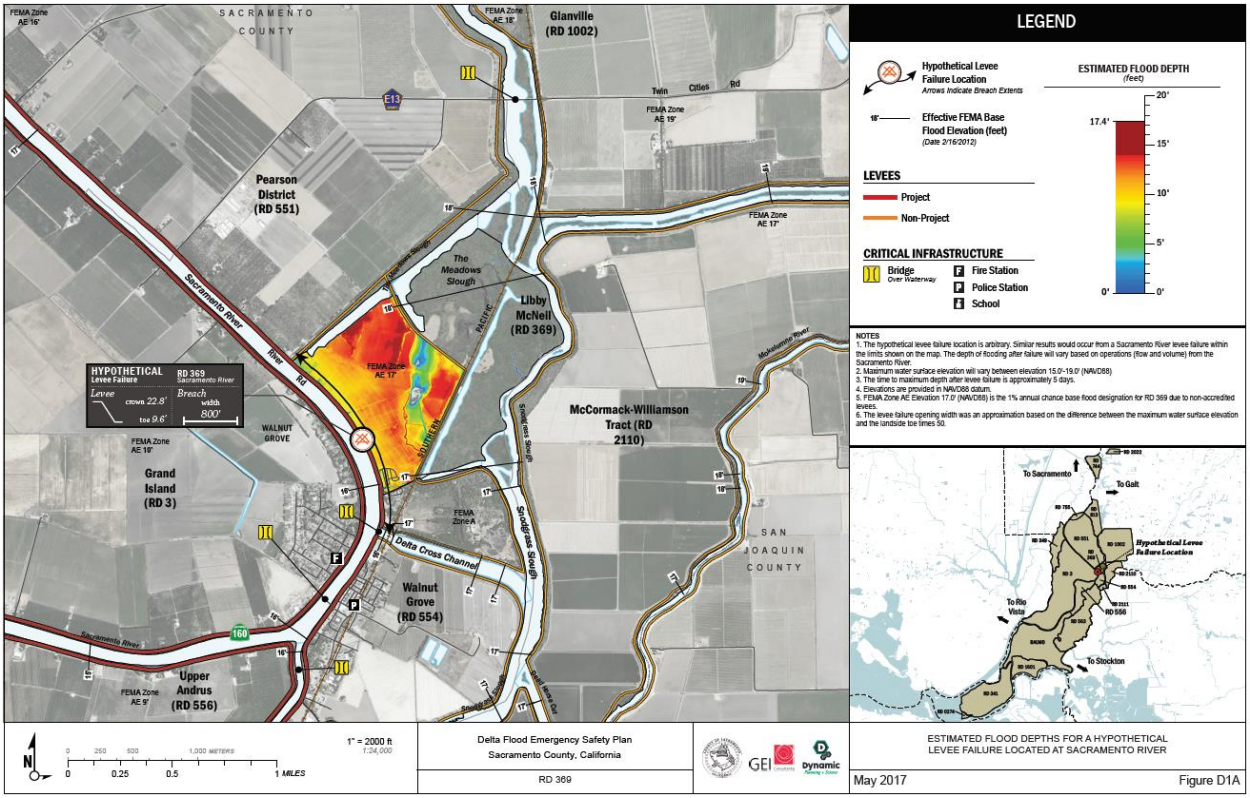
Source: Sacramento County Storm Ready – retrieved March 26, 2021

Figure 6-5 RD 369 – Time to One Foot Inundation after Levee Breach



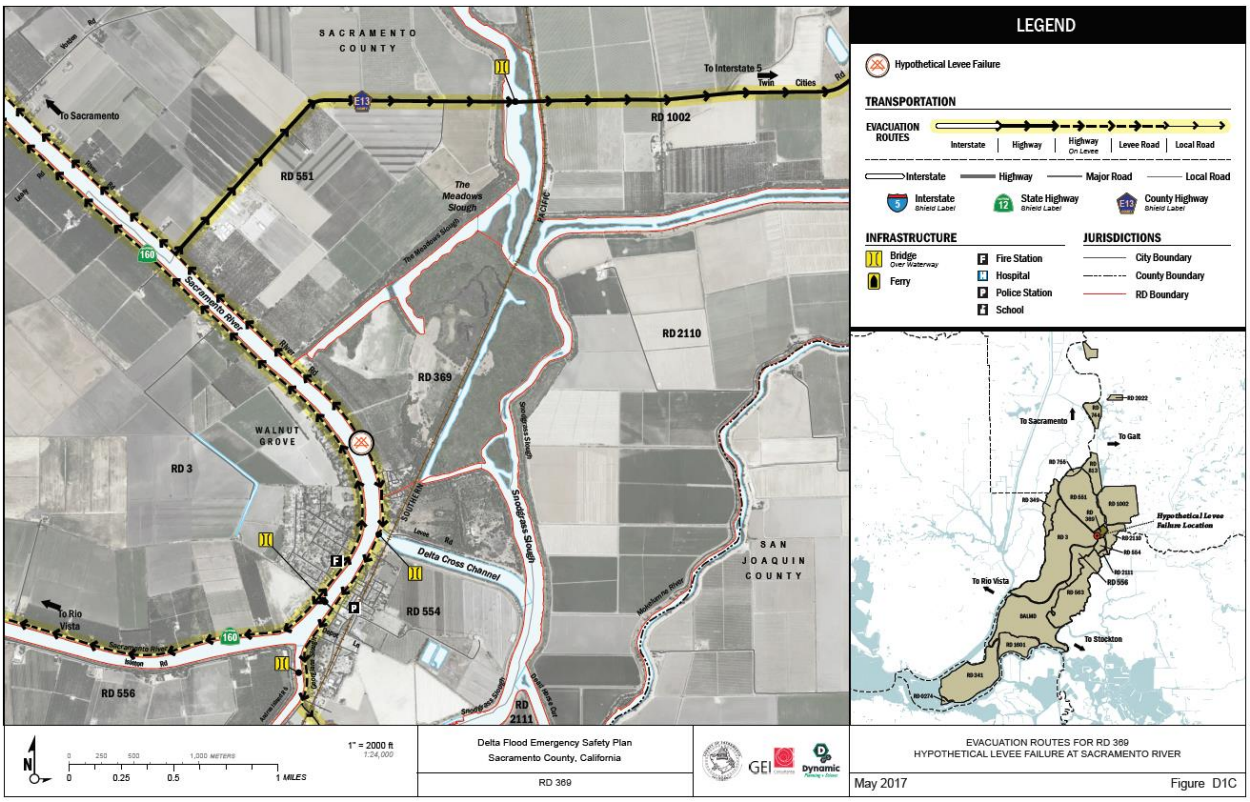
Source: Sacramento County Storm Ready – retrieved March 26, 2021

Figure 6-6 RD 369 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 26, 2021

Figure 6-7 RD 369 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 26, 2021

Assets at Risk

All of RD 369 is at risk to a significant flood event. Flooding of RD 369 could potentially impact the District owned assets, including agricultural operations, and the residential and commercial structures comprising the Town of Locke. Levee structures could also be damaged from flood waters and extensive flooding could create a life safety issue to area residents and visitors. The District Planning Team noted that if their pumps were damaged or failed during a flood, it would put the District at significant risk of substantial flooding.

Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species. Should a levee failure occur, the Locke Historic District would also be at risk.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur

each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

The following most notable, severe weather events in the Delta area were identified:

- 1986 – Due to the extreme storm event, multiple days of heavy rain, strong winds from extreme low pressure gradients, high tides and runoff affecting the entire Sacramento-San Joaquin Delta.
- 1997 – A series of large storms that produced heavy rain and high winds caused heavy runoff and high tide conditions that impacted the entire Sacramento – San Joaquin Delta region.

However, there were no identified damages to RD 369 from these events.

While precipitation occurs on an annual basis and three state and federal disaster declarations related to heavy rains and storms as well as flooding, occurred in Sacramento County in 2017, RD 369 has not experienced any notable damages from these events.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations that help alleviate flooding. More information on power shortage and failure can be found in the at the beginning of Section 4.5.3 above, as well as in Section 4.3.3 of the Base Plan.

District specific vulnerabilities and impacts also include those identified above in the flood and levee sections as a levee failure resulting from severe weather would be significant. It should be noted that the County conducts levee patrols during heavy rain events to identify any potential issues with levee integrity.

Assets at Risk

Heavy rain and thunderstorms are the most frequent type of severe weather occurrence in the area. Wind and lightning often accompany these storms and have caused damage in the past. Problems associated with the primary effects of severe weather include flooding, pavement deterioration, washouts, high water crossings, and downed trees. However, it is the secondary effects of heavy rain and storms that are of concern to RD 369. Heavy rains can cause flooding, levee failure, and stream bank erosion. The District noted that in the past when the system starts to become overwhelmed due to heavy rains, additional, temporary pumps have been brought in to assist. All District assets and the Town of Locke are all potentially at risk to these severe weather events.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Highly Likely
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the Delta area of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

The following high wind events were noted within the Delta area:

- 1986 – Due to the extreme storm event, multiple days of heavy rain, strong winds from extreme low pressure gradients, high tides and runoff affecting the entire Sacramento-San Joaquin Delta.
- 1997 – A series of large storms that produced heavy rain and high winds caused heavy runoff and high tide conditions that impacted the entire Sacramento – San Joaquin Delta region.

In addition to these two events that also caused significant flooding and levee issues throughout the Sacramento County Planning Area, RD 369 noted that high wind events occur on an annual basis, but no specific events resulting in damages could be recalled. The District did note that they tend to lose power 1-2 times a year, usually associated with severe wind events.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Erosion impacts to levees from wave action
- Failure of the pump systems
- Occasional building damage, primarily to roofs

The District Planning Team noted that the entire levee systems are at risk from wind. Extended power outages are also a concern as none of the pump systems have a source of backup power. Other district assets may also be at risk depending on severity of wind event. The District Planning Team noted that all

District assets, including natural resources are at risk if wind contributed to a levee failure in the District. The entire Locke Historic District is also potentially at risk to damaging winds.

6.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

6.6.1. Regulatory Mitigation Capabilities

Table 6-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 369.

Table 6-7 RD 369 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	N	
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	Y	KSN is currently developing a flood safety plan for RD 369.
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Draft Flood Risk Reduction Feasibility Study for Delta Legacy Community of Locke, CA
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: Follows County Code
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	

Land Use Planning and Ordinances	Y/N	Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	Y	Covered by the unincorporated County DFIRMs.
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	Y	While not a formal District program, CA DWR conducts semi-annual levee inspections of levee conditions.
Other	Y	Improvements near levees: Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database.
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. RD 369 needs to identify viable funding mechanisms to assist in the evaluation/development/implementation of hazard related studies and plans.		

Source: RD 369

6.6.2. Administrative/Technical Mitigation Capabilities

Table 6-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in INSERT.

Table 6-8 RD 369's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	Y	Established for this plan

Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	A vegetation maintenance program is in place for the levees. This involves using goats to eat down the weeds and spraying the vegetation twice annually.
Mutual aid agreements	Y	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	N	
Community Planner	N	
Civil Engineer	N	
GIS Coordinator	N	
Other	Y	Mr. Clarence Chu is the General Manager and one of three board members for RD 369. Other O & M support is contracted out as needed.
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	N	
Hazard data and information	N	
Grant writing	N	
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
RD 369 needs to identify viable funding mechanisms to assist in the ability to hire contract staff more regularly for O&M purposes and to be able to address levee issues as they come up. For example, the hole in the levee discovered during a CA DWR inspection has not been fixed due to lack of District funding.		

Source: RD 369

6.6.3. Fiscal Mitigation Capabilities

Table 6-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 6-9 RD 369's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Impact fees for new development	N	
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	Y	
State funding programs	Y	
Other		
How can these capabilities be expanded and improved to reduce risk?		
RD 369 needs to identify viable funding mechanisms to assist in all aspects of levee ownership, including operations and maintenance. With only 20+ households located in the District, most of fixed or low income, the District has not wanted to burden the residents with any additional fees.		

Source: RD 369

6.6.4. Mitigation Education, Outreach, and Partnerships

Table 6-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 6-10 RD 369's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Outreach is done as conducted by the County and during other local projects such as for the Delta Small Communities project which covers Locke
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other	Y	Most hazard related outreach to those who live in the Town of Locke is conducted on an informal basis as part of living in the Locke community.

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
How can these capabilities be expanded and improved to reduce risk?		
RD 369 needs to identify viable funding mechanisms to be able to support any additional outreach to local residents.		

Source: RD 369

6.6.5. Other Mitigation Efforts

The District has ongoing mitigation efforts that include the following:

The District is responsible for levee maintenance. The District uses goats to maintain the vegetation on the levees. The District also sprays the vegetation semi-annually for additional vegetation control.

6.7 Mitigation Strategy

6.7.1. Mitigation Goals and Objectives

The RD 369 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

6.7.2. Mitigation Actions

The planning team for the RD 369 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Earthquake Liquefaction
- Floods: 1%/0.2% annual chance
- Levee Failure
- Severe Weather: Heavy Rains and Storms
- Severe Weather: Wind and Tornado

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to

implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Backup Power Project

Hazards Addressed: Multi-hazard: Earthquake Liquefaction; Flood, Levee Failure; Severe Weather: Heavy Rains and Storms and Wind and Tornadoes

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to provide backup power to Reclamation District 369 facilities when power goes out. This primarily affects the District pumps.

Project Description: The District would like to ensure continued operation of District infrastructure during a Power Outage through obtaining backup power generators, quick connects, and associated electrical improvements or other backup power options. The project would design and install main disconnect systems to allow for safe use of generators as needed during a power shutoff or power failure. The project would include one generator per district and improvements for disconnect systems for each pump station.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: None

Responsible Office/Partners: RD 369

Project Priority: High

Cost Estimate: $200,000

Benefits (Losses Avoided): Preservation of 369 levee structures, Life Safety, Property Protection, Ecosystem Restoration and Habitat Enhancement Component, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: State – Delta Flood Emergency Response Grant Program, FEMA Grant Programs, Small Communities project implementation funding

Timeline: 1-10 years depending on regulatory process

Action 2. Flood Safety Plan Updates, Training, and Exercises

Hazards Addressed: Earthquake Liquefaction; Flood: Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to develop/update RD 369's Flood Safety Plan, participate in training, and to exercise the flood safety plan to ensure it can successfully be implemented.

Project Description: The District would like to ensure continued training of staff, board members, and agents with response functions with regards to flood fighting and associated activities. Developing/updating RD 369's Flood Safety Plan is essential to continue to protect infrastructure protected by the district's levees. The Emergency Operations Plan provides guidance on how the District will organize, coordinate with outside partners, flood fight, dewater, recover, and serves as a planning document for future flood fight operations.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: California Water Code Section 9650-51 (AB156), Central Valley Flood Protection Plan's emergency preparedness priority, the Districts Flood Safety Plan

Responsible Office/Partners: RD 369, Sacramento County

Project Priority: High

Cost Estimate: $100,000

Benefits (Losses Avoided): Life Safety, Property Protection, Preservation of 369 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: State – Delta Flood Emergency Response Grant Program, FEMA Grant Programs

Timeline: 1-10 years depending on regulatory process

Action 3. Small Communities Plans - flood protection - structural and nonstructural mitigation

Hazards Addressed: Earthquake Liquefaction; Flood: Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The Sacramento County communities of Locke located within RD 369 is subject to potential catastrophic flooding should a levee breach or other major flooding occur. As part of CA DWR flood protection programs, Sacramento County, on behalf of Locke, obtained a grant, under Phase I of this program to assess and evaluate levee and flood risk in each of these communities. Phase 2 will involve implementation and construction of structural and nonstructural mitigation projects identified during Phase I.

Project Description: The Small Communities projects will contain many levee and flood management improvement actions that the County, in conjunction with RD 369, and other agencies that will work to improve levee integrity and otherwise manage the flood risk to potential reduce flood related losses. These

projects include but are not limited to the following structural and nonstructural project types: system-wide flood control projects, levee improvements, geotechnical remediation, environmental enhancement projects, operation and maintenance improvements, structure raising, ring levees, cross levees, fixing of perimeter levees, crown raising, Zone D designations, seepage repair and protection, erosion/bank/slope protection, vegetation maintenance and removal, encroachment modification, flood insurance program enhancements, and others. Currently construction of a cross levee is currently a favored alternative for structural mitigation for RD 369, but that can change and also may be combined with other structural and non-structural mitigation actions as detailed in the Draft Flood Risk Reduction Report for Locke.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Small Communities Projects for Town of Locke

Responsible Office/Partners: RD 369, Sacramento County, CA DWR, USACE, other partners

Project Priority: High

Cost Estimate: Phase I of the Small Communities projects were $500,000/community. Phase 2 Construction Costs will be included in Phase 1 when completed. Construction of a cross levee is estimated around $4M. Other costs are detailed in the plan.

Benefits (Losses Avoided): Expected annual damages, based on levee fragility analysis described in the Flood Risk Reduction Plan 2021, are about $360K per year. Life Safety, Property Protection, Preservation of 369 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: CA DWR, FEMA hazard mitigation, the Army Corps of Engineers

Timeline: 2021 and ongoing

Delta Annex Chapter 7 Reclamation District 551

7.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 551 (RD 551), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 551, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

7.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 7-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 7-1 RD 551 – Planning Team

Name	Position/Title	How Participated
Topper Van Loben Sels	President	Evaluated District issues and developed solutions
Doug Chan	Trustee	Evaluated District issues and developed solutions
Kurt Jonson	Trustee	Evaluated District issues and developed solutions
Gilbert Cosio/MBK	District Engineer	Evaluated District issues and developed solutions

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 7-2.

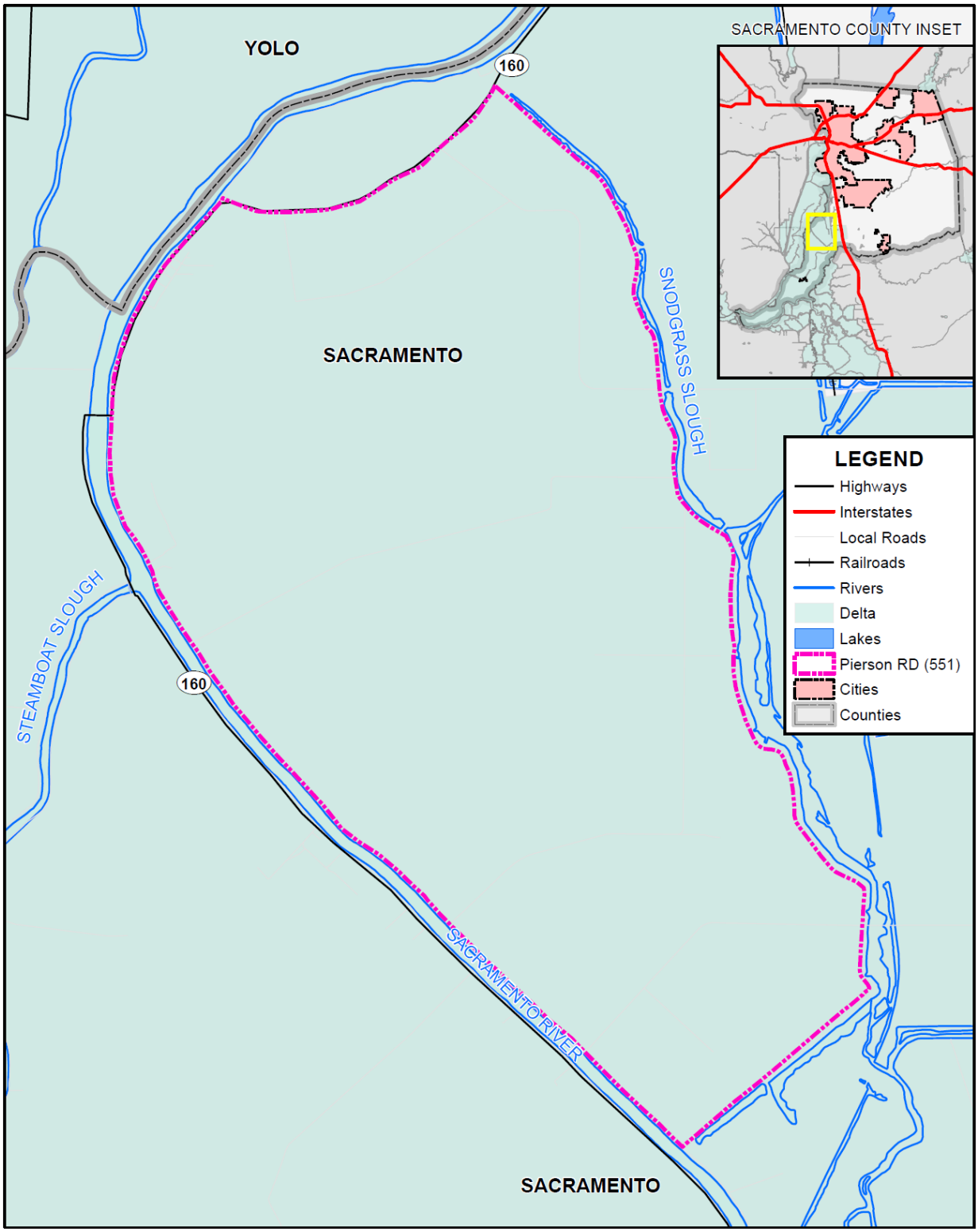
Table 7-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
N/A	No mitigation related planning mechanisms have been completed since 2016.

7.3 District Profile

The District profile for the RD 551 is detailed in the following sections. Figure 7-1 displays a map and the location of the District within Sacramento County.

Figure 7-1 RD 551



Data Source: Pierson Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

7.3.1. Overview and Background

Reclamation District No. 551, Pearson District (District), is the local public entity that provides flood protection in the form of levee maintenance and drainage to the landowners of Pearson District. The District operates and maintains all the levees that protect the landowners. As described in Division of Water Resources, (currently known as Department of Water Resources) Bulletin No. 37, published in 1930, the District is described as protecting 8,800 gross acres, with a net protected area of 8,537 acres, within Sacramento County.

The District originally built the project levee along the Sacramento River (6.85 miles); USACE, under authority of the SRFCP, rebuilt portions of the levee. This is the levee recognized by both the state and federal governments as the primary flood protection levee, as part of the SRFCP. The District built the non-project levee along Snodgrass Slough (5.91 miles) to its present design in the 1920s. There are also 1.37 miles of non-project cross levee, adjacent to the Delta Meadows State Park.

The District does not supply water, which is the responsibility of the individual landowners; however, the District maintains 37.97 miles of canals and ditches that provide drainage to the property owners. These ditches and canals are fed by farmer ditches, which are designed by the landowner to drain their property adequately. Once the drain water enters the District's ditches and canals, water is removed at pumping plants located at one location on Pearson District.

Land use is predominantly agricultural, aside from the small town of Courtland. Orchards (including pears, apples, and cherries), vineyards, alfalfa, grain, and miscellaneous row crops are the primary crops. The historic town of Courtland is the largest residential area on the District. There are an estimated 636 residents within the District. Courtland has a sewage treatment plant operated by Sacramento County. Two large fruit packing operations are located within the protected area of the District. There are public roads running along the entire length of the Sacramento River levee.

The District has no major land use changes, although there are statewide planning efforts that if carried out could require major land use changes, affecting all aspects of the District operation and maintenance of the levee and drainage system. The District is currently in the process of annexing adjacent Reclamation District 755.

Interior ground elevations slope toward the center of the District. Interior ground elevations range from 12 feet (toe of Sacramento River levee) to -12 NGVD within the District interior. Top of levee elevations range from 19.0 to 27.5 feet national geodetic vertical datum (NGVD) along the non-project back levee, and 24.9 to 26.2 feet NGVD along the project levee (left bank of Sacramento River). The low elevation of 19.0 on the non-project levee is located at Lambert Road, still over 2.0 feet above the 100-year flood elevation. Except for this and two other road crossings, the non-project levee generally has over 6 feet of freeboard above the 100-year flood elevation.

Reclamation is one of the first forms of public improvement in California, with the early focus on reclaiming "swamp and overflowed" lands granted to the state under the Federal 1850 Arkansas Act. The term

reclamation primarily encompasses flood control and drainage, but has also long included irrigation.[1] To help local landowners reclaim the swamp and overflowed lands, the state adopted a series of statutes authorizing them to form local reclamation and levee districts. The area of a proposed district was outlined in a formation petition presented to a state or county board, which would order a district to be formed after a majority vote of the affected landowners. Beginning in 1861, the Board of Swamp Land Commissioners issued the orders organizing reclamation and levee districts. Beginning in 1867, districts were organized under the Green Act by county boards of supervisors. (Stats. 1867-8, c. 415.) A few reclamation districts were also created by special act of the legislature. (See, e.g., Stats. 1911, c. 100 (RD 900).) Regardless of how they were formed, reclamation districts now operate under Water Code Division 15, § 50000 et seq., and levee districts under Division 19, § 70000 et seq. (See also Stats. 1911, c. 100, § 2.)

As reclamation districts were formed under the above noted laws, they were given numbers sequentially. Pearson District formed in 1893, and was given the number "551." The area protected by the District has remained the same for essentially the entire time of its existence.

Starting in the 1940s, USACE improved the Sacramento River levee is a flood control structure to meet the federal design standard. To satisfy the conditions of federal involvement in such projects, the Central Valley Flood Protection Board (CVFPB) agreed to operate and maintain the Sacramento River levee. USACE transferred the District levee, as part of Unit No. 111, completely over to CVFPB, formerly the State Reclamation Board, in September 1955. Under Section 8618 of the Water Code, reclamation districts are authorized to establish agreements with the CVFPB to perform these actions for the state. The District is required to maintain and operate the levees to meet the standards as listed in the Supplemental Operation and Maintenance Manual.

7.4 Hazard Identification

RD 551 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 7-3).

[1] Hershey v. Reclamation Dist. No. 108, 200 Cal. 550, 567-68 (1927).

Table 7-3 RD 551—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Occasional	Limited	Low	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Extensive	Occasional	Critical	Low	High
Earthquake	Extensive	Occasional	Limited	Low	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Low	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Significant	Likely	Critical	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Significant	Likely	Critical	High	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Limited	Low	Low
Subsidence	Significant	Likely	Limited	Low	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Limited	Unlikely	Negligible	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

7.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

7.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 7.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 7-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

7.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

The District protects the town of Courtland. The total population within the District is approximately 700 with approximately 173 residential structures with a depreciated value of $54 million.

The District has approximately 8,436 acres dedicated to agriculture. The District supports a mixture of permanent crops such as orchards and vineyards, row crops, grain, and pasture. The total value of this is estimated to be $50 million.

Additionally, the District supports critical infrastructure that includes State Highway 160 as well as County roads, a ferry, local bridges, schools, fire station, water wells, gas wells, and communication tower

Assets at Risk and Critical Facilities

This section considers the RD 551's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 7-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 551's physical assets, valued at over $290 million, consist of the buildings and infrastructure to support the District's operations.

Table 7-4 RD 551 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Pumps – Snodgrass Slough	Drain Pumps	$3,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Pumps – Lake	Drain Pumps	$2,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
District Owned Facilities	Home, Buildings & Equipment	$3,000,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Levees	Flood Control System	282,600,000	Floods, Levee Failure, Severe Weather: Heavy Rain and Storms
Total		**$290,600,000**	

Source: RD 551

Natural Resources

RD 551 has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan. In the past, RD 551 has protected a number of natural gas wells. Currently, there are no wells in operation on Pearson District. RD551's levees support vegetation that provide fish and wildlife habitat. Agricultural ground and ditches also support wildlife.

Historic and Cultural Resources

RD 551 has a variety of historic and cultural resources of value to the District. These historic and cultural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan. Since the land has been settled for over 150 years, there are many historic structures on Pearson District.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Pearson District is within the Primary Zone of the Delta. Therefore, in addition to Sacramento County, development is controlled by a State agency, the Delta Protection Commission. Therefore, there is little, if any, potential for growth beyond that allowed by agricultural zoning.

Development since 2016

No District facilities have been constructed since 2016. As such, vulnerability to the District is unchanged.

Future Development

Future development in these areas generally parallels that of the Sacramento County Planning Area. More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan. Pearson District is within the Primary Zone of the Delta. Therefore, in addition to Sacramento County, development is controlled by a State agency, the Delta Protection Commission. Therefore, there is little, if any, potential for growth beyond that allowed by agricultural zoning. None of these planned repairs listed in Table 7-5 are intended to induce growth due to land use regulations.

Table 7-5 RD 551 Proposed Maintenance and Improvement Projects

Proposed Projects	Levee Segment
2017 Storm Damage, Waterside Erosion Repairs	Sacramento River
Remediate unacceptable items listed in the USACE PIR (2013)	Sacramento River
Interior Drainage Improvements	Sacramento River and Snodgrass Slough

7.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 7-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

The District is not located within an area that is subject to a PSPS and has not been affected by any activity.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

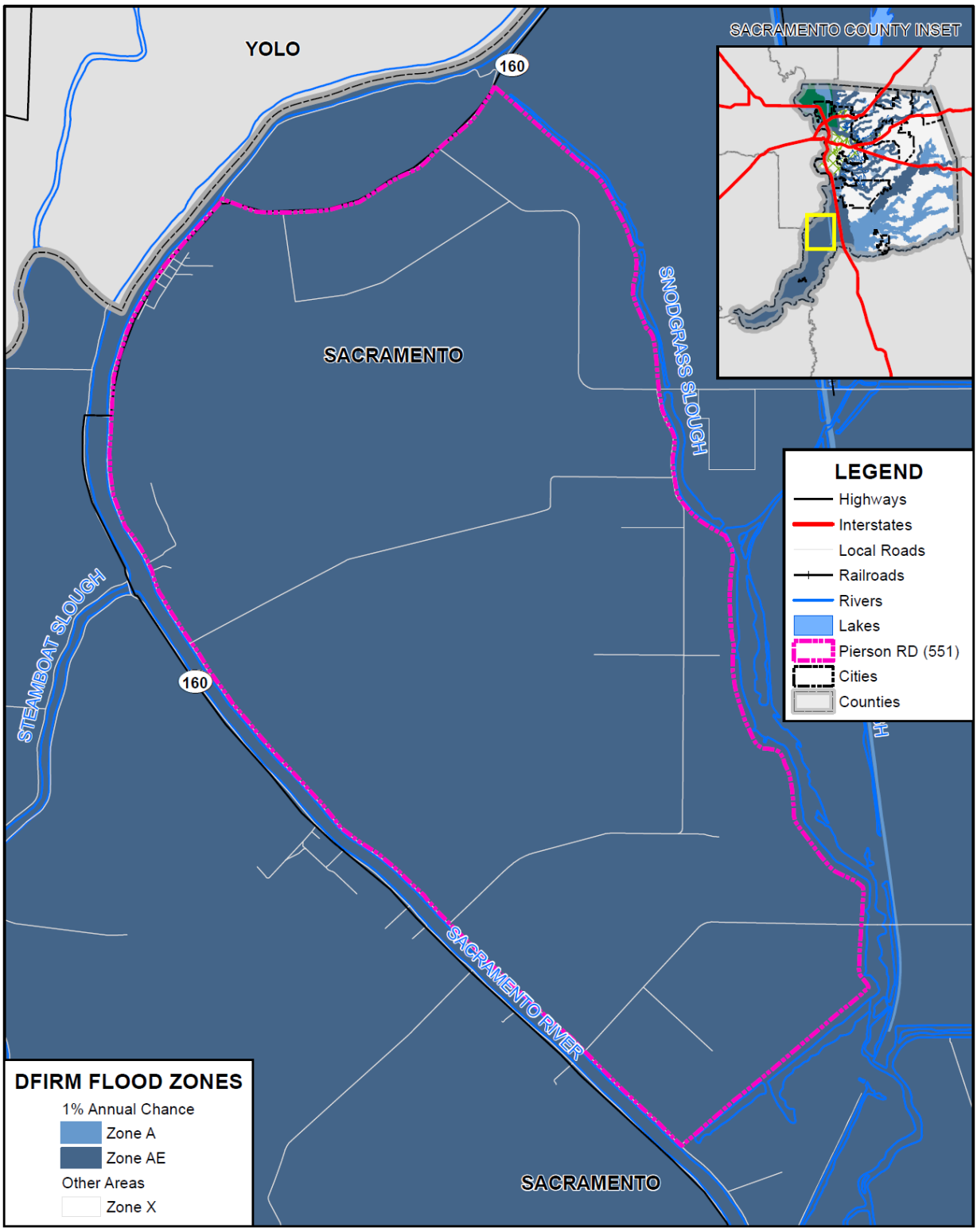
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage. Flooding on the Sacramento River has threatened the levees of RD 551 in the past. Flooding inside the leveed area would occur as a result of levee failure or overtopping. The flood elevations around Pearson District exceed the elevation of almost every acre of ground protected by RD 551 levees. Therefore, a levee breach under flood conditions would be catastrophic to the landowners. In addition, the Pearson District levees are not certified to protect against the 100-year flood.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the RD 551 have been subject to historical flooding.

Location and Extent

The RD 551 has areas located in the 1% annual chance floodplain. This is seen in Figure 7-2.

Figure 7-2 RD 551 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Pierson Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 7-6 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 7-6 RD 551– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	
X (unshaded)	Areas outside of the flood zone	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 7-7. These events also likely affected the District to some degree.

Table 7-7 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Past river floods, most recently in 1986, 1997/1998, 2006 and 2017, have damaged the RD 551 levees in the form of erosion. Some of this erosion was repaired by RD 551 under flood fight conditions. Restoration erosion repair has typically been performed by the Corps of Engineers as authorized under PL 84-99. Repair work under PL 84-99 was performed by the Corps of Engineers on Pearson District levees following the recent floods of 1986, 1997, 1998, and 2006. Erosion experienced in other years was repaired by RD 551. The District temporarily lost eligibility in the PL84-99 program but is in the process to regain eligibility through the preparation and execution of a Systemwide Improvement Framework (SWIF). The District is now eligible to receive repair and recovery assistance from the Corps of Engineers in the event of a levee failure.

Past floods, as previously listed, have also required flood fighting by RD 551. This flooding fighting has consisted of seepage control and emergency erosion repair. Seepage control is critical in levee breach prevention. The levees and levee foundations of Pearson District are very porous and subject to flood water seeping through, and under, the levee. If left uncontrolled, this seepage could accelerate to the point that it has the force to move levee material. This phenomenon is called piping, or internal erosion of the levee. Once enough material is moved out of the levee section, a levee breach occurs.

Most recently, high water events in 2017 and 2019 have resulted in considerable waterside erosion and exacerbated sites that have experienced erosion over time throughout the District levees.

The flood event of 2017 also resulted in increased vegetation removal, levee patrols, and pumping costs.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

Should a flood breach the levees, the entirety of the assets of RD 551 would be at risk. These assets include the small community of Courtland. All of the RD 551551 drain pumps would be flooded and therefore, RD 551 could not drain the flooded areas with their existing pumps; auxiliary pumps would have to be brought in. A flood event could also deteriorate the District levees on waterside slopes causing significant erosion as seen in the aftermath of the 2017 event. If a breach were to occur, the levees could experience erosion on the landside slopes from wave wash.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

During high rainfall events, the drainage system is not capable to evacuate water from the interior of Pearson District without flooding some low lying properties. On properties that farm annual row crops, this is not a problem since crops are not normally planted until after the rainy season. However, winter wheat, perennial, or multi-year crops are susceptible to damage when water overflows the banks of the drain canals.

Location and Extent

The RD 551 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted the following past occurrences of localized flooding: The storm event of 2017 resulted in localized flooding in the center of the District in low areas adjacent to State Highway 220 and Poverty Road. These areas are mostly row crops, but recently permanent orchards have been established in historically wet areas on the District and may be lost in a localized flooding event depending on the floodwater residency time.

Stormwater flooding occurs every few years. In most years, it is not significant enough to be a problem. For the most part, past flooding has damaged alfalfa and winter wheat. However, past floods have damaged county roads. In addition, many acres of vineyards and orchards have been planted in the past few years, so it is anticipated that these recently planted permanent crops may be damaged by future canal bank flooding.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

As stated above, stormwater flooding has the potential to result in significant damage due to the increased acreage of permanent crops. In addition, residences in the lower elevations of Courtland are at risk.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

During high rainfall events, the drainage system is not capable of evacuating water from the interior of Pearson District without flooding some low lying properties. On properties that farm annual row crops, this is not a problem since crops are not normally planted until after the rainy season. However, winter wheat, perennial, or multi-year crops are susceptible to damage when water overflows the banks of the drain canals.

Assets at Risk

As stated above, stormwater flooding has the potential to result in significant damage due to the increased acreage of permanent crops. Stormwater flooding can result in losses of less flood resistant crops planted at low elevations. Depending on timing and severity of flooding, some permanent crops will be lost and require reestablishment. Reestablishing a vineyard or orchard can take 5 years or more before there is a harvestable crop.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a

narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees.

To reduce the risk of flooding the District is planning to perform the repairs listed in Table 7-5 to reduce the likelihood of levee failure.

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures. The RD 551 levees have not failed in over 100 years. Two floods over the past few decades (1986 & 1997) required extensive flood fighting by RD 551 forces in order to prevent a levee breach.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

A levee failure would impact almost all the assets and critical facilities on Pearson District; including the small community of Courtland. State Highways 160, as well as a number of county roads are at risk. Approximately 8,000 of agricultural land would be damaged and possibly rendered unfarmable for at least a year. There are many permanent crops on Pearson District, such as wine grapes, pears, apples and cherries that would be destroyed. If a breach were to occur within the levees fronting the towns or areas north, there could be a potential loss of life due to limited evacuation time and disruptions in evacuation routes.

A levee failure and subsequent flooding on Reclamation District 551 could result in large wave fetch that could damage the interior slopes of the District's levee system as well as those of adjacent Districts.

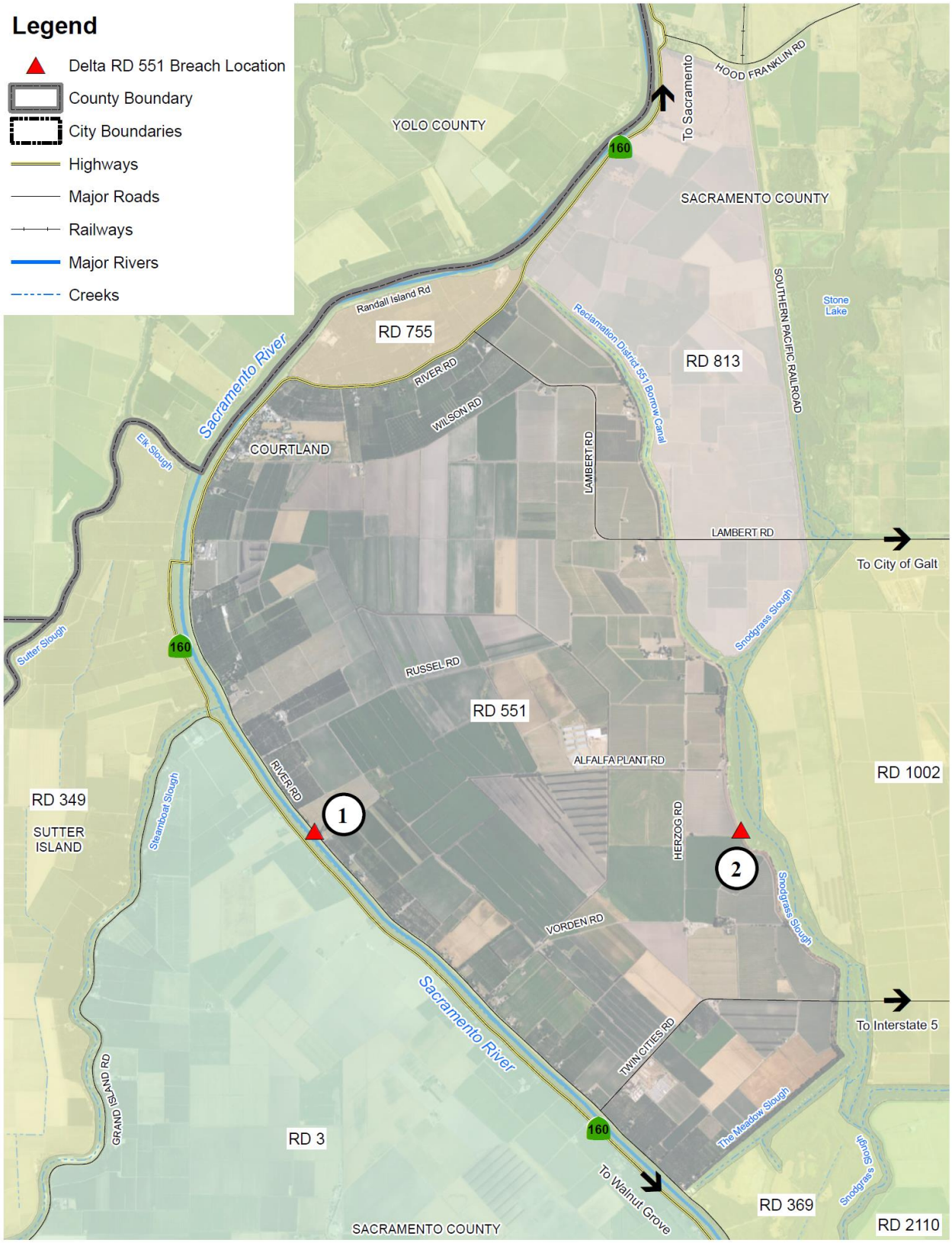
Scour at the breach area is another concern. Once the breach is repaired this location may prove to be too low to support any agriculture due to drainage difficulties.

StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

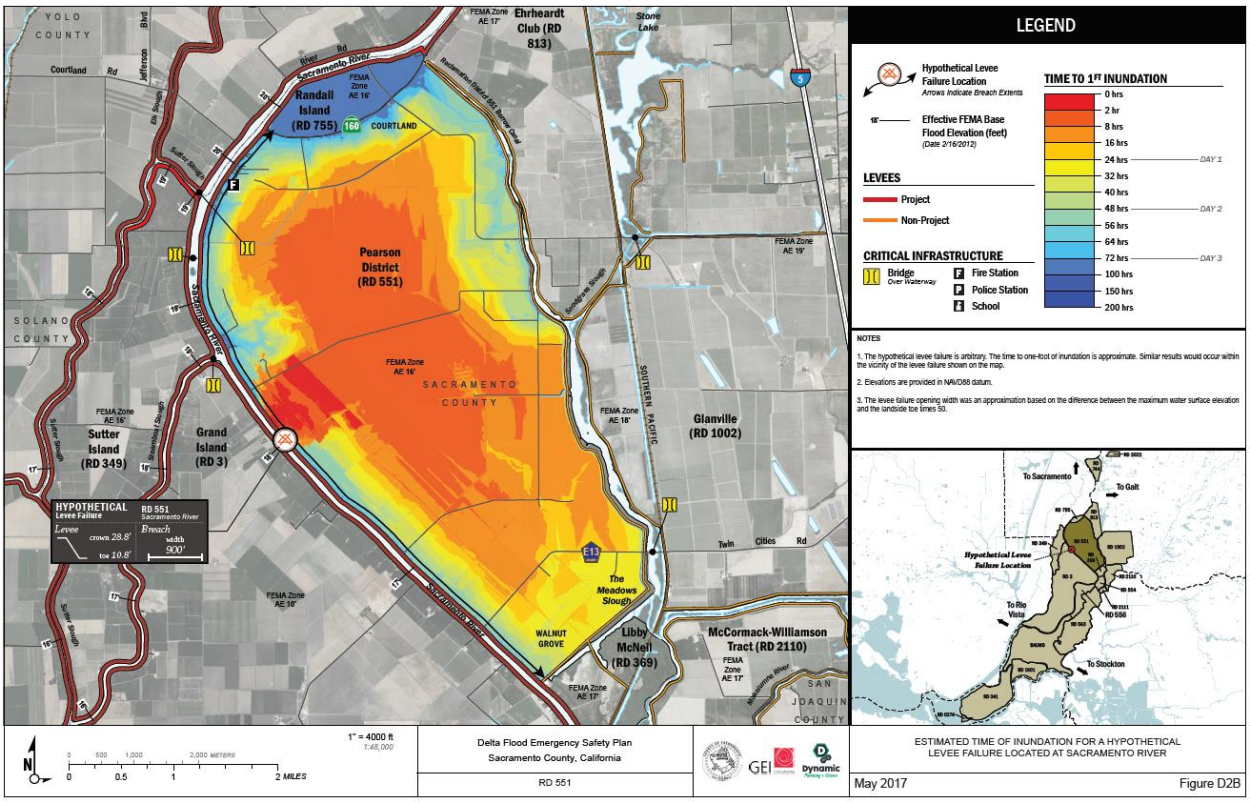
For RD 551, Figure 7-3 details the locations in the Delta within RD 551 where flooding could occur. The red triangles denote potential levee breach locations. RD 551 has two potential levee break scenarios. Maps for Scenario 1 regarding time to one foot inundation (Figure 7-4), estimated flood depths (Figure 7-5), and suggested evacuation routes (Figure 7-6) are displayed below. Maps for Scenario 2 can be found on the Sacramento County stormready.org website.

Figure 7-3 RD 551 – Potential Levee Breach Location



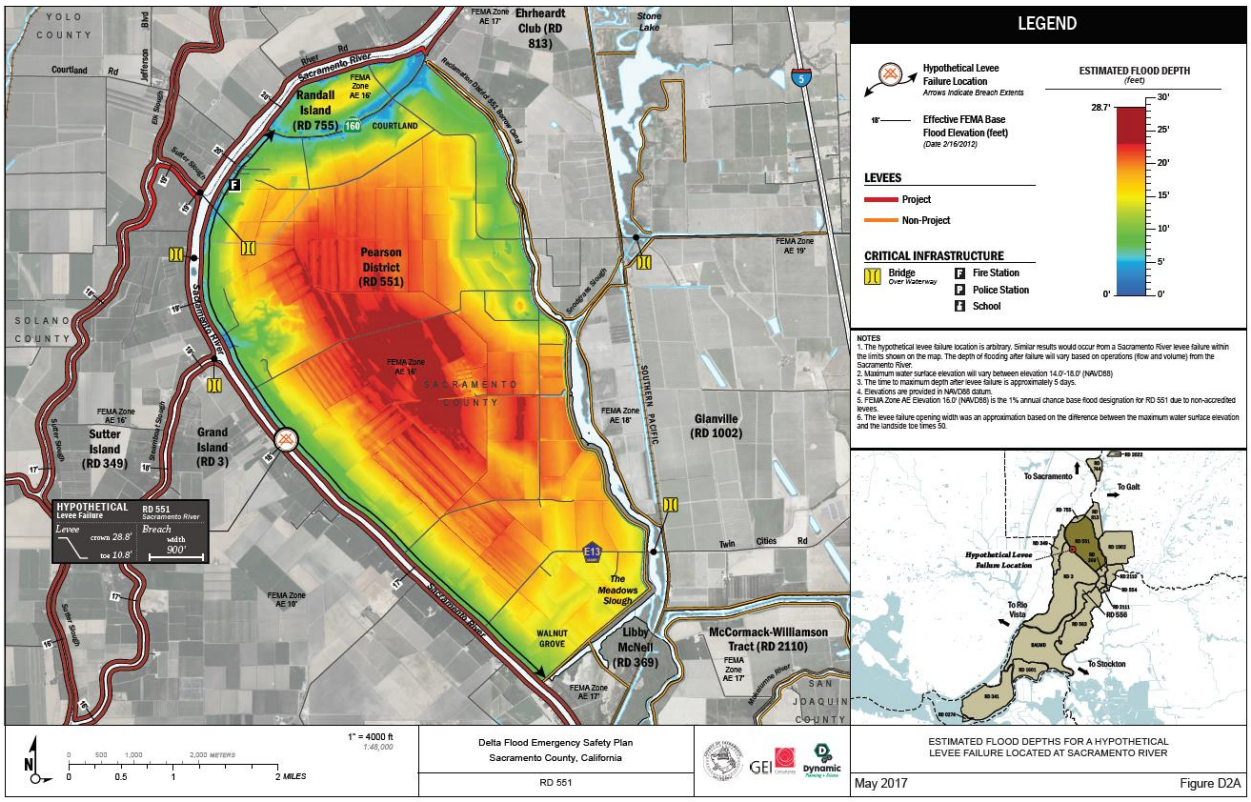
Source: Sacramento County Storm Ready – retrieved March 30, 2021

Figure 7-4 RD 551 – Time to One Foot Inundation after Levee Breach



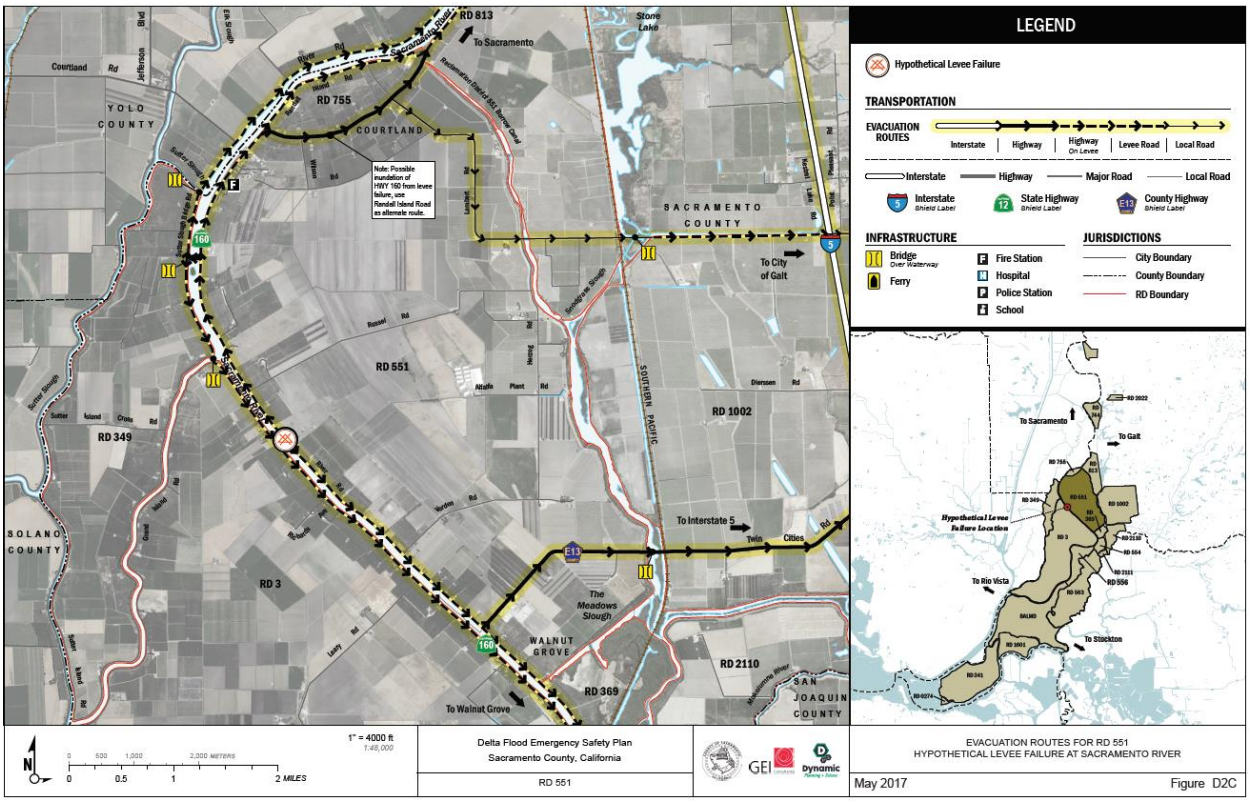
Source: Sacramento County Storm Ready – retrieved March 30, 2021

Figure 7-5 RD 551 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 30, 2021

Figure 7-6 RD 551 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 30, 2021

Assets at Risk

A levee failure would impact almost all the assets and critical facilities on Pearson District; including the small community of Courtland. State Highway 160, as well as a number of county roads are at risk. Approximately 8,000 acres of agricultural land would be damaged and possibly rendered unfarmable for at least a year. There are many permanent crops on Pearson District, such as alfalfa, grain, orchards, tomatoes, potato processing, vineyards, and a variety of other field crops that would be destroyed. Production of permanent crops can take approximately 5 years to produce a viable harvest.

A levee failure could cause flooding that could damage the District's pumps and drainage system. A levee failure can also result in subsequent levee failures around the District and on adjacent islands due to increased fetch of the flooded area and subsequent erosion on exposed levee slopes.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding. In 1996, the District experienced a heavy rainfall event that overwhelmed the District's drainage system and left a substantial amount of acreage in the lower elevations inundated for at least a month. Recent above average years for rainfall, such as 2017 and 2019 have resulted in similar localized flooding and increased costs to power and run the Districts pumping facilities.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed

trees can break utilities and interrupt services. During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding.

It is the secondary effects of heavy rain and storms that are of concern to RD 551. Heavy rains can cause flooding, levee failure, and erosion. Flooding, levee failure, and erosion can cost RD 551 millions in damages.

Severe storm events can lead to erosion, significant flooding and impacts to the levee system. Although water surface elevation is a major factor to levee seepage and overtopping, severe weather can cause significant damage, such as erosion, that puts the integrity of the Pearson District levee system at risk.

A levee failure would impact almost all the assets and critical facilities on Pearson District; including the small community of Courtland. State Highways 160, as well as a number of county roads are at risk. Approximately 8,000 of agricultural land would be damaged and possibly rendered unfarmable for at least a year. There are many permanent crops on Pearson District, such as wine grapes, pears, apples and cherries that would be destroyed.

Assets at Risk

Heavy rain and thunderstorms are the most frequent type of severe weather occurrence in the area. Wind and lightning often accompany these storms and have caused damage in the past. Problems associated with the primary effects of severe weather include erosion, flooding, pavement deterioration, washouts, landslide/mudslides, and downed trees. However, it is the secondary effects of heavy rain and storms that are of concern to RD 551. Heavy rains can cause flooding, levee failure, and stream bank erosion. Flooding, levee failure, and stream bank erosion can cost RD 551 millions in damages as stated previously under a levee failure scenario.

High winds during storm events can knock down power lines and result in a loss of power to the District pumps. This will require the District to bring in diesel powered auxiliary pumps and will likely result in increased flooding within the District.

7.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

7.6.1. Regulatory Mitigation Capabilities

Table 7-8 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 551.

Table 7-8 RD 551 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y/2021	Five-year plan consisting of levee stability, seepage control and maintenance projects.
Capital Improvements Plan	Y/2021	Five-year plan consisting of levee stability, seepage control and maintenance projects can outlay a long term improvement plan.
Economic Development Plan	N	Not within the responsibilities of the Reclamation District
Local Emergency Operations Plan	Y/2017	Through a state grant, Sacramento County is funding revisions to the District's existing Emergency Action Plan for RD 551. The plan update will be complete in early 2022.This plan will also evaluate and create an action plan for a relief cut in the event of a levee failure.
Continuity of Operations Plan	N	No plan in place.
Transportation Plan	N	Not within the responsibilities of the Reclamation District
Stormwater Management Plan/Program	Y/Ongoing	RD 551 consistently evaluates flooding of low areas and the need for improvements in its drainage system
Engineering Studies for Streams	N	No plan in place.
Community Wildfire Protection Plan	N	No plan in place.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	Annual routine maintenance plans and participation in the state Delta Levees Subventions Program which assists in funding levee maintenance. RD 3 is also active in the Corps of Engineers PL84-99 program and is beginning to implement its System-Wide Improvement Framework (SWIF) to respond to maintenance and rehabilitation issues brought up by the Corps of Engineers Periodic Inspection Report
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Version/Year: Not within this jurisdiction's authority
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score: Not within this jurisdiction's authority
Fire department ISO rating:	N	Rating: Not within this jurisdiction's authority
Site plan review requirements	N	Not within this jurisdiction's authority
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	Not within this jurisdiction's authority
Subdivision ordinance	N	Not within this jurisdiction's authority
Floodplain ordinance	N	Not within this jurisdiction's authority
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	Not within this jurisdiction's authority
Flood insurance rate maps	N	Not within this jurisdiction's authority
Elevation Certificates	N	Not within this jurisdiction's authority

Acquisition of land for open space and public recreation uses	N	Not within this jurisdiction's authority
Erosion or sediment control program	Y	Erosion control measures on levee and canal slopes as necessary. Sediment removal from drainage system canals as necessary.
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. In implementation of the District's SWIF, the District will require increased coordination from permitting agencies as well as landowners. Many issues identified are going to require significant permitting and come at a high cost to landowners. Programmatic permitting capabilities as well as a grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure. The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The Districts capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund.		

Source: RD 551

7.6.2. Administrative/Technical Mitigation Capabilities

Table 7-9 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 551.

Table 7-9 RD 551's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	Not within this jurisdiction's authority
Mitigation Planning Committee	N	Not within this jurisdiction's authority
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	RD 551 annually performs over $100,000 in maintenance. In addition, it periodically constructs projects to repair deficiencies in the levee.
Mutual aid agreements	N	None formally established with adjacent Reclamation Districts. Informally resources will be shared in the event of an emergency.
Other	N	
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	Not a position within this jurisdiction
Floodplain Administrator	N	Not a position within this jurisdiction
Emergency Manager	Y	Topper van Loben Sels, President
Community Planner	N	Not a position within this jurisdiction

Civil Engineer	Y	Gilbert Cosio and the staff at MBK Engineers has served as District Engineer for over 30 years and has participated in many flood fight actions.
GIS Coordinator	N	Not a position within this jurisdiction
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	There are sirens at fire houses in adjacent towns. The process of using these as flood warnings should be revisited by local volunteer fire departments. District has a phone list, but does not have staffing beyond the trustees, civil engineer, and secretary.
Hazard data and information	Y	Civil Engineer has hazard data and information to aide district
Grant writing	N	Not a position within this jurisdiction
Hazus analysis	N	Not a position within this jurisdiction
Other		
How can these capabilities be expanded and improved to reduce risk?		
Consistent and available funding opportunities can aide in planning and outlaying substantial improvement projects.		

Source: RD 551

7.6.3. Fiscal Mitigation Capabilities

Table 7-10 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 7-10 RD 551's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	RD 551's annual assessment includes funding for future anticipated capital projects
Authority to levy taxes for specific purposes	Y	As dictated by law, RD 551 has the authority to levy taxes for specific purposes
Fees for water, sewer, gas, or electric services	N	Not within this jurisdiction's authority
Impact fees for new development	N	Not within this jurisdiction's authority
Storm water utility fee	N	Not within this jurisdiction's authority
Incur debt through general obligation bonds and/or special tax bonds	Y	RD 551 has the ability to levy special assessments
Incur debt through private activities	N	Not within this jurisdiction's authority
Community Development Block Grant	N	Not within this jurisdiction's authority
Other federal funding programs	Y	The District is preparing a Letter of Intent to become eligible for the Corps of Engineers PL84-99 program

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
State funding programs	Y	The District participates in the Delta Levees Subventions program that provides a 75/25 state to local cost share.
Other		
How can these capabilities be expanded and improved to reduce risk?		
Substantial funding will be required both publicly and privately in implementation of the District's SWIF. A grant program to address such issues identified in the SWIF would help both the District and landowners remediate issues in a timely manner so that the District can remain eligible for PL84-99 funding in the event of a levee failure. The Delta Levees Special Projects and Subventions Programs are state-local cost share programs that the District relies on to perform required operations and maintenance activities. This program is currently only funded through bonds. With uncertainty on long term program funding, the District is unable to confidently outlay long term repair and improvement projects. The Districts capabilities could be expanded and improved if funding would be more consistent and secure such as coming from the General Fund. Furthermore the District has utilized other funding opportunities such as the Flood System Repair Program to address critical issues. Continued funding of such programs would greatly benefit the District's ability to perform necessary repairs and improvements.		

Source: RD 551

7.6.4. Mitigation Education, Outreach, and Partnerships

Table 7-11 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 7-11 RD 551's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	No formal program currently exists within this jurisdiction
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	RD 511 maintains a web page with appropriate information to educate the public. With SWIF implementation, the District will perform outreach to landowners for education and assistance in addressing encroachment issues
Natural disaster or safety related school programs	N	No formal program currently exists within this jurisdiction
StormReady certification	Y	The RD 551 manager, trustees, and District Engineer have been, or soon will be, trained in SEMS and NIMS
Firewise Communities certification	N	No formal program currently exists within this jurisdiction
Public-private partnership initiatives addressing disaster-related issues	N	No formal program currently exists within this jurisdiction

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Other		
How can these capabilities be expanded and improved to reduce risk?		
Many risks to the integrity of the levee system can come from noncompliant and aging encroachments such as pipes through the levee. Repair and replacement of encroachments, particularly pipes can place a large financial burden on landowners leading to deferred maintenance and ultimately a dangerous situation within the flood control system. It would be beneficial if a program were established that would create a local agency/private landowner partnership that provides funding and permitting assistance to address these issues before they result in levee failures		

Source: RD 551

7.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

RD 551 has been a very active participant in the state's Delta Levee Subventions Program for about 20 years. This program has proven useful and has enabled RD 551 to react financially if a non-routine cost arises.

7.7 Mitigation Strategy

7.7.1. Mitigation Goals and Objectives

The RD 551 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

7.7.2. Mitigation Actions

The planning team for the RD 551 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and

projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. 2017 and 2019 Storm Event Waterside Erosion Repairs

Hazards Addressed: Earthquake, Earthquake: Liquefaction, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The high water events of 2017 and 2019 resulted in 30 areas that had experienced erosion on the waterside slope of the Sacramento River levee. Some areas had experienced erosion in previous high water events (1986 and 1997) that became worse following these events.

Project Description: Repairing waterside erosion at various locations along Sacramento River that resulted from the 2017 and 2019 high water events. Utilizing rip rap material to re-establish the existing levee slope.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 551 Five Year Plan, Storm Damage DWR Emergency Rehabilitation (SDDER) Program

Responsible Agency/ Department/Partners: Reclamation District 551, Department of Water Resources

Cost Estimate: $800,000

Benefits (Losses Avoided): Protects levee breach which could result in losses of $120 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program and Flood System Repair Project

Timeline: Scheduled to be completed by 2026

Project Priority (H, M, L): High

Action 2. FSRP Critical Seepage Repair

Hazards Addressed: Earthquake, Earthquake: Liquefaction, Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: As part of the California Department of Water Resources' (DWR) Flood System Repair Project (FSRP) critical and serious seepage sites were identified on RD 755. The District will be annexed by RD 551 given a failure on the RD 755 levee would also flood RD 551. Pending additional program funding and a local ability to cost share, the sites can be repaired under the FSRP program.

Project Description: The District plans to install a cut off wall to address seepage along approximately 4,000 feet of the left bank of the Sacramento River between Levee Mile (LM) 0.2 and LM 0.9. The Project will address historic seepage that has been observed during high water events.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 551 Five Year Plan, Flood System Repair Project (FSRP)

Responsible Agency/ Department/Partners: Reclamation District 551, Department of Water Resources

Cost Estimate: $10 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of $120 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Flood System Repair Project

Timeline: No current plan to complete

Project Priority (H, M, L): High

Action 3. Addressing Unacceptable Items in the District's USACE Periodic Inspection Report

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The USACE Periodic Inspection Report dated August 2013, identified one unacceptable deficiency category, encroachments, that affects the District's PL 84-99 eligibility. Six other categories, erosion, vegetation, sod cover, depressions/rutting, animal control, and rip rap/bank protection had items that were minimally acceptable but they do not impact eligibility. The District's assigned rating is currently unacceptable. The listed unacceptable encroachments included 37 pipe crossings and 138 items/structures within the levee section, particularly those in the town of Courtland

Project Description: Addressing these unacceptable items to maintain eligibility in the PL84-99 program with a worst first approach. If an item in one of the lower priority categories poses a greater risk it will be

addressed sooner. Once the unacceptable items are addressed the District will continue to correct items listed in the USACE Periodic Inspection Report in its effort to achieve an acceptable rating.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 551 Five Year Plan, System Wide Improvement Framework

Responsible Agency/ Department/Partners: Reclamation District 551, Department of Water Resources

Cost Estimate: $6.5 million

Benefits (Losses Avoided): Protects levee breach which could result in losses of $120 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program, Deferred Maintenance Program

Timeline: Schedule for completion 2050

Project Priority (H, M, L): High

Action 4. Interior Drainage Improvements

Hazards Addressed: Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: The District has issues draining the interior of the District and will need to adjust and repair some of their drainage features to facilitate drainage.

Project Description: Repair and enhance pumping facilities within the existing District drainage system to improve efficiency and reduce residency time of flood waters. This could also include the acquisition of an ancillary diesel pump to use in the event of pump damage or power outages.

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Reclamation District 551 Five Year Plan, Storm Damage DWR Emergency Rehabilitation (SDDER) Program

Responsible Agency/ Department/Partners: Reclamation District 551, Department of Water Resources

Cost Estimate: $2 million

Benefits (Losses Avoided): Assists with dewatering the island which could result in losses of up to $120 million in property, crops and other assets as well as disruptions and damages to critical infrastructure such as roads and power transmission.

Potential Funding: Delta Levees Subventions Program and Flood System Operations and Maintenance Program

Timeline: No current schedule for completion

Project Priority (H, M, L): High

Action 5. Implement recommendations in Courtland Flood Risk Reduction Plan

Hazards Addressed: Earthquake, Earthquake: Liquefaction Floods: 1%/0.2% annual chance, Floods: Localized Stormwater, Levee Failure, Severe Weather: Heavy Rains and Storms

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Sacramento County conducted studies to evaluate risk in each small legacy community located within Sacramento County in the Delta. The study proposed and recommended several remediation actions to reduce to risks from flooding.

Project Description: The study recommended a suite of potential management actions that included: 1) Repair of DWR FSRP Critical and Serious Seepage Sites and Repair Levee adjacent to Courtland 2) Address Erosion Sites in SPFC Levees 3) Address Erosion Concerns on whole District 4) All-Weather Access Road/Flood Fight Berm around Courtland 5) Ring Levee and FEMA Certification for the community of Courtland 5) Repair and Strengthen-In Place Sacramento River Levee north of Highway 220 6) Repair and Strengthen-In Place Sacramento River Levee 7) Repair and Strengthen-In Place Snodgrass Slough and Delta Meadows 8) Secure 100-Year FEMA Certification for Sacramento River and Snodgrass Slough Levee

Other Alternatives: None.

Existing Planning Mechanism(s) through which Action Will Be Implemented: Small Community Flood Risk Reduction Feasibility Study, Sacramento County Flood Safety Plan Update

Responsible Agency/ Department/Partners: Sacramento County, Reclamation District 551, Sacramento County Office of Emergency Services

Cost Estimate: $1 million to $600 million

Benefits (Losses Avoided): Proposed actions will reduce the risk of flooding to the town of Courtland that is located on the east side of the Sacramento River. As well as any damages to surrounding property and agricultural crops depending on the management action.

Potential Funding: Delta Levees Subventions Program, Flood System Operations and Maintenance Program, Small Community Flood Risk Reduction Program

Timeline: Dependent on qualification for outside funding

Project Priority (H, M, L): Medium

Delta Annex Chapter 8 Reclamation District 554

8.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 554 (RD 554 or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 554, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

8.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 8-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 8-1 RD 554 – Planning Team

Name	Position/Title	How Participated
Jeff Tranum	Chairman, Board of Trustees	Provided information regarding the annex.
Gilbert Labrie	Contract District Engineer	Attended planning meetings. Provided information regarding the annex.
Barb McGowan	Assistant to District Engineer	Provided information regarding the annex.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 8-2.

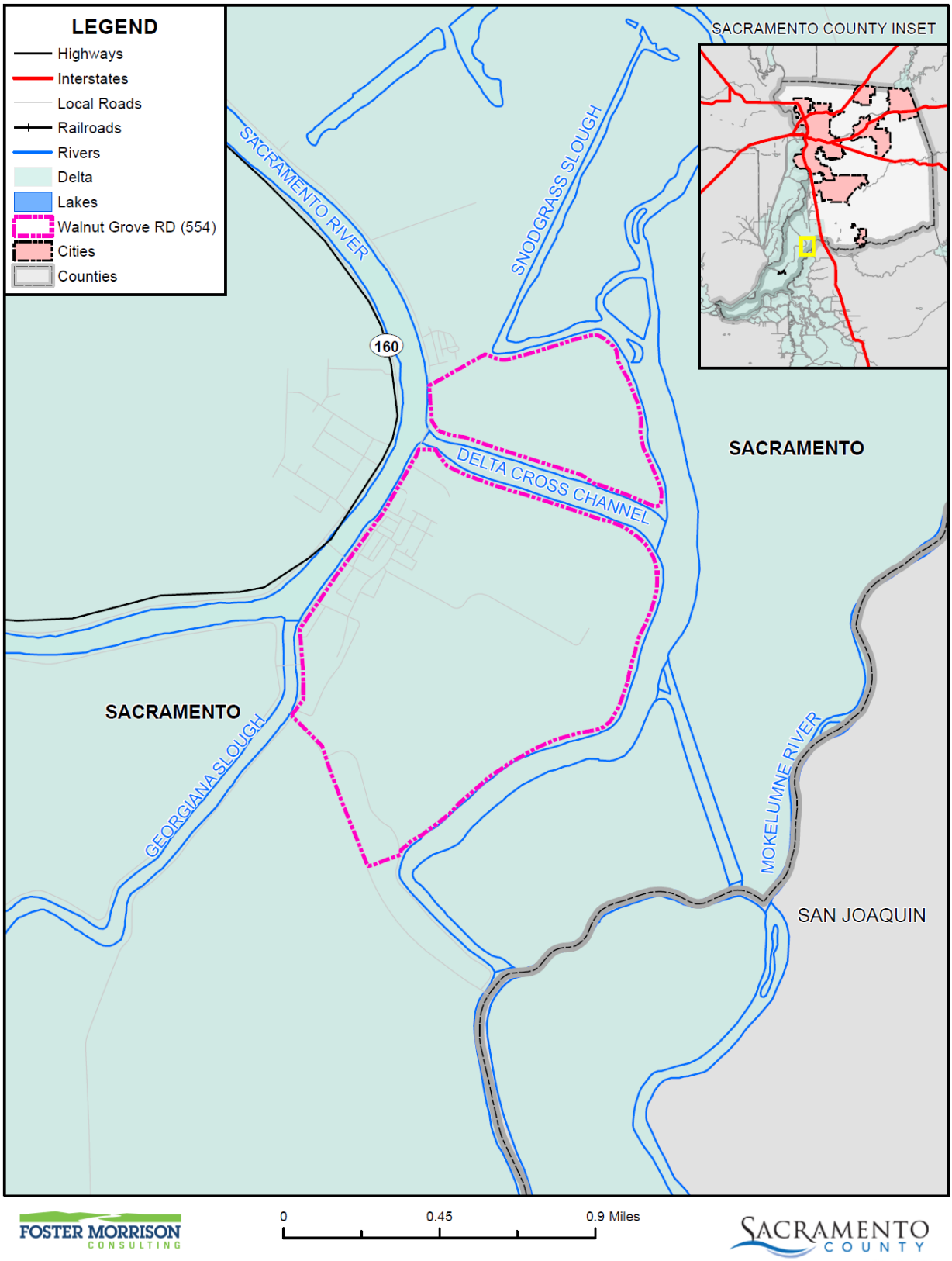
Table 8-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
2016 Sacramento County Flood Safety Plan (by GEI). Currently being updated in 2021	The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter.
2021 Emergency Operations Plan (EOP)	Coordination between RD 554 team members to clarify and ensure conformance and focus to prevent duplication efforts when a solution is available and planned.

8.3 District Profile

The District profile for the RD 554 is detailed in the following sections. Figure 8-1 displays a map and the location of the District within Sacramento County.

Figure 8-1 RD 554



Data Source: Walnut Grove Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

8.3.1. Overview and Background

Reclamation District 554 protects the urban, eastern side of Walnut Grove, 374 acres of cropland, and the Walnut Grove Marina service area. Walnut Grove was established in 1850 by John Sharp and became a thriving agricultural center and shipping port by 1865.

Reclamation District 554 is the upper 452-acre portion of Tyler Island that is separately protected by 3.58 miles of levee. The District includes the east Walnut Grove urban area. It is the only town in the Delta that is interdependent and occupies both sides of the Sacramento River. The main commercial corridor is on this side of Walnut Grove along with the main sewer collection system and key government services. But the majority of the land use in this small district is rural/agricultural since the urban area is only 77 acres.

RD 554 is bordered by Sacramento River, Georgiana Slough, Snodgrass Slough, the Delta Cross Channel, and the cross levee between RD 554 and RD 563 (lower Tyler Island). Levees along the Sacramento River, Georgiana Slough, and the Delta Cross Channel are federal project levees (1.6 miles). The Cross Channel, Snodgrass Slough, and the cross-levee are non-project levees (1.98 miles), but are still held to the project levee standard. Reclamation District 554 manages levee inspections, levee maintenance, and two pumping stations on the island. The pumping stations are both located along Snodgrass Slough.

8.4 Hazard Identification

RD 554 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 8-3).

Table 8-3 RD 554—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Limited	Occasional	Negligible	Low	–
Dam Failure	Extensive	Unlikely	Catastrophic	Low	Medium
Drought & Water Shortage	Significant	Likely	Critical	Low	High
Earthquake	Limited	Occasional	Limited	Low	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Low	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Significant	Occasional	Limited	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Limited	Low	Medium
Levee Failure	Significant	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Critical	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Low	Low
Subsidence	Limited	Occasional	Negligible	Low	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Likely	Limited	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

8.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

8.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 8.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 8-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

8.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 554's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 8-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 554's physical assets, valued at over $36 million, consist of the buildings and infrastructure to support the District's operations.

Table 8-4 RD 554 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Levee	Infrastructure	$30,000,000	Floods: 1%/0.2%, Localized Flooding, Levee Failure, Heavy Rain and Storms
Cross-levee	Infrastructure	$5,000,000	Localized Flooding, Heavy Rain and Storms
Pump Station	Infrastructure	$500,000	Localized Flooding, Levee Failure, Heavy Rain and Storms
Pump Station	Infrastructure	$500,000	Localized Flooding, Levee Failure, Heavy Rain and Storms
Total		**$36,000,000**	

Source: RD 554

In general, the most vulnerable District assets include the levees and pumping stations that the District owns and maintains. There are approximately 3.58 miles of levee surrounding the District. The levees along Georgiana Slough and the Delta Cross Channel are federal project levees. Snodgrass Slough and the cross-levee are non-project levees. The levee system is subject to riverine flooding. However, it is highly unlikely the levee system will fail due to overtopping. A high water situation could increase the hydraulic gradient within the levee that could result in under or through seepage. Seepage, if left unchecked, can result in levee failure and subsequent flooding. The District owns two pumping stations that are critical for island drainage. If the drainage system becomes compromised the District could experience localized flooding. If the system becomes compromised in a flood situation, damages could be worse than anticipated.

Natural Resources

RD 554 has a variety of natural resources of value to the District. Due to the urban nature of RD 554 there are only a few areas of freshwater wetland, upland, and riparian habitats. The size of the island and development that has taken place over time, has resulted in mostly ruderal vegetation. See Figure 8-2 for a map of vegetation types. According to the Department of Fish and Game Levee Log in the 5-Year Plan, riparian, scrub shrub, and freshwater marsh habitat types exist on and adjacent to the levees. The estimated amount of each type of habitat per lineal feet is shown on Table 8-5.

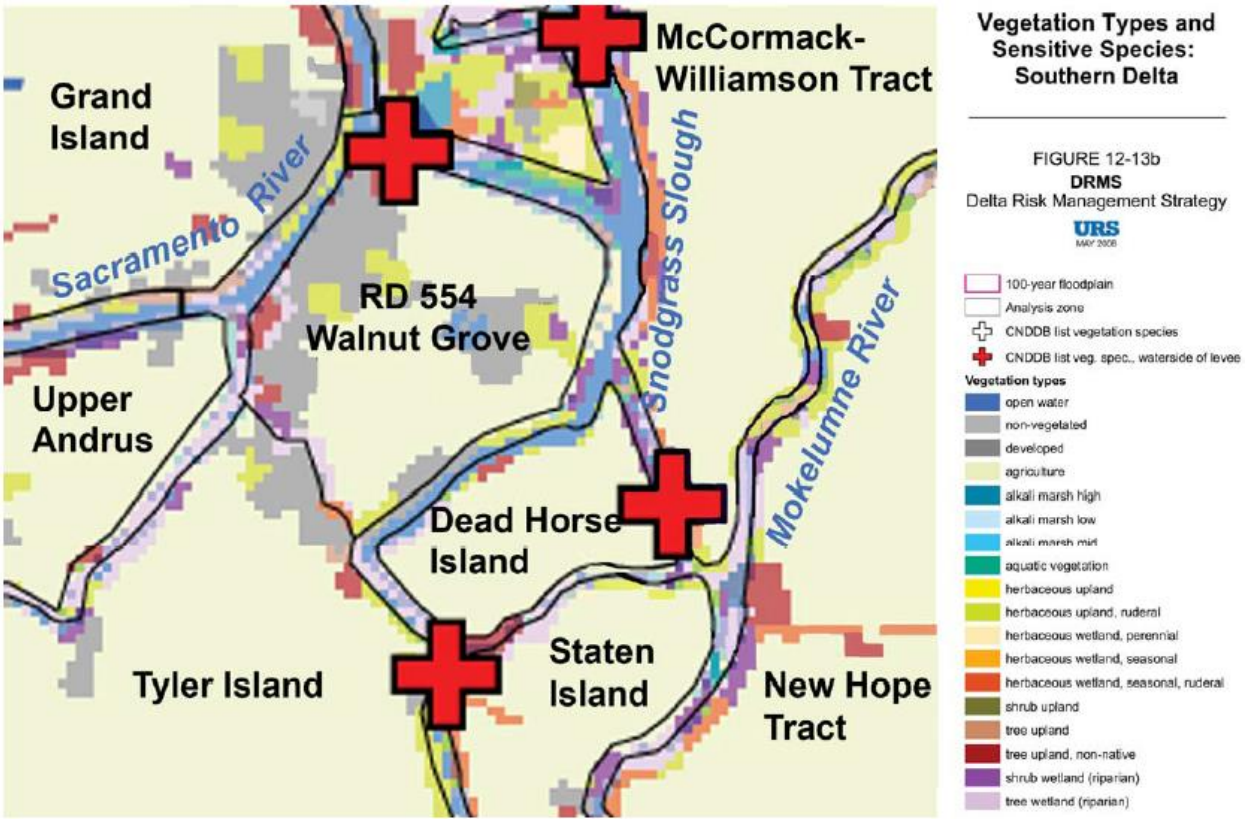
Table 8-5 RD 554 Vegetation Types

Type	Waterside	Landside
Riparian	2223 lf (3.66 ac.), 29 single trees	1710 lf (1.35 ac.), 15 single trees
Scrub Shrub	880 lf (0.62 ac.), 23 single trees	1700 lf (1 ac), 40 single trees
Freshwater Marsh	1229 lf (0.37 ac.)	0 lf

Source: RD 554 2012 5-Year Plan

Note: These estimates are for non-project levees comprising the location of proposed projects in this plan.

Figure 8-2 RD 554 Vegetation Types

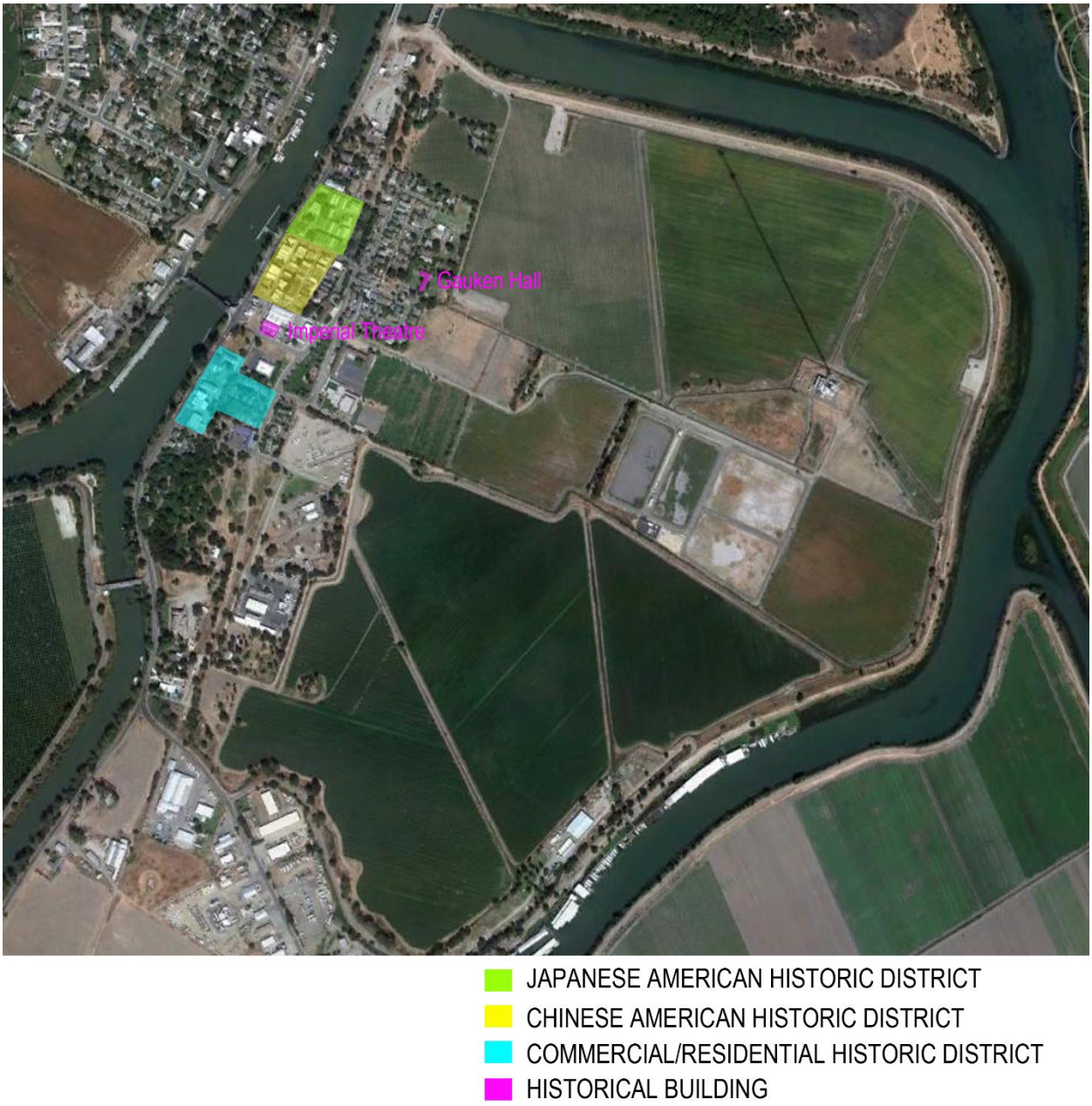


Source: RD 554 2012 5-Year Plan

Historic and Cultural Resources

RD 554 has a variety of historic and cultural resources of value to the District. In the Walnut Grove area, there are three nationally registered historic districts, the Walnut Grove Chinese and Japanese American Historical Districts, and the Walnut Grove Commercial/Residential Historic District. There are three two nationally registered historical buildings, Gakuen Hall and the Imperial Theatre. These are shown on Figure 8-3.

Figure 8-3 Historic Sites in Walnut Grove



Source: RD 554 2012 5-Year Plan

Growth and Development Trends

Limited growth is expected to occur in the District due to limits of Walnut Grove's SPA.

Development since 2016

No District facilities have been constructed since 2016. As such, vulnerability to the District is unchanged.

Future Development

There are approximately 10 acres of land available for development. One new home has been built in the last decade; any anticipated growth is expected to be slow and small in nature. There are no current development plans.

8.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 8-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional

brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Currently, there is no effect and no backup power is required. This could change if the length of outage is significant.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

Currently, there is no effect and no backup power is required. This could change if the length of outage is significant.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

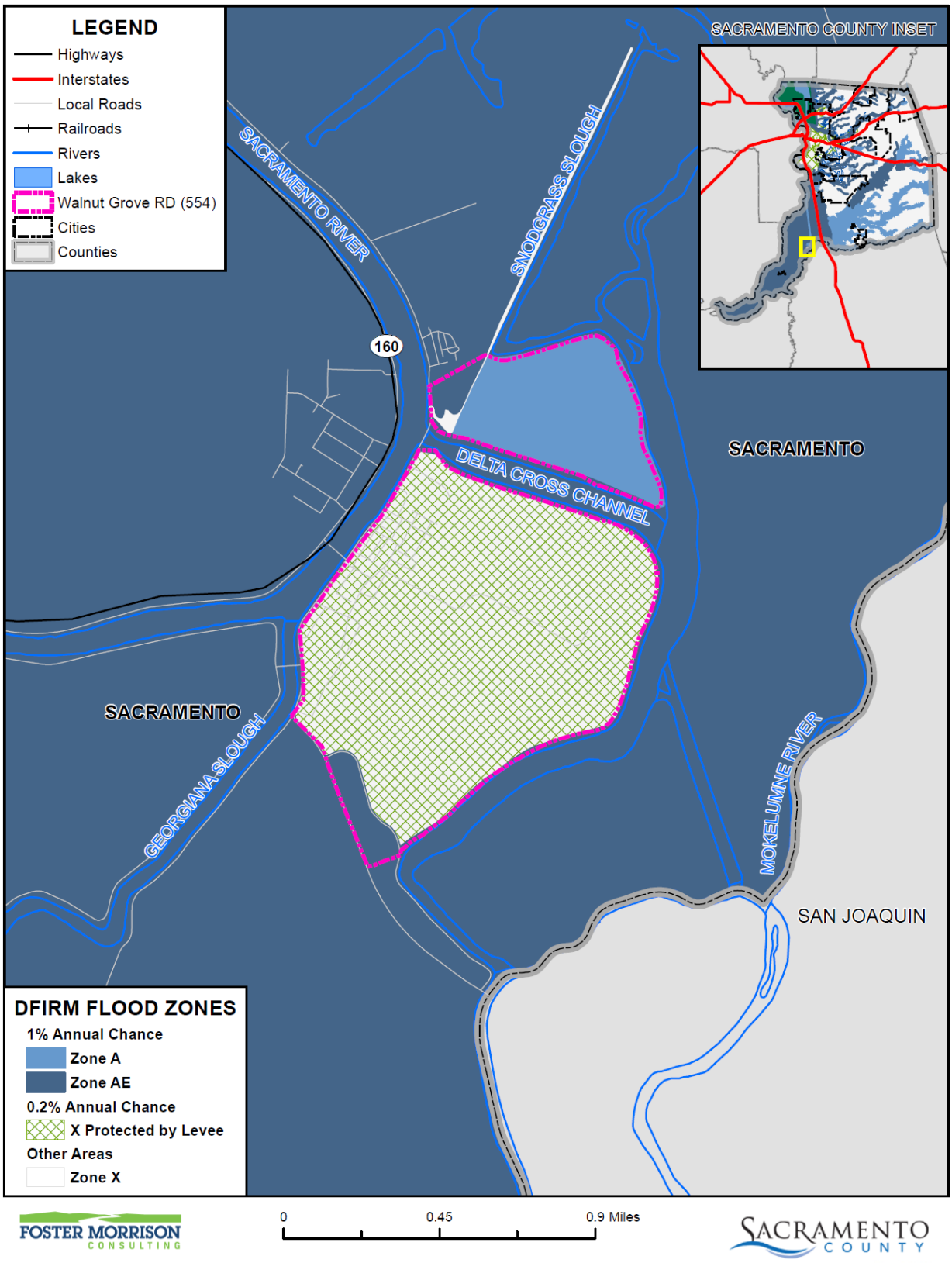
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the RD 554 have been subject to historical flooding.

Location and Extent

The RD 554 has areas located in the 1% and 0.2% annual chance floodplain. This is seen in Figure 8-4.

Figure 8-4 RD 554 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Walnut Grove Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 8-6 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 8-6 RD 554– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	X
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	X

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 8-7. These events also likely affected the District to some degree.

Table 8-7 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

1986 was the closest the District came to experiencing a 100-year flood event when adjacent lower Tyler flooded. The District has not experienced a 200 or 500-yr flood. Recent floods and high water events (HWE) in the District include:

- 2017 HWE: Event initiated extra monitoring. No notable damage.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

A 1%, /0.5%/0.2% annual chance flood event could cause flooding within the District. A high water event, depending on the water elevation, is unlikely to cause failure due to overtopping as many other surrounding Districts are lower and more likely to fail before failure of RD 554 levees. Higher levels of water could increase hydraulic gradients within the levee section resulting in landside seepage or boils. Continued seepage, if left unaddressed, could erode the levee and result in failure. Heavy flows could also cause erosion and scour on the waterside bank that could undermine the levee and cause failure.

There are three nationally registered historic districts protected by the levee system, the Walnut Grove Chinese and Japanese American Historic Districts and the Walnut Grove Commercial/Residential Historic District. There are also two nationally registered historical buildings, Gauken Hall and Imperial Theater. There are also historic homes that are over 100 years old. A 100/200/500 year flood event could inundate these districts and historic places if the event results in levee failure. Such an event may also exceed the District's pumping facility and improper drainage could also flood the districts. Flooding could cause irreparable damage to some structures and they could be lost.

Assets at Risk

The levee system and pumping stations are vulnerable to a 1%/0.5%/0.2% annual chance flood. As the flows could exceed the capacity of both the levee system and the pumping station that is needed to drain the island.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Highly Likely
Vulnerability–High

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The RD 554 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture. Localized flooding can occur anywhere inside the District.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted the following past occurrences of localized flooding:

Some form of localized stormwater flooding occurs during most heavy rains. The most likely time this could have occurred in the past was during the wet year in 2006. Since 2016, the following events occurred:

- 2017 HWE: Initiated extra monitoring, no notable damage. Produced excess electrical cost for pumping the excess run off required to prevent localized flooding and the threat of overtopping on Snodgrass Slough.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards. Localized stormwater flooding can occur during heavy rains or seepage events that exceed the District's drainage capabilities. Lower areas around the island may be subject to minor flooding.

Assets at Risk

Localized flooding can overtax the Districts pumping system and create for a more hazardous situation involving the levee system by limiting the ability for inspection.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Extremely High

Hazard Profile and Problem Description

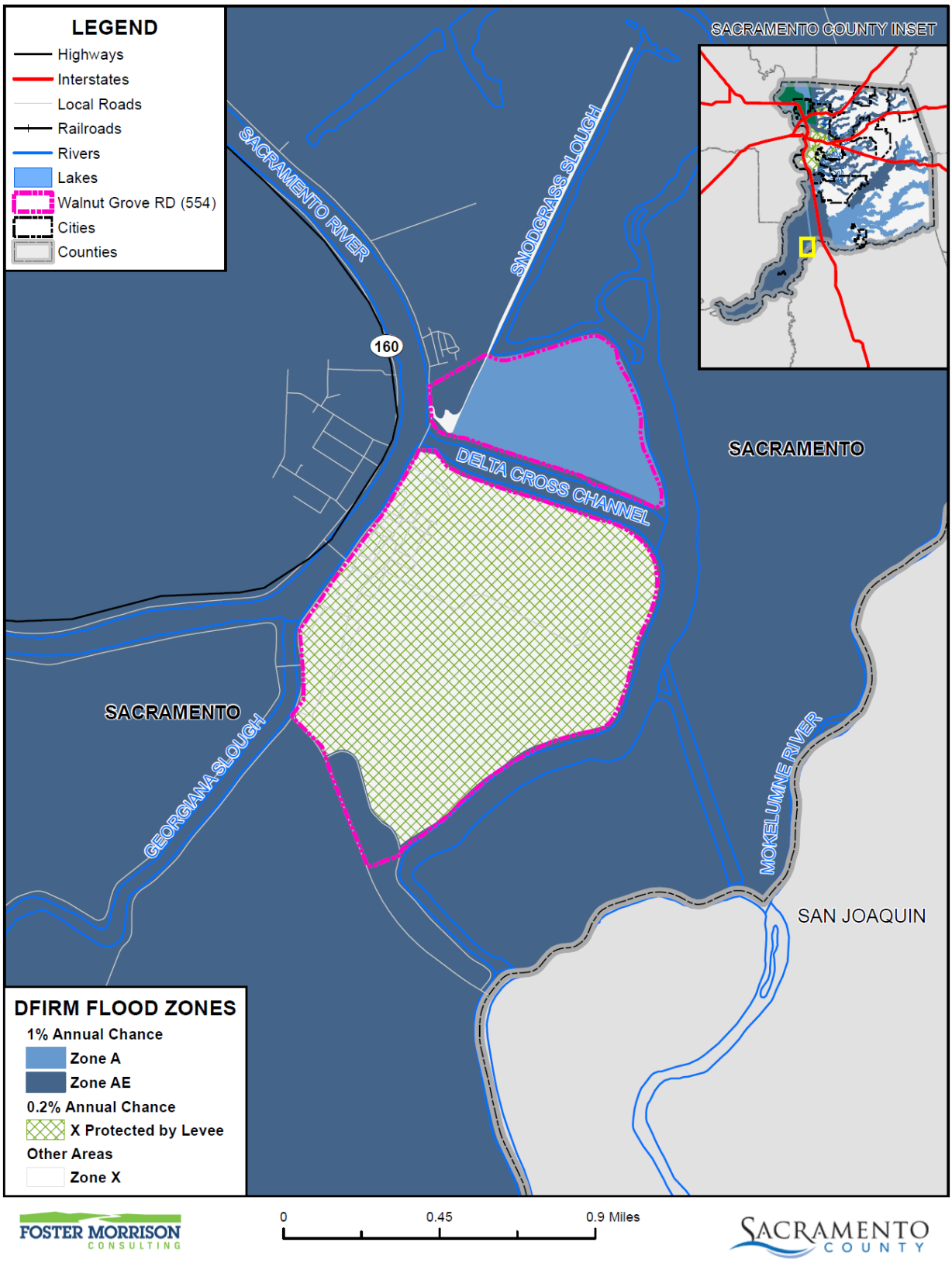
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

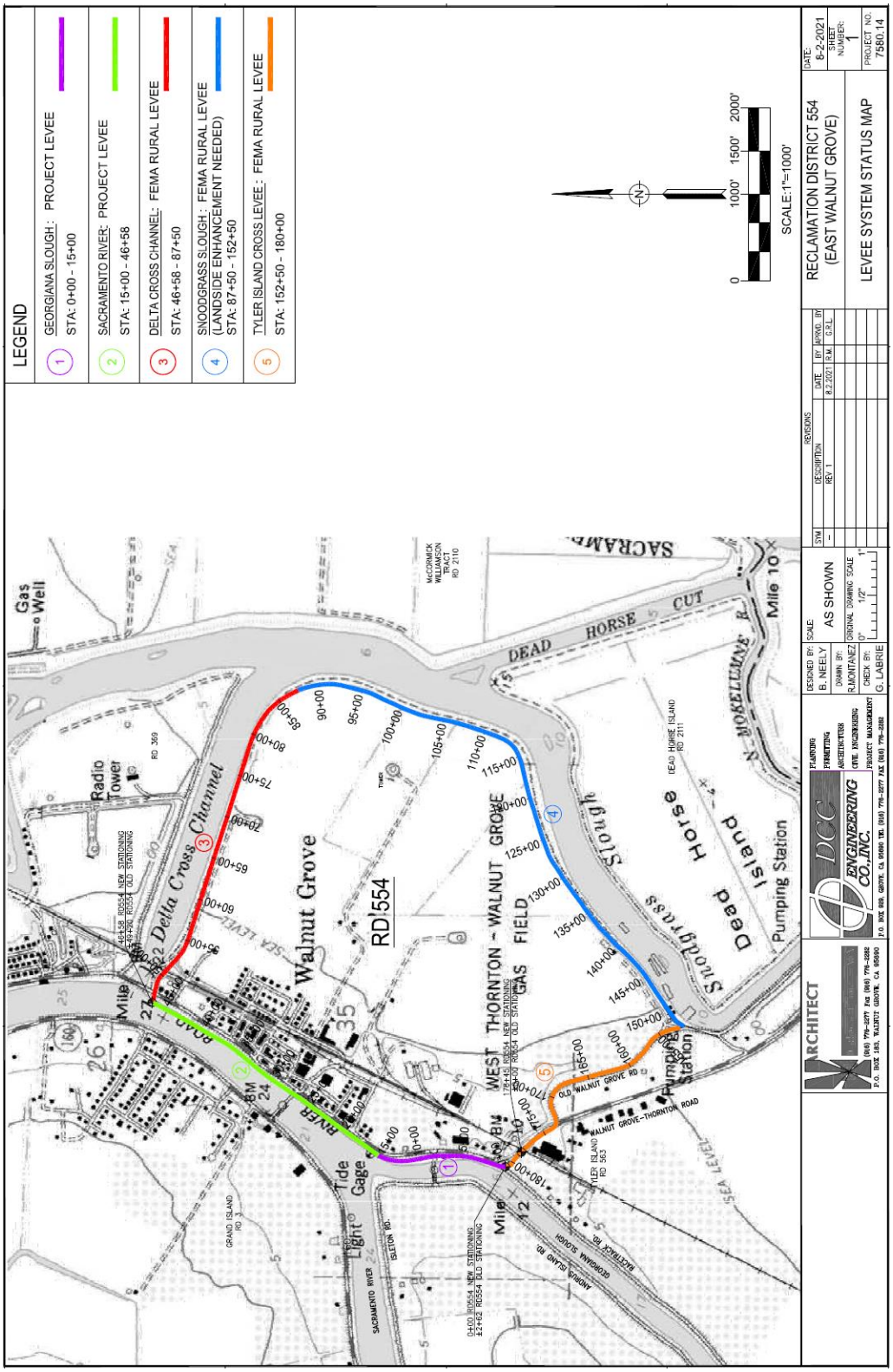
There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 8-5. Levee statuses (from DCC Engineering) of the District are shown on Figure 8-6.

Figure 8-5 RD 554 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Walnut Grove Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure 8-6 RD 554 – Levee Status Map



Source: DCC Engineering, 8/2/2021, RD 554

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The 5-Year Plan noted that in 1986, lower Tyler Island flooded and threatened to flood RD 554. At that time, an effort was undertaken to enhance the cross levee height by adding a berm on the lower Tyler side of the levee to ensure that the urban area did not get flooded. The added height was not necessary when the water crested but the emergency construction paved the way for the more permanent configuration that exists today. That levee upgrade then led to a successful LOMR for eastern Walnut Grove and its Zone X determination in 1987. No events have occurred since 2012.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those propert ies outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards. The District noted that RD 554 is high ground. This urban area is on higher ground and would be less effected if there was a 100 year flood, making this too general/generic a paragraph.

Not only would a breach inundate RD 554, but it would also overtop (or by an intentional breach) the dry cross levee and flood the rest of Tyler Island. Flood waters would flow down to the lower part of the island since it is at a lower elevation than RD 554. The lowest elevation on the southern part of Tyler Island is -15.0 feet (NAVD 88) according to the LIDAR survey supplied by DWR. By the same survey, the lowest elevation on RD 554 is -1.0 feet. The average elevation for Tyler Island is +9.0 feet.

The 2012 5-Year Plan addressed levee repair costs due to failure. The 5-Year Plan broke down costs by land use type:

- **Residential** – For RD 554, it is estimated that there could be a one-time displacement cost of $57,500 for all occupied households along with an additional $4,780 per day to house these residents elsewhere. On lower Tyler Island, the estimated one-time displacement could be $9000 and an additional $756 per day. The Walnut Grove Marina adds a transient population that is difficult to quantify since there are no statistics covering that element to determine associated costs. Furthermore, this number would fluctuate with the seasons. To house this population in emergency shelters it is estimated to cost $85 a day. As there would be sufficient time to evacuate, the costs to accommodate this unique group of part-time residents may not be significant. But the marina would be shut down until the island was pumped out.
- **Commercial** – Commercial structures will be adversely impacted from the time they are inundated through the time it takes to repair such damage and damage to surrounding infrastructure. There are about 48 businesses on all of Tyler Island. Overall, a flood could cost Walnut Grove and Tyler Island

businesses an estimated $113,000 per day. Some businesses may be unable to recover from a flood and could possibly be lost as the result of a flood event.

- **Agricultural** – Crops grown on Tyler Island are generally alfalfa, wheat, corn, pears, truck crops, tomatoes, rice, and wine grapes. Tyler Island has a total of 8,687 acres of crops. Average cost for rehabilitation and field cleanup is $235 per acre. This involves the removal of debris and sediment deposits after floodwaters have receded. Silt and debris can also clog drainage and irrigation ditches adding a variable cost to rehabilitation. The estimated total one-time cost for clean-up and rehabilitation is estimated to be $2.7 million. If inundation lasts longer than 14 days, it is assumed that the crops will be permanently lost. Any flood event that occurs between planting and harvest, could completely destroy the crops. Reestablishment of a lost crop dramatically increases economic losses. The inundation period is assumed to be five weeks on lower Tyler Island, meaning all crops on the lower end could potentially be lost in a flood event. However, due to the smaller size of RD 554 and an assumed inundation period of five days, not all crops may be lost. Not including clean-up costs, reestablishment of all crops on the island could total an estimated $29 million.

Using the 2021 adjusted figure for breach repair, Walnut Grove RD 554 estimates $1,875,000 for repair, recovery, and associated damages. Additionally, land values have increased because of the changes in crops. A breach at RD 554 would impact RD 563 and therefore would result in expenses for damage on both islands and increase the estimate to approx. $33,000,000. So, a major event would impact both upper and lower Tyler Island.

The 5-Year Plan also addressed infrastructure issues related to levee failure. Levee failure on Reclamation District 554 could cause direct physical damage to the island's infrastructure. If a break were to occur in the north inundating Walnut Grove/Thornton Road/J11, it would disrupt the island's connection to Highway 160 or 1-5, delaying up to 1,500 trips. The cost due to lost trips is small but the estimated time delay could cost $48,000 per day, $53,000 if 10% are assumed to be truck trips. Some of Walnut Grove's surface streets could be inundated affecting the area on a local level by removing access to the town's residential areas. The District also houses a FM radio and television transmission tower with support facilities serving KOVR, KXTV, and KQCA. This 2049' tower currently serves the Stockton-Sacramento-Modesto broadcasting area stations and radio stations (Fybush). The transmitter building is on stilts so the equipment will not be affected in a flood. But a flood could still restrict maintenance access to the building, and potentially interfere with broadcasting if there is a lengthy power disruption.

Overall, residential, commercial, agriculture, and infrastructure losses due to a flood event on all of Tyler Island could cost approximately $185,000 per day. The one-time/direct cost of the event to relocate the residents and businesses and reestablish cropland would be around $2.2 million. Assuming an inundation residence period 5 days on RD 554 (upper Tyler) a flood event there could cost approximately $1.6 million. Lower Tyler with an assumed inundation residence period of 5 weeks (35 days), a flood event could cost approximately $27.2 million of direct and indirect costs. These figures include daily losses to residents and business, one-time costs of displacement, rehabilitation costs of cropland, and reestablishment and annual production loss costs for vineyards and orchards. A flood event occurring between February and October, that would delay planting until the next season and is assumed to kill all crops, could add up to approximately $78.3 million of direct and indirect costs for both districts. This figure includes the estimated costs associated with repairing the breach and pumping out the islands, about $30 million.

Water quality issues were also addressed in the 5-Year Plan. Due to the urban nature of a portion of RD 554, a flood could release household and commercial chemicals potentially contaminating the surrounding

waterways. A flood could also suspend sediment, metals, fertilizers, and pesticides that are attached to soil particles. Increased sedimentation of the waterway can reduce the amount of sunlight to reach submerged aquatic plants and also smother fish larvae and harm fish by clogging their gills. The extent of the effects on fish and aquatic species from suspended sediment and chemicals depend on the quantities of pollutants, amount of dilution, and frequency of freshwater releases.

Besides those listed above, other potential in-island pollutant sources could degrade water quality on the island and in the waterways. A long inundation period could create anoxic conditions in the soil can release toxic substances, such as manganese that is naturally occurring but can be dangerous to health in high concentrations. Other toxic substances such as, organochlorine "legacy" pesticides that, although have been banned for over 20 years, slowly degrade in the environment and can still be present in soils where it was applied. This can have harmful effects on fish species in terms of reducing food production, namely a primary producer, phytoplankton if released into the waterway. Although not harmful in small traces, "legacy" pesticides can become more concentrated through bioamplification and not only harm fish species but terrestrial and avian species as well.

Waterside habitat that is adjacent to the break could be lost due to the erosive forces of the water flowing through the break.

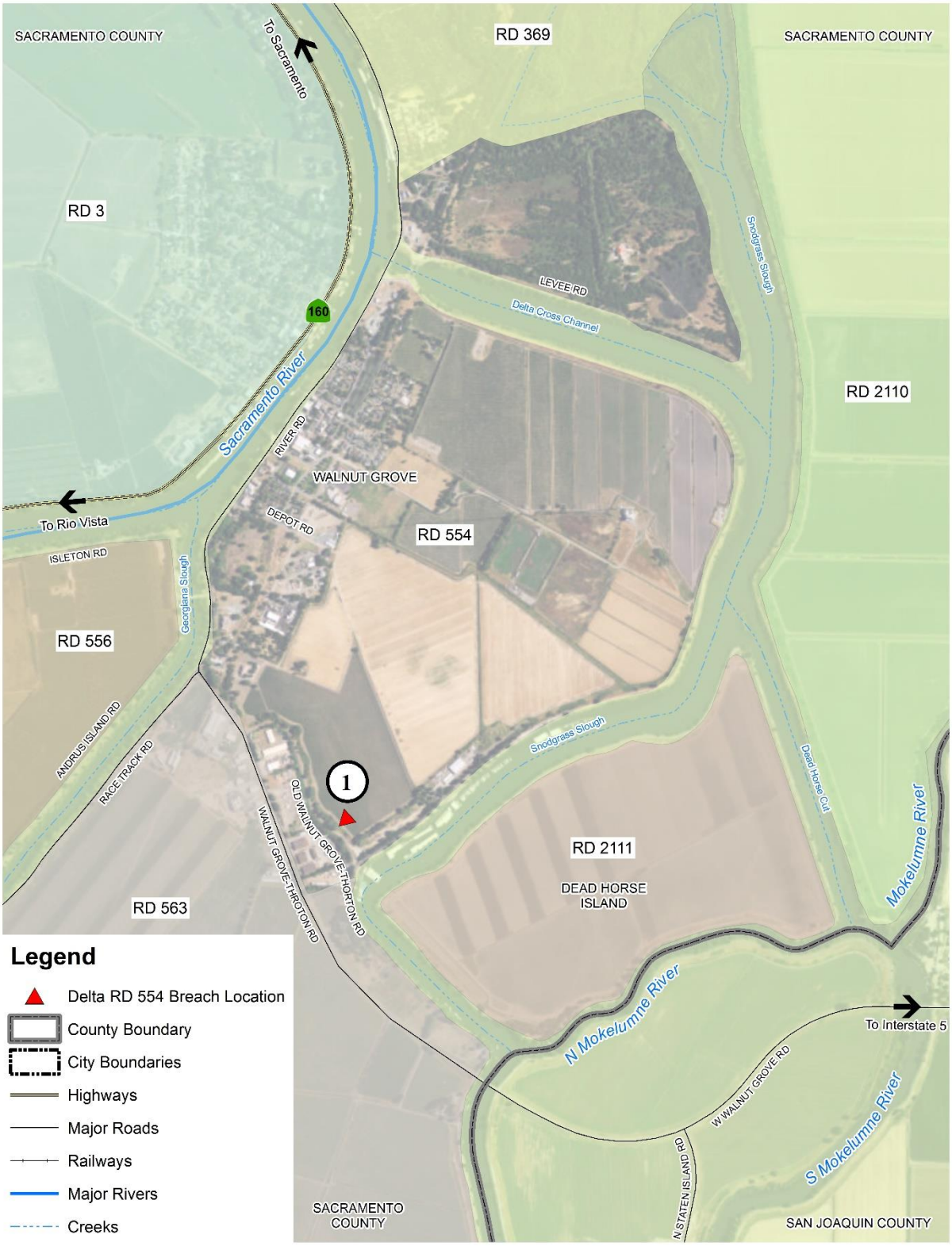
StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

For RD 554, Figure 8-7 details the locations in the Delta within RD 554 where flooding could occur. The red triangles denote potential levee breach locations. RD 554 has a potential levee break scenario. Maps regarding time to one foot inundation (Figure 8-8), estimated flood depths (Figure 8-9), and suggested evacuation routes (Figure 8-10) are displayed below.

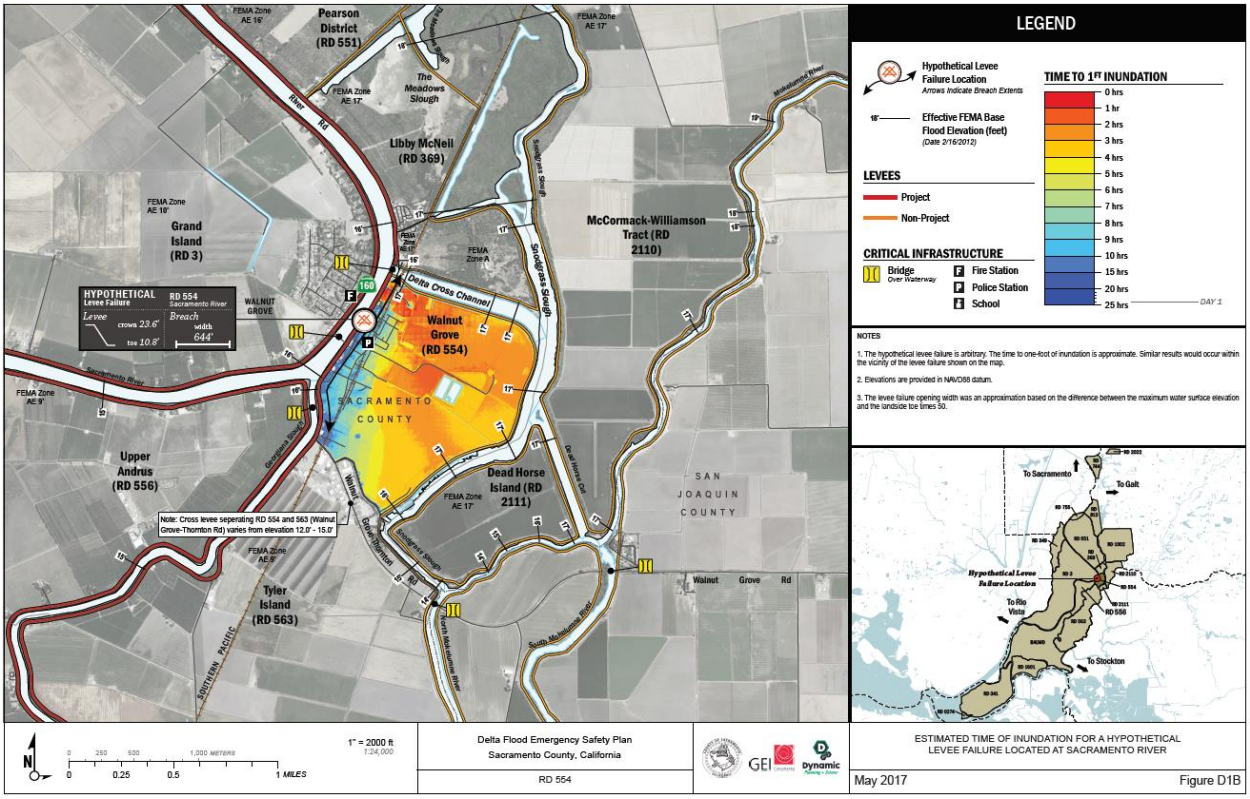
Note: This information is based on assumptions and scenarios developed as part of the flood safety planning done for Delta RDs in 2017; areas of possible flooding depicted in these maps may or may not reflect current conditions and would change depending on the location of breach areas and conditions during any given event. Current conditions should be verified with an LMA representative.

Figure 8-7 RD 554 – Potential Levee Breach Location



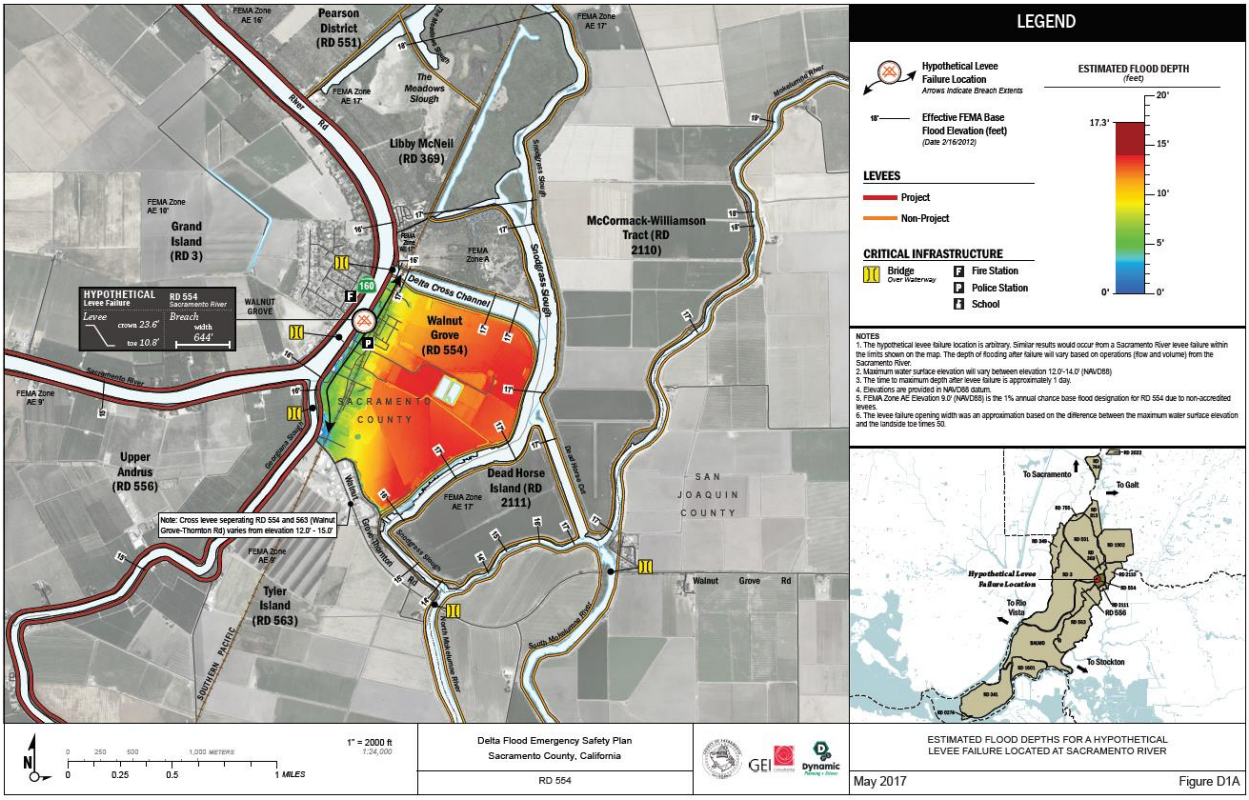
Source: Sacramento County Storm Ready – retrieved March 26, 2021

Figure 8-8 RD 554 – Time to One Foot Inundation after Levee Breach



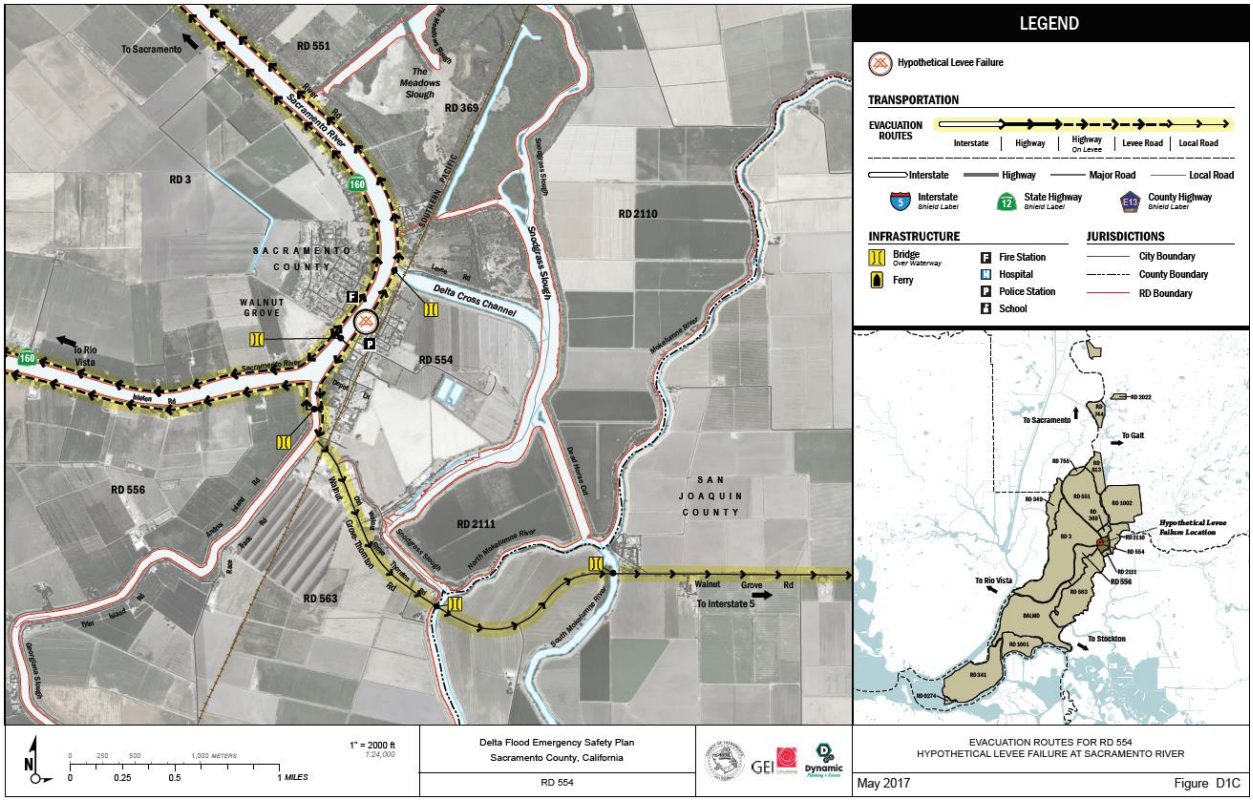
Source: Sacramento County Storm Ready – retrieved March 26, 2021

Figure 8-9 RD 554 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 26, 2021

Figure 8-10 RD 554 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 26, 2021

Assets at Risk

Levees and district pumping plants. On island inundation can create an open water situation where a large fetch could develop and erode the interior of other levees within the District. Inundation of the drainage pump can make it inoperable and require replacement. Other critical facilities at risk include a fire department, police station and elementary school. The fire department and police station are non-critical facilities because they are above the potential HW/flood elevation. Assets at risk to levee failure were shown on Table 8-4.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots

(57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, has occurred in the District. This is the cause of many of the federal disaster declarations related to flooding.

The last heavy rain and storm event the District experienced was in 2006, 1997 and 1986. No significant damages occurred due to these high water events. Events since 2016 include:

- 2017 HWE: Additional monitoring was initiated, but no significant damage

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

Heavy rains and storms can result in higher flood flows that could increase the hydraulic gradients within the levee section and result in seepage or if great enough, possibly overtopping. They can also increase flows and result in erosion of the waterside bank. Riparian vegetation could be lost from high flows as a

result of heavy rains and large storms. The historic buildings and districts discussed above could be damaged from heavy storms due to falling trees or flooding.

Assets at Risk

The District levees and pumping plant are at risk of damage from heavy rains and storms.

8.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

8.6.1. Regulatory Mitigation Capabilities

Table 8-8 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 554.

Table 8-8 RD 554 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y	1. Current 5-year plan is under review and being updated. It describes past, present, and future hazards. These hazards are managed and implemented using the standard operating plan strategies. 2. At this time, an Emergency Operations Plan Update is still in development. Expected process to the finalized during the next 2 years. 3. 2016 Sacramento County Flood Safety Plan is in place. As well, as a Hazard Plan concerted with Sacramento County with GEI as the interface. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter. 4. Small Communities Program for flood protection and structural and nonstructural mitigation. This Legacy grant is interfaced through GEI/MBK in conjunction with agencies and RD 554 to improve levee integrity, operations, and management to reduce flood related losses. The benefit as a participant in SCP is to reduce risk to people, property, and environmental resources. Flood risk reduction can be implemented through this program. 5. Update of the 2016 LHMP continues to include valuable information about the priority of hazards RD 554 faces. Once accepted this data and information can be used to the highest and best interest of the District and the protected community.
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	In development	The plan addresses flooding hazards and can be used to implement mitigation actions. While EOP is in development, there is unofficial protocol of those that live and work on the island. They have used this protocol over a long time to respond to flood and other related hazards.
Continuity of Operations Plan	Y	While EOP is in development, there is unofficial protocol of those that live and work on the island. They have used this protocol over long period of time to respond to flood and other related hazards. The EOP provides continuity for the District and the expected process is to finalize during the next 2 years.
Transportation Plan	N	

Stormwater Management Plan/Program	Y	This category is included in the District standard operations and maintenance procedures. Patrols are dispatched at critical times. Before and after storms, patrols know where to look, inspect and take action to proactively provide flood risk reduction. Procedures are in place to keep water flow moving.
Engineering Studies for Streams	Y	District is contracted with local engineering company who provides counseling and advice of Operations and Management for risk reduction, levee integrity, and mitigation relating to water/flood flows. Engineer provides and satisfies agency interface as well as Fiscal advice.
Community Wildfire Protection Plan	Y	In the event of such hazard, the community Reverse 911 and phone tree would be initiated. Detailed communication from WGFD command center would be put into action.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	N	
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: CBC 2019
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	Y	Walnut Grove SPA County Building Department Walnut Grove HOA
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	Walnut Grove Special Planning Area controls land use and development so could aide in reducing hazard impacts through land use and development criteria. Sacramento County Zoning Code reduces both hazard and growth and development. The District is a mixture of zoned agriculture, commercial and residential property covered by an SPA in itself limits development. The District is mostly zoned agriculture which limits growth and development.
Subdivision ordinance	N	
Floodplain ordinance	Y	Yes, Sacramento County Floodplain Ordinance restricts development in the floodplain
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	Y	PAL - District is working on being mapped back into Zone X

Elevation Certificates	Y	Sacramento County requires Elevation Certificates for new construction. Other outside resources such as insurance companies and mortgage companies may choose to require EC also. There is emphasis and funding from FEMA to raise existing homes to provide safer residential properties against hazards. Thereby reducing risk.
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	Y	5-Year Plan continues to include monitoring for such hazards. Through the Districts standard operating plan, patrols are dispatched at critical times. Special attention is given to inspection of critical erosion sites. The District is responsible for its own main levee repair and maintenance in which procedures are outlined in the general patrol guidelines. Patrols take action to proactively provide erosion or sediment reports. The results are reduced risk for the District and Community.
Other	Y	Pre permit submissions requires an owner to receive RD approval before proceeding forward with permits. This procedure prepares new developers or owners for the risk reduction measure to include in their projects.
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. The District noted the following expansion abilities: Continue to support the Small Communities Program for flood protection and structural and nonstructural mitigation. This Legacy grant is interfaced through GEI/MBK in conjunction with agencies and RD 554 to improve levee integrity. Continue working with the geotechnical engineer to complete a report on the integrity of the District levee to identify deficiencies and develop engineering solutions to reduce risk.		

Source: RD 554

8.6.2. Administrative/Technical Mitigation Capabilities

Table 8-9 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 554.

Table 8-9 RD 554's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	

Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Drainage system is effective. Developing a tree trimming and vegetation clearing plan RD 554 has planned maintenance programs that include annual vegetation management. Levees are mowed, vegetation is trimmed, and roadways are clear for patrol and emergency vehicles to have access.
Mutual aid agreements	Y	RD 554 is contracted with a local engineering company who provides counseling, review, and implementation on risk reduction, levee integrity, and mitigation related to mitigation capabilities. Unofficial coordination between many community members and local residents responding to their respective duties during a hazard. This is very effective risk reduction coordination.
Other	N	
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	Y	Determined by the Fire Department Chief.
Community Planner	Y	County Board of Supervisors through town meetings, board or trustees, and interface with District Engineer.
Civil Engineer	Y, FT	Staff is trained to coordinate with agencies and perform tasks in an emergency situation. The Engineer provides interface with agencies and their staff.
GIS Coordinator	N	
Other	N	
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Reverse 911, phone tree, detailed and organized communication from WGFD command center would be put into action.

Hazard data and information	Y	1. Current 5-year plan is under review and being updated. It describes past, present, and future hazards. These hazards are managed and implemented using the standard operating plan strategies. 2. At this time, an Emergency Operations Plan is still in development. Expected process to the finalized during the next 2 years. 3. 2016 Sacramento County Flood Safety Plan is in place. As well, as a Hazard Plan concerted with Sacramento County with GEI as the interface. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter. 4. Update of the 2016 LHMP continues to include valuable information about the priority of hazards RD 554 faces. Once accepted this data and information can be used to the highest and best interest of the District.
Grant writing	N	
Hazus analysis	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
RD 554 must organize a more appropriate warning system among trustees, public and staff. Additionally, the organization through the Fire Department Chief provides a continuity the community and agencies allowing information to flow more efficiently. Implementing mitigation strategies to improve District LOP for its community. Thus, reducing risk to life and property. This capability is a District priority, but expenditures and allowances of financial resources often slows or stalls efforts to implement preventive operational and maintenance plans.		

Source: RD 554

8.6.3. Fiscal Mitigation Capabilities

Table 8-10 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 8-10 RD 554's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Delta Levees Subventions program to maintain levee system.
Authority to levy taxes for specific purposes	Y	Proposition 218 provides the District with the limited ability to raise benefit assessments through a vote of property owners.

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Fees for water, sewer, gas, or electric services	Y	Fees are assessed by the County for sewer and water. SMUD provides electrical service.
Impact fees for new development	N	Unknown
Storm water utility fee	Y	Benefit Assessments are applied for drainage
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	Y	Districts may borrow from a financial institution can be an option
Community Development Block Grant	N	
Other federal funding programs	N	
State funding programs	Y	Delta Levee Subventions Program Delta Levee Special Projects Proposition 84 and 1E Small Community Plan
Other	N	Additional funding would allow more projects to be completed per year adding staff to better reduce the risk in the District
How can these capabilities be expanded and improved to reduce risk?		
The involvement of Federal agencies funds would help in reducing risk as well as the removal of the sunset clause on the Delta Levees Subventions Program. The involvement of Federal agencies funds would help in reducing risk. RD 554 is in the Subventions Program.		

Source: RD 554

8.6.4. Mitigation Education, Outreach, and Partnerships

Table 8-11 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 8-11 RD 554's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	Walnut Grove Volunteer Fire Department, Delta Citizens Municipal Advisory Council, Walnut Grove HO and Merchants Association, Rotary Club of Walnut Grove, River Delta Historical Society, River Delta Unified School District.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Department of Water Resources Delta Flood Emergency Preparedness, Cal OES, Sacramento County OES River Delta Unified School District

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	Y	Through neighboring RD's, unofficial partnerships are in place for assistance in the event of a hazard.
Other	Y	RD 554 is contracted with a local engineering company who provides counseling, review, and implementation on risk reduction, levee integrity, and mitigation related to mitigation capabilities. Unofficial coordination between many community members and local residents responding to their respective duties during a hazard is in place. This is a very effective risk reduction coordination.
How can these capabilities be expanded and improved to reduce risk?		
As a small number of people district, current planned coordination for RD 554 is consistently reviewed, implemented, and quite effective. Continuation of improving outreach programs in coordination with State agencies and neighboring RD's may be helpful in community education about disaster related issued.		

Source: RD 554

8.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

- The US Army Corps of Engineers performed an erosion repair project along the Sacramento River levee summer 2007 to create a riparian bench and resolve erosion issues. The District is currently developing a geotechnical study to locate deficiencies within the system. The District is still completing the geotechnical studies to identify deficiencies within the system. Once the problematic areas are identified. the District will perform repair projects to improve the levee system and reduce risk to the District and its communities.
- Cross levee interface at Snodgrass Slough
- Erosion Repair on the Sacramento River downstream of the cross channel
- Stability berm and levee profile rehabilitation along Snodgrass Slough and small section across the Cross Channel levee (minor)

8.7 Mitigation Strategy

8.7.1. Mitigation Goals and Objectives

The RD 554 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

8.7.2. Mitigation Actions

The planning team for the RD 554 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Small Communities Plans – Flood Protection – Structural and Nonstructural Mitigation

Hazards Addressed: Floods, Levee Failure, Heavy Rain and Storms, and Disadvantaged Community

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: BALMD and RD#554 Walnut Grove East, Sacramento County, are included in the Small Communities Plans. These and other communities obtained grants under the CA DWR flood protection programs. Phase 1 provided the resourced to access and evaluate levee and flood risks. The upcoming Phase 2 of the program will involve implementation and construction of mitigation projects identified in Phase 1.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects brought to light in the Small Communities Plans. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, cross levee interface at Snodgrass Slough, Erosion repair on the Sacramento River downstream of the cross channel, and stability berm and levee profile rehabilitation along Snodgrass Slough and small section across the Cross Channel levee (minor). In general, these projects will contain many levee and flood management improvements including but not

limited to environmental projects such as burrowing animal mitigations, levee repairs, erosion control, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: Small Communities Projects; Disadvantaged Community Projects; 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; and 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners:

1. Isleton – BALMD (RD 317, RD 407)

2. Walnut Grove East – RED 554 Walnut Grove

3. Walnut Grove West – RD 3 Grand Island

4. Locke – RD 369 Libby McNeil

5. Courtland – RD 551 Courtland

Cost Estimate: Phase 1 of the Small Communities projects were $500,000 per community. Phase 2 Construction Costs will be determined upon the completion of Phase 1

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR, FEMA hazard mitigation, the Army Corps of Engineers, 2021 HMA Grants (BRIC and FMA), and others.

Timeline: Upon completion of Phase 1 and moving into Phase 2 Construction a timeline would be included.

Project Priority (H, M, L): High

Action 2. Disadvantaged Community Projects and subsequent updating in 2021.

Hazards Addressed: Floods, Levee Failure, Heavy Rain and Storms, and Disadvantaged Community

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD554. The plans include information that sets up SEMS/NIMS processes, identifies

critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, cross levee interface at Snodgrass Slough, Erosion repair on the Sacramento River downstream of the cross channel, and stability berm and levee profile rehabilitation along Snodgrass Slough and small section across the Cross Channel levee (minor). In general, these projects will contain many levee and flood management improvements including but not limited to, levee repairs, erosion control and repair, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; Disadvantage Community Projects; Small Communities Program Projects; 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; FEMA hazard mitigations, the Army Corps of Engineers; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Action 3. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.

Hazards Addressed: Floods, Levee Failure, Heavy Rain and Storms, and Disadvantaged Community

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD554. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, cross levee interface at Snodgrass Slough, Erosion repair on the Sacramento River downstream of the cross channel, and stability berm and levee profile rehabilitation along Snodgrass Slough and small section across the Cross Channel levee (minor). In general, these projects will contain many levee and flood management improvements including but not limited to, levee repairs, erosion control and repair, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; 2021 Emergency Operations Plan (EOP) – Currently in development; Disadvantage Community Projects; Small Communities Program Projects; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; FEMA hazard mitigations, the Army Corps of Engineers; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Action 4. 2021 Emergency Operations Plan (EOP) – Currently in development

Hazards Addressed: Floods, Levee Failure, Heavy Rain and Storms, and Disadvantaged Community

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD554. The EOP is coordination between RD554 team members to clarify and ensure conformance and focus to prevent duplication efforts when a solution is available and planned.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, cross levee interface at Snodgrass Slough, Erosion repair on the Sacramento River downstream of the cross channel, and stability berm and levee profile rehabilitation along Snodgrass Slough and small section across the Cross Channel levee (minor). In general, these projects will contain many levee and flood management improvements including but not limited to, levee repairs, erosion control and repair, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2021 Emergency Operations Plan (EOP) – Currently in development; 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021; Regional Flood Management Plan; Disadvantaged Community Projects and the Small Communities Program Projects; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; FEMA hazard mitigations, the Army Corps of Engineers; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Action 5. Regional Flood Management Plan Projects

Hazards Addressed: Floods, Levee Failure, Heavy Rain and Storms, and Disadvantaged Community

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD554.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects brought to light in the Small Communities Plans. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, cross levee interface at Snodgrass Slough, Erosion repair on the Sacramento River downstream of the cross channel, and stability berm and levee profile rehabilitation along Snodgrass Slough and small section across the Cross Channel levee (minor). In general, these projects will contain many levee and flood management improvements including but not limited to environmental projects such as burrowing animal mitigations, levee repairs, erosion control, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; Small Communities Program Projects; Disadvantaged Community Projects, and 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Delta Annex Chapter 9 Reclamation District 556

9.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 556 (RD 556 or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 556, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

9.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 9-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 9-1 RD 556 – Planning Team

Name	Position/Title	How Participated
Jeff Tranum	Chairman, Board of Trustees	Provided information regarding the annex.
Gilbert Labrie	Contract District Engineer	Attended planning meetings. Provided information regarding the annex.
Barb McGowan	Assistant to District Engineer	Provided information regarding the annex.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 9-2.

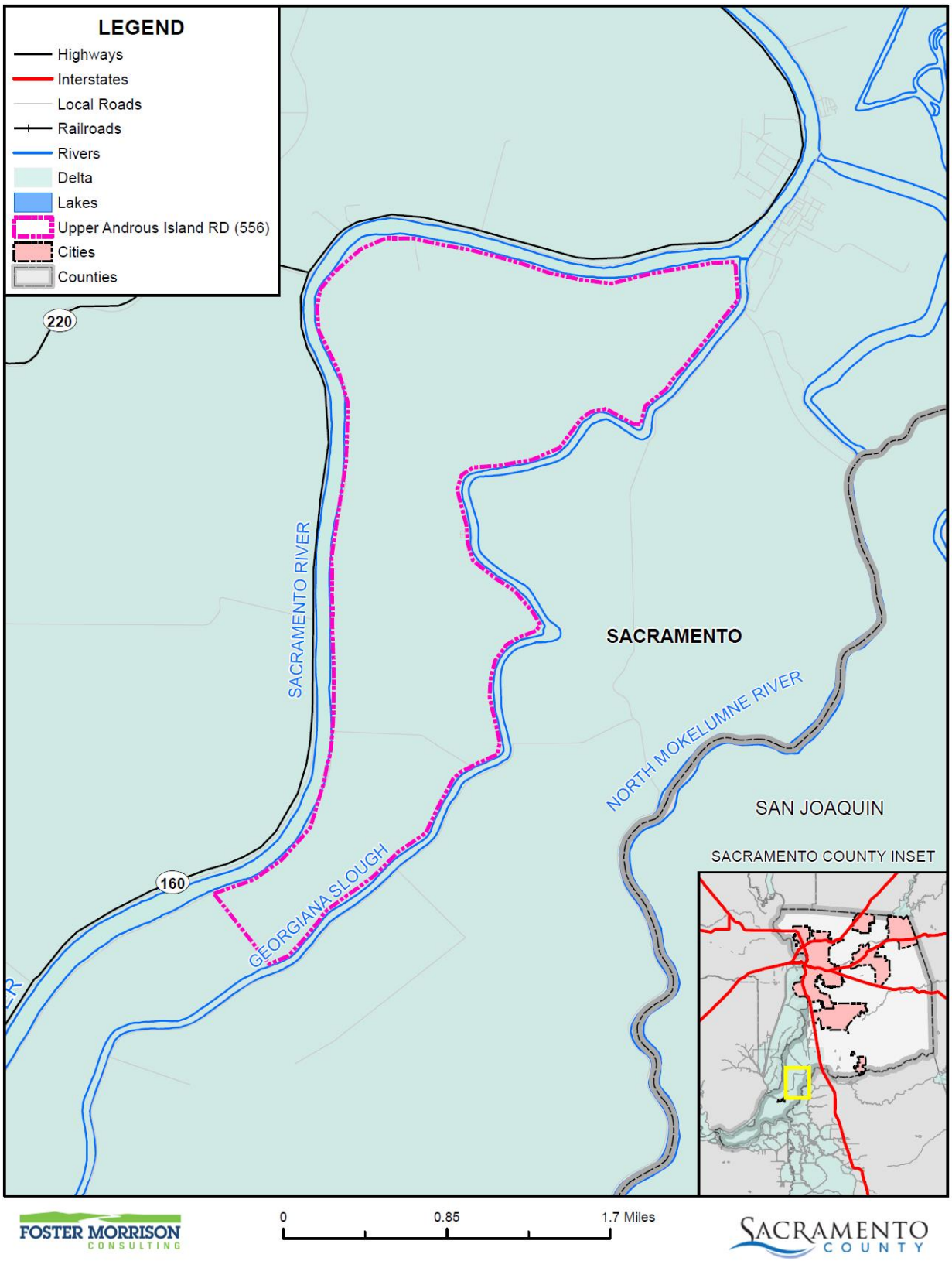
Table 9-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
2016 Sacramento County Flood Safety Plan (by GEI). Currently being updated in 2021	The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter.
2021 Emergency Operations Plan (EOP)	Coordination between RD 554 team members to clarify and ensure conformance and focus to prevent duplication efforts when a solution is available and planned.

9.3 District Profile

The District profile for the RD 556 is detailed in the following sections. Figure 9-1 displays a map and the location of the District within Sacramento County.

Figure 9-1 RD 556



Data Source: Upper Androus Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

9.3.1. Overview and Background

Reclamation District 556 was established on September 8, 1983, by the Water Code section 50000 et seq. There are five trustees that are elected every four years. The terms are staggered.

The District is currently under the FEMA Flood Zone designation AE. Meaning the District has a greater than 1% chance annually that it will flood, restricting development.

9.4 Hazard Identification

RD 556 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 9-3).

Table 9-3 RD 556—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Limited	Occasional	Negligible	Low	–
Dam Failure	Limited	Occasional	Limited	Medium	Medium
Drought & Water Shortage	Significant	Likely	Limited	Low	High
Earthquake	Limited	Occasional	Limited	Low	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Low	Low
Floods: 1%/0.2% annual chance	Limited	Occasional	Limited	High	Medium
Floods: Localized Stormwater	Limited	Highly Likely	Limited	Low	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Limited	Low	Medium
Levee Failure	Significant	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Limited	Occasional	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Low	Low
Subsidence	Limited	Occasional	Limited	Medium	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Likely	Limited	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

9.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

9.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 9.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 9-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

9.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 556's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 9-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 556's physical assets, valued at over $26 million, consist of the buildings and infrastructure to support the District's operations.

Table 9-4 RD 556 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Levee	Infrastructure	$20,000,000	Floods, Subsidence, Dam Failure, Heavy Rain and Storms
Cross-Levee	Infrastructure	$5,000,000	Floods, Heavy Rain and Storms
Pump Station	Infrastructure	$1,000,000	Floods, Heavy Rain and Storms
Total		**$26,000,000**	

Source: RD 556

Natural Resources

RD 556 has a variety of natural resources of value to the District. The District is primarily comprised of cultivated lands within the interior of the island. Some riparian habitats can be found on the waterside slope of the levees.

Historic and Cultural Resources

RD 556 has a variety of historic and cultural resources of value to the District. There are no registered historical sites. But the bucolic nature of the historic farm homes surrounded by crops within the island adds to cultural value of the Delta as place.

Growth and Development Trends

Due to zoning and floodplain restrictions, essentially no growth has occurred on the island in recent history. For this reason no growth is expected. As such, a change in vulnerability is unlikely.

Development since 2016

No District facilities have been constructed since 2016. As such, vulnerability to the District remains unchanged.

Future Development

Due to zoning and floodplain restrictions, essentially no growth has occurred on the island in recent history. For this reason no growth is expected. The District did note that long range plans are to include erosion repairs and deferred maintenance of levee vegetation.

9.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 9-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard

Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Currently, there is no affect and no backup power is required. This could change if the length of outage is significant.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This

was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

Currently, there is no affect and no backup power is required. This could change if the length of outage is significant.

Dam Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped or fail. Overtopping is the primary cause of earthen dam failure in the United States.

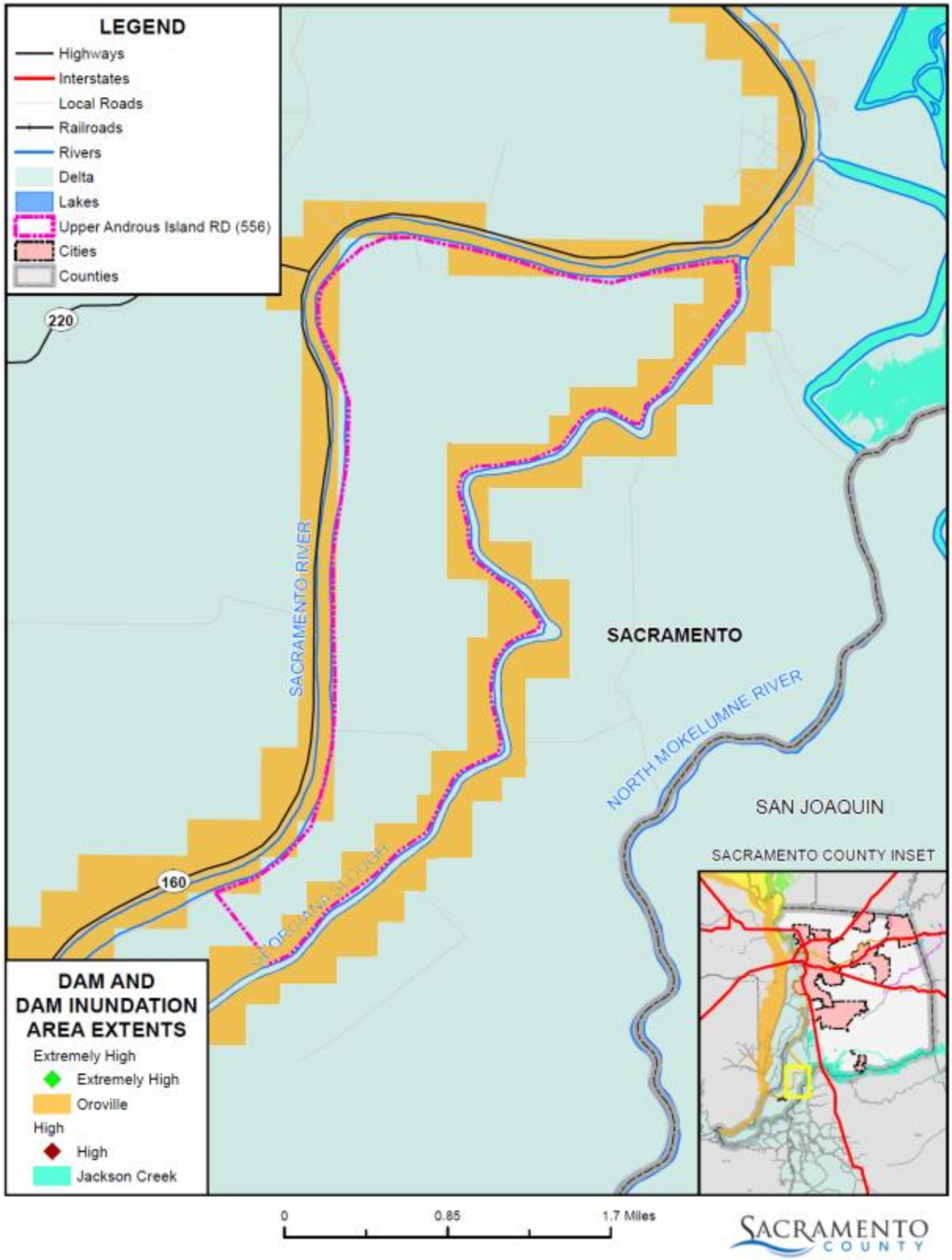
Location and Extent

Dam failure is a natural disaster from two perspectives. First, the inundation from released waters resulting from dam failure is related to naturally occurring floodwaters. Second, a total dam failure would most probably happen as a consequence of the natural disaster triggering the event, such as an earthquake. There is no scale with which to measure dam failure. However, Cal DWR Division of Safety of Dams (DOSD) assigns hazard ratings to dams within the State that provides information on the potential impact should a dam fail. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in four categories that identify the potential hazard to life and property: Low, Significant, High, and Extremely High. These were discussed in more detail in Section 4.3.7 of the Base Plan.

While a dam may fill slowly with runoff from winter storms, a dam break has a very quick speed of onset. The duration of dam failure is generally not long – only as long as it takes to empty the reservoir of water the dam held back. The District would be affected for as long as the flood waters from the dam failure took to drain downstream.

There are no dams inside the County whose inundations would affect RD 556. Dams outside the County that can affect the District can be seen on Figure 9-2.

Figure 9-2 RD 556 – Dam Inundation Areas from Dams Outside the County



Data Source: DWR DSOD Data 2020 and Cal OES Dam Status 10/2017, Upper Androus Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 9/2020.

Past Occurrences

There has been no federal or state disaster declarations for dam failure in the County. The District noted no other dam failure occurrences that have affected the District.

Vulnerability to and Impacts from Dam Failure

Dam failure flooding would vary by community depending on which dam fails and the nature and extent of the dam failure and associated flooding. Impacts to the District from a dam failure flood could include loss of life and injury, flooding and damage to property and structures, damage to critical facilities and infrastructure, loss of natural resources, and all other flood related impacts. Additionally, mass evacuations and associated economic losses can also be significant.

While unlikely, it is possible that dam failure can create a high water situation in the adjacent channels that could put the levee system at risk of failure from overtopping, under seepage, through seepage or debris impact. Given the distance from the dam system, a dam surge could dissipate prior to reaching this point in the Delta and result in a minor change in water elevation.

The District noted that Georgiana Slough is vulnerable to overtopping and through seepage. Over topping of the cross levee would flood the City of Isleton, Highway 160, Highway 12, and other access roads.

Assets at Risk

The levees are at the highest risk to this hazard. Historic homes could be lost as a result of flooding due to dam failure. Riparian habitats that border the channel can be lost due to erosive forces of high flows from dam failure.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

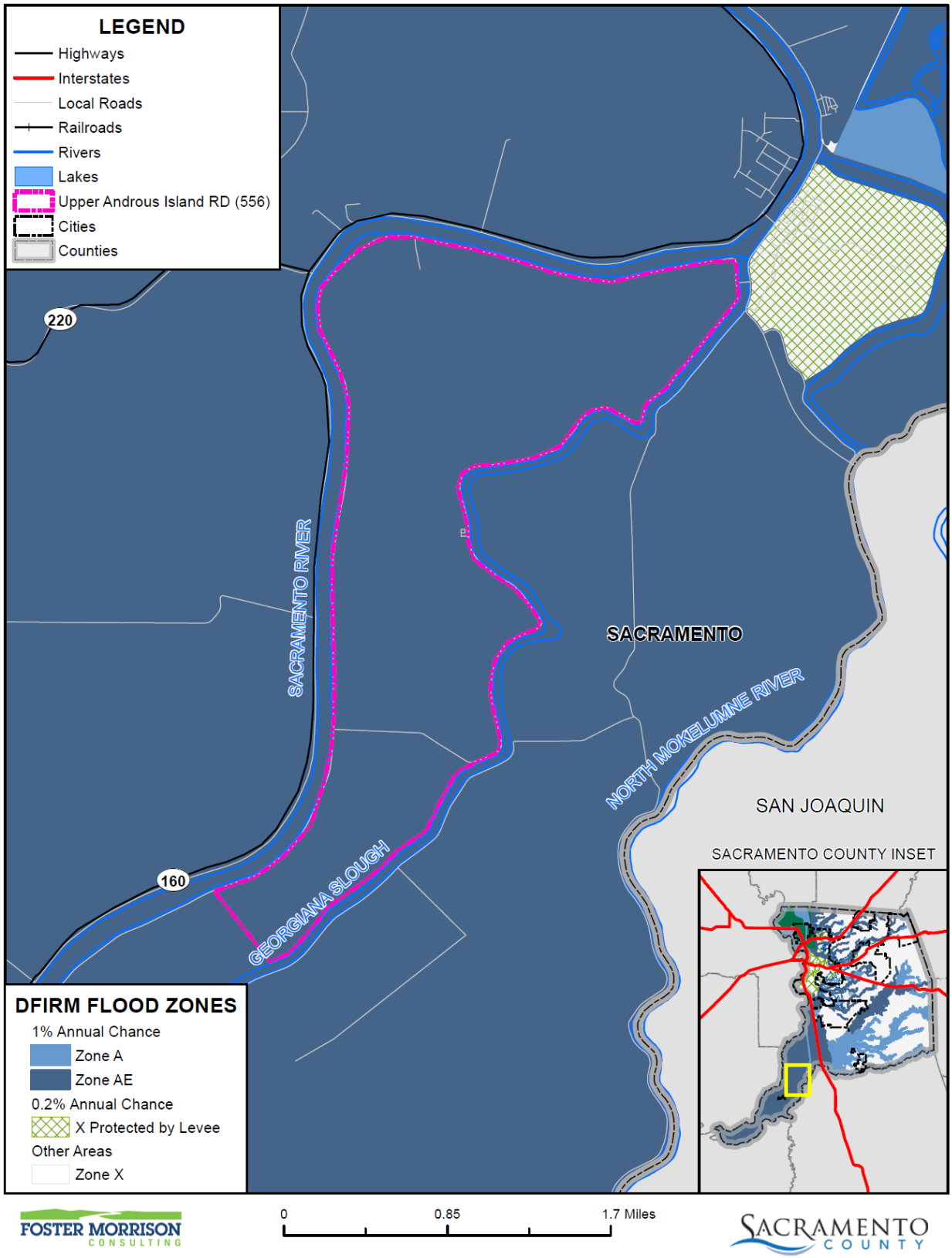
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the RD 556 have been subject to historical flooding.

Location and Extent

All of RD 556 is located in the 1% annual chance floodplain. This is seen in Figure 9-3.

Figure 9-3 RD 556 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Upper Androus Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 9-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 9-5 RD 556– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 9-6. These events also likely affected the District to some degree.

Table 9-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

1986 and 1997 was the closest the District came to experiencing a 100-year flood. The District has not experienced a 200 or 500-year flood. The District noted the following high water events (HWE) since 2016:

- 2017 HWE: Initiated extra monitoring

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

A 100/200/500-year flood event could cause flooding within the District. A high water event, depending on the water elevation, could cause failure due to overtopping but more realistically could increase hydraulic gradients within the levee section resulting in landside seepage or boils. Continued seepage, if left unaddressed, could erode the levee and result in failure. Heavy flows could also cause erosion and scour on the waterside bank that could undermine the levee and cause failure.

Assets at Risk

The levee system and pumping station are vulnerable to a 100/200/500-year flood, as the flows could exceed the capacity of both the levee system and the pumping station that is needed to drain the island. Riparian habitats that border the channel can be lost due to erosive forces of high flows from 100/200/500-year flows. Historic homes could be lost as a result of flooding due to a 100/200/500 year flood event.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

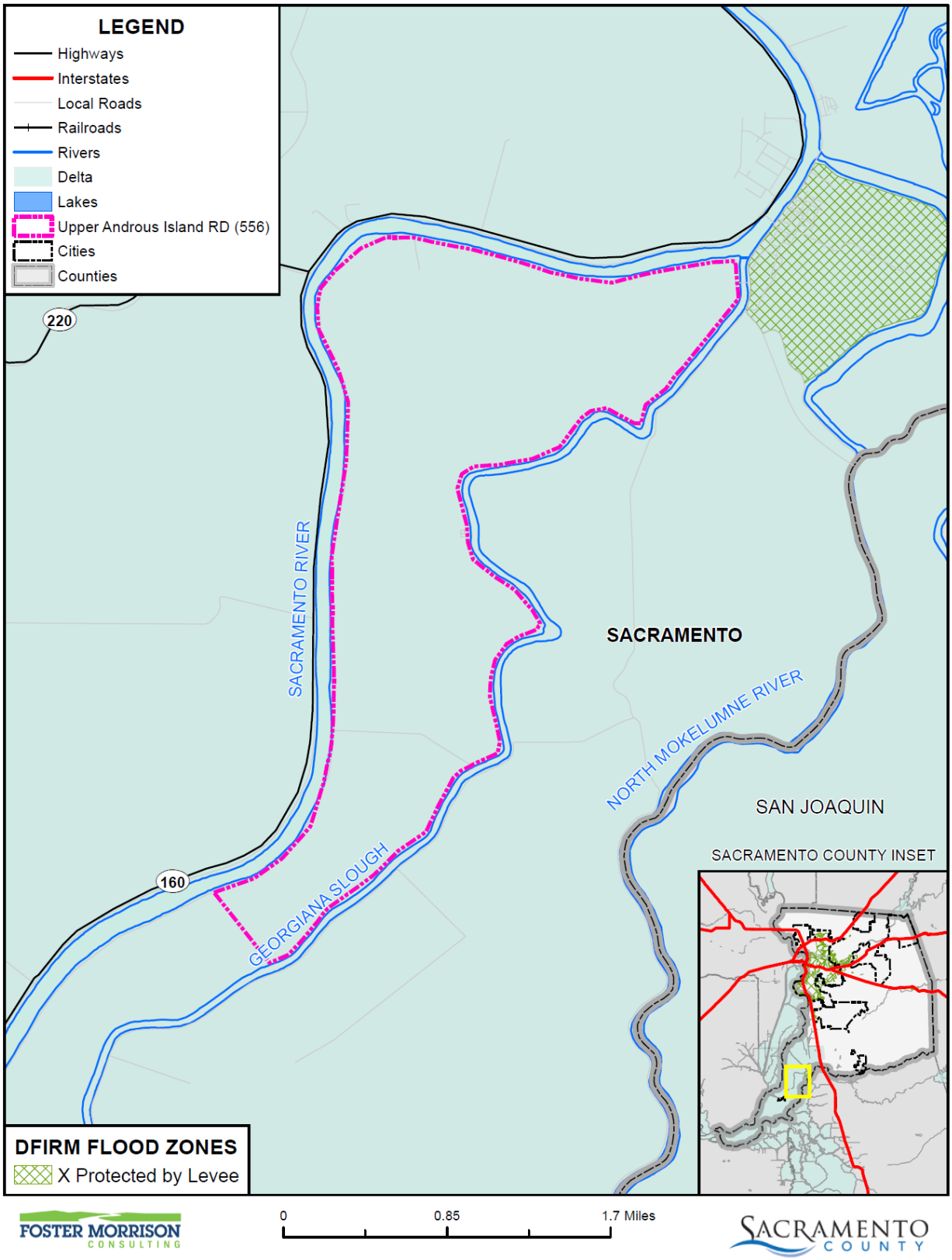
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 9-4. As shown, the levees in the District are not certified on FEMA DFIRMs as providing flood protection to the 1% annual chance flood. DCC Engineering Co., Inc. has prepared a Levee System Status Map of RD #556 dated 8/2/2021 that is shown on Figure 9-5.

Figure 9-4 RD 556 – Levee Protected Areas

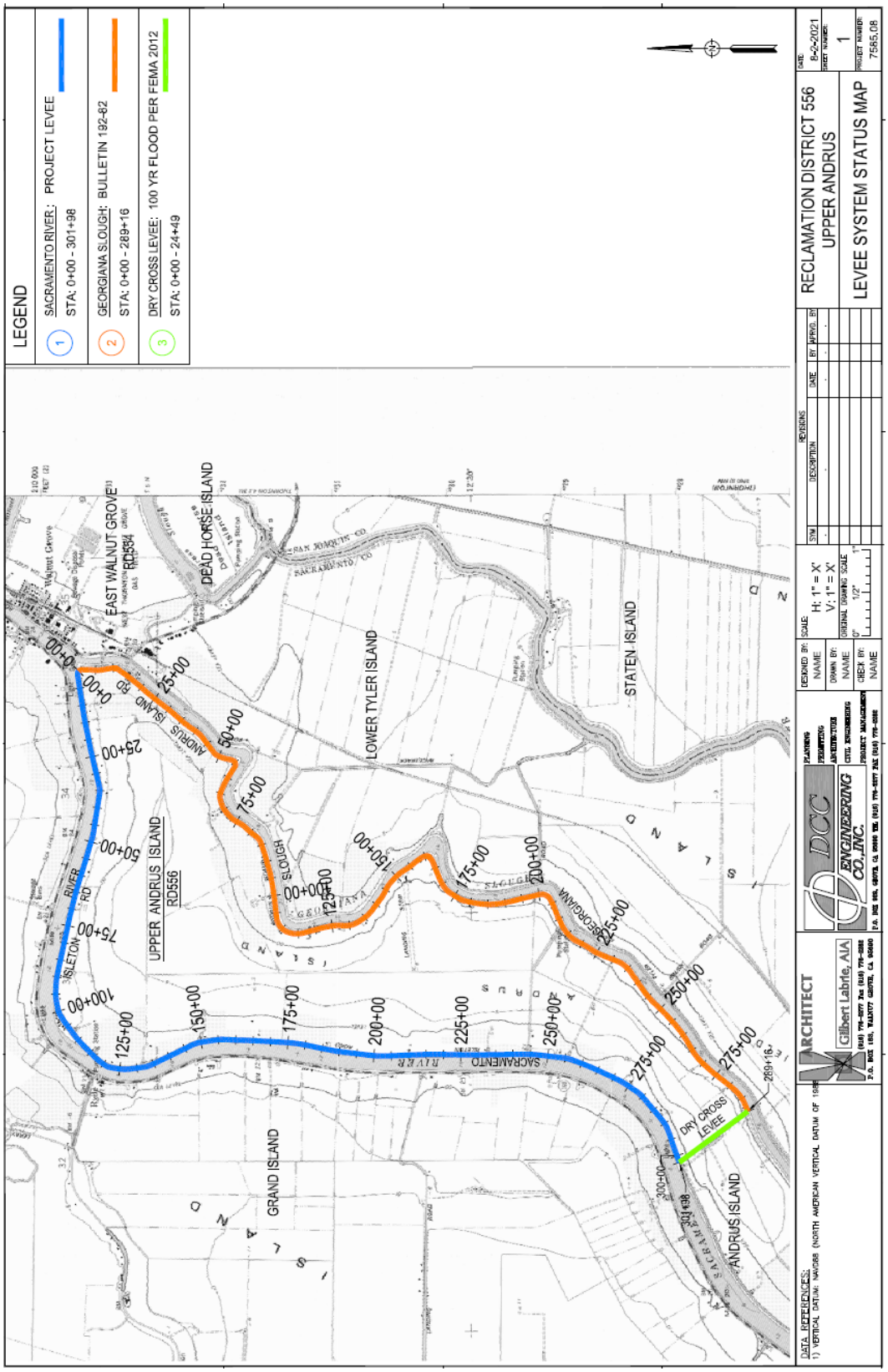


FOSTER MORRISON CONSULTING

SACRAMENTO COUNTY

Data Source: FEMA NFHL 07/19/2018, Upper Androus Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure 9-5 RD 556 – Levee Status



Source: RD 556, DCC Engineering

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted no past occurrences of levee failures.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Levee failure could result in inundation of the District and could also result in the flooding of the island. A RD 556 breach would incur raising the cross levee. It would also flood Brannan-Andrus Island (BALMD) where the City of Isleton is located. An estimate would be approximately $260,500,000. Increased levee protection and additional levee improvements in the 5-year plan, including but not limited to:

- Dry Cross levee interface
- Erosion Repair on the Sacramento River and Georgiana Slough.

StormReady Flood Scenarios and Evacuation Routes

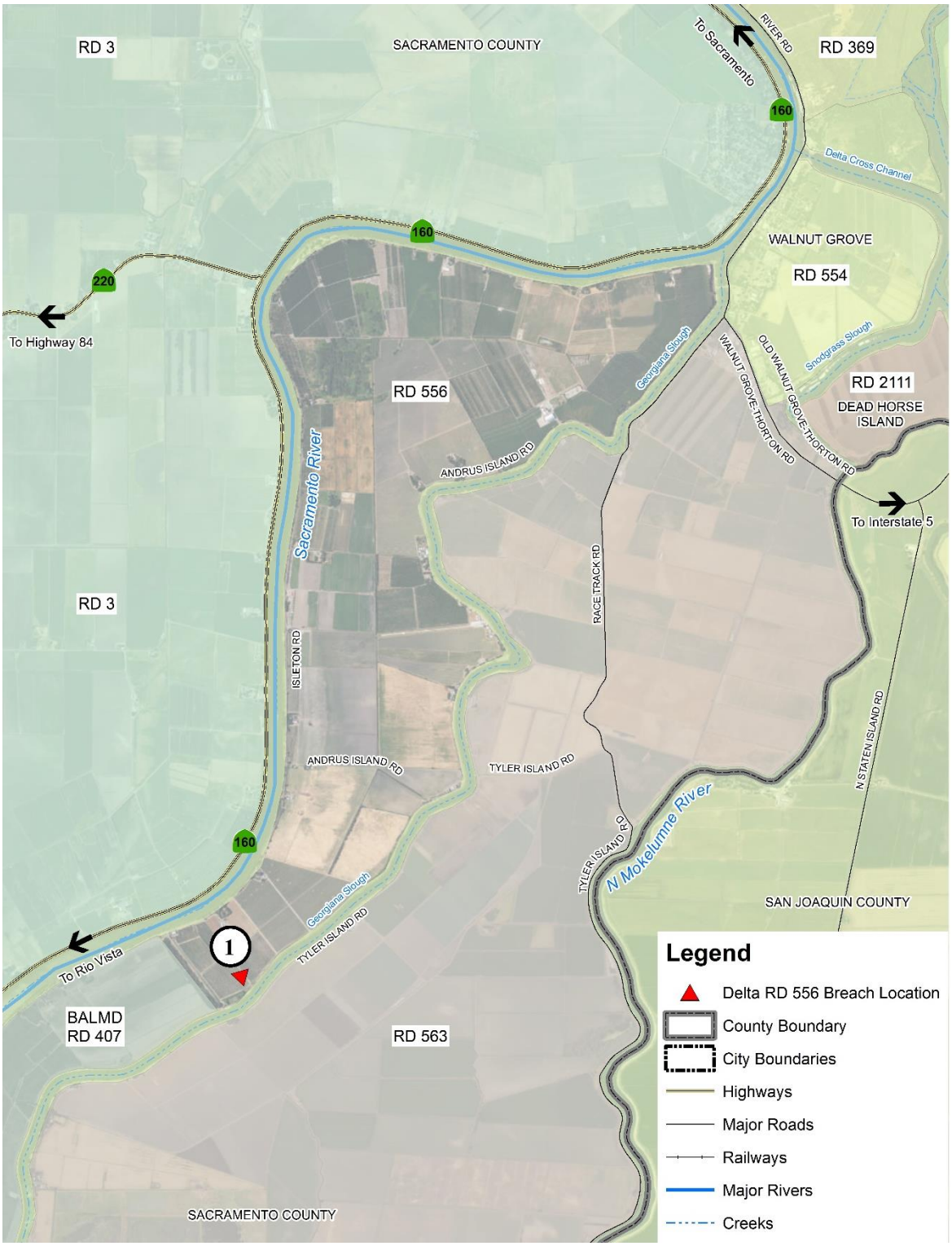
The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

For RD 556, Figure 9-6 details the locations in the Delta within RD 556 where flooding could occur. The red triangles denote potential levee breach locations. RD 556 has one potential levee break scenario. Maps for Scenario 1 regarding time to one foot inundation (Figure 9-7), estimated flood depths (Figure 9-8), and suggested evacuation routes (Figure 9-9) are displayed below.

Note: This information is based on assumptions and scenarios developed as part of the flood safety planning done for Delta RDs in 2017; areas of possible flooding depicted in these maps may or may not reflect

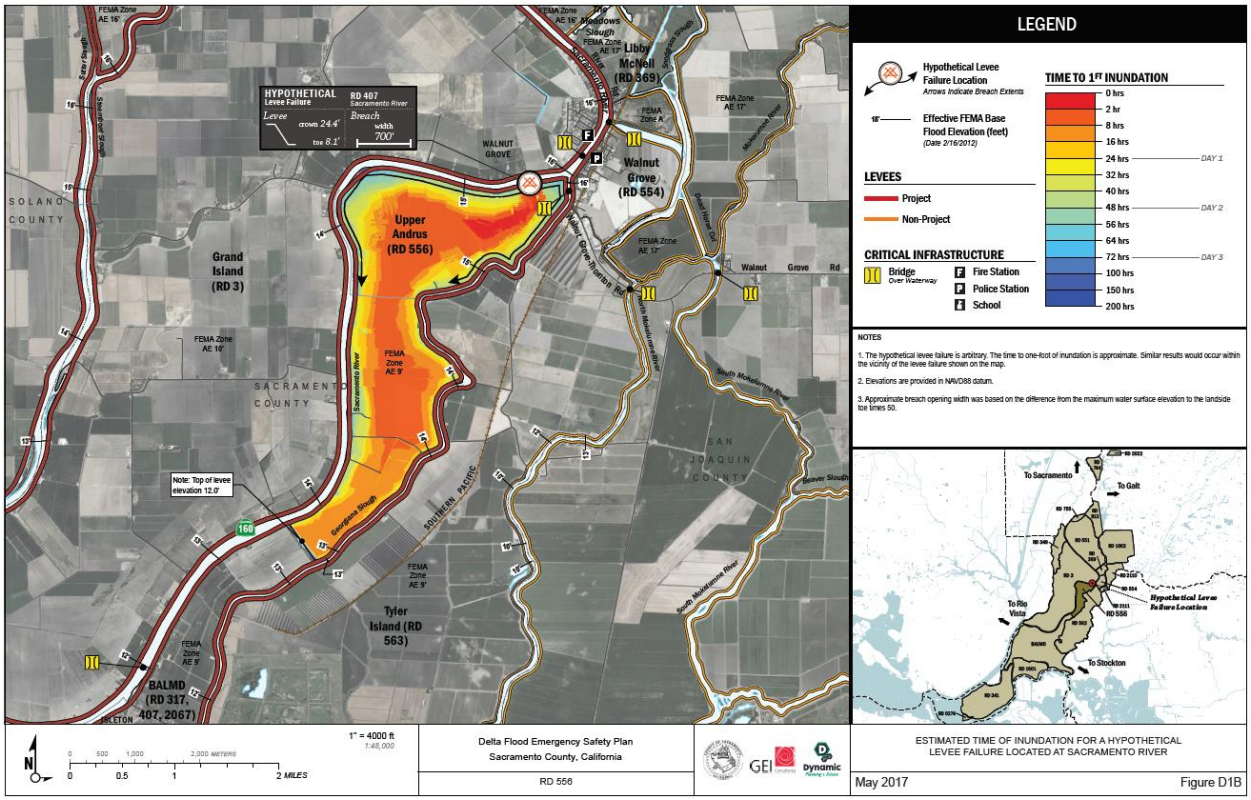
current conditions and would change depending on the location of breach areas and conditions during any given event. Current conditions should be verified with an LMA representative.

Figure 9-6 RD 556 – Potential Levee Breach Location



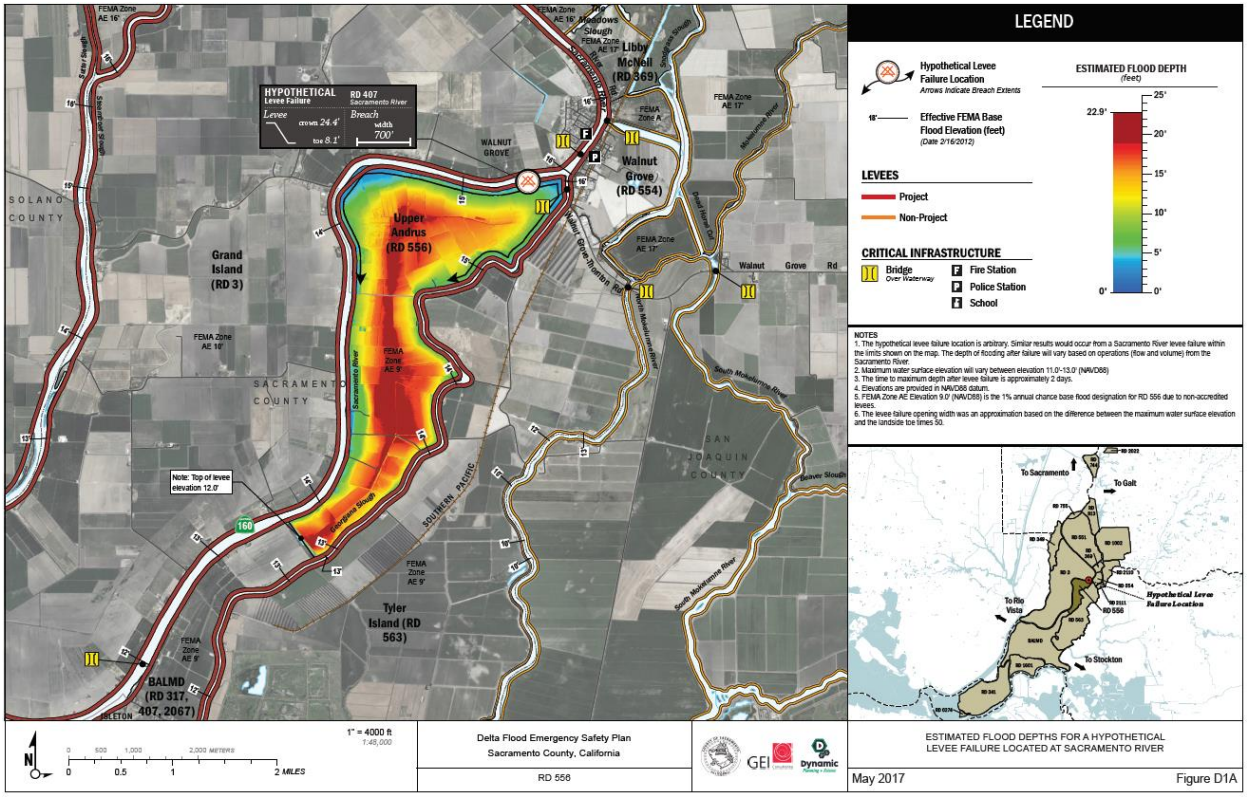
Source: RD 556, DCC Engineering

Figure 9-7 RD 556 – Time to One Foot Inundation after Levee Breach



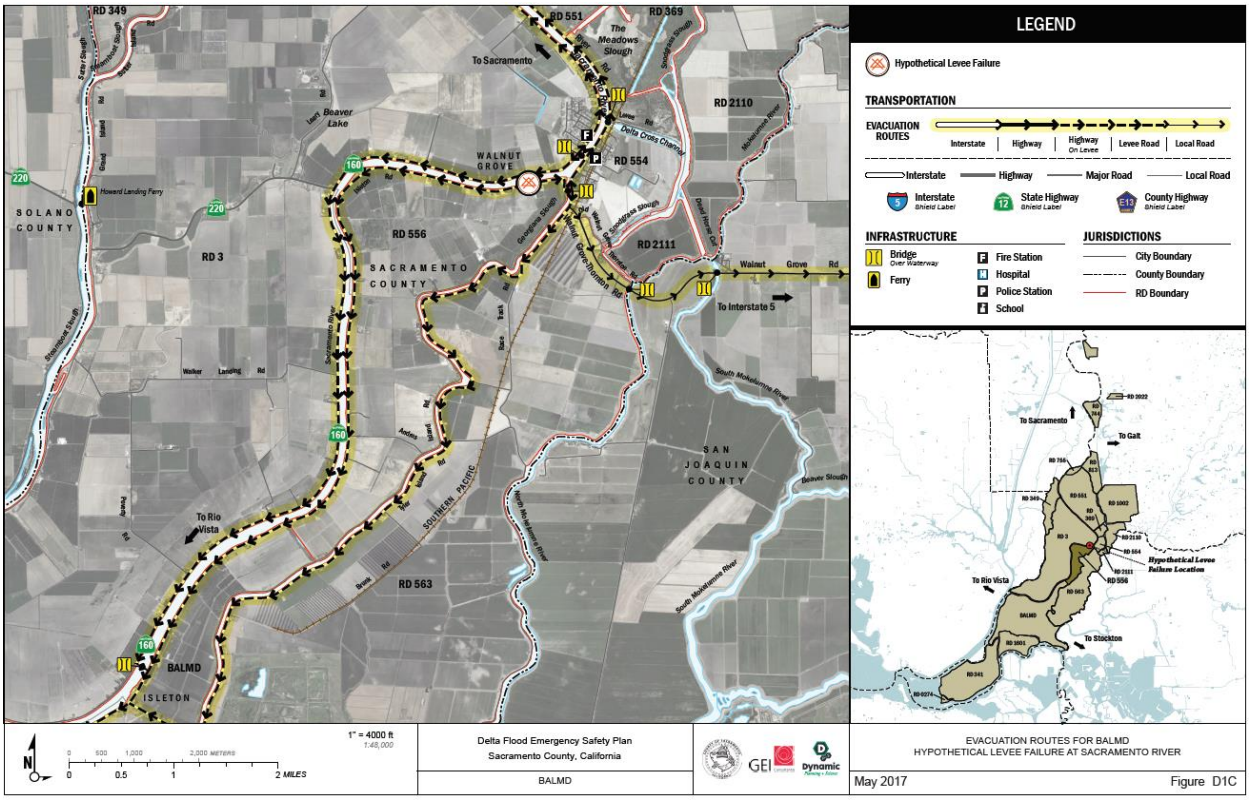
Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 9-8 RD 556 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 9-9 RD 556 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 16, 2021

Assets at Risk

Assets at risk include the levees and district pumping plant. An island inundation can create an open water situation where a large fetch could develop and erode the interior of other levees within the District. Inundation of the drainage pump can make it inoperable and require replacement.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

The last heavy rain and storm event the District experienced was in 2006, 1997 and 1986. No significant damages occurred due to these high water events. Storms since 2016 were noted as:

- 2017 HWE: Initiated extra monitoring. Severe weather resulted in excess electrical cost to pump the excess run off required to prevent localized flooding. No significant damage.
- 2017 HWE: Initiated extra monitoring of water flow which in turn results in seepage issues on the Georgiana Slough.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding.

The District Planning Team noted that heavy rains and storms can result in higher flood flows that could increase the hydraulic gradients within the levee section and result in seepage or if great enough, possibly overtopping. They can also increase flows and result in erosion of the waterside bank.

Vulnerability and impacts from Severe Weather heightens staffing responsiveness for extra monitoring of levees and water flow which in turn could result in seepage on the Georgiana Slough. Severe Weather has the potential for implementation of flood fighting plans as a protection for levees and community members.

Assets at Risk

The District levees and pumping plant are at risk of damage from heavy rains and storms. Riparian benches could be lost from high flows as a result of heavy rains and large storms.

Subsidence

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Subsidence is the gradual settling or sinking of the earth's surface over manmade or natural underground voids with little or no horizontal motion. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. Subsidence is worsened when groundwater drawdown exceeds the ability of the ground to naturally recharge. This is more common during periods of drought.

Location and Extent

There is no scientific scale to measure subsidence. Subsidence is measured in inches or feet of elevation change over time. Subsidence has a long speed of onset, as it occurs over many years. The duration of subsidence is long, as it is rare for subsidence to be reversed. In Sacramento County, the Delta in the southeast portion of the County is highly at risk to subsidence. In the Delta, subsidence affects the islands as well as the levees.

Past Occurrences

There have been no state or federal disasters in the County related to subsidence. No events of past subsidence have affected the District. The District noted that subsidence occurs over time, so pinning a past occurrence is difficult.

Vulnerability to and Impacts from Subsidence

Historically, the County has been at risk from subsidence. Vulnerability in the County from subsidence comes from several different causes:

- Compaction of Unconsolidated Soils by Earthquake Shaking (Liquefaction)
- Compaction by Heavy Structures
- The Erosion of Peat Soils
- Fluid Withdrawal

These were discussed in detail in Section 4.3.16 of the Base Plan. The District is concerned with all four causes. Subsidence will cause the District levees additional stress.

Assets at Risk

The District levees are most at risk from this hazard.

9.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

9.6.1. Regulatory Mitigation Capabilities

Table 9-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 556.

Table 9-7 RD 556 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y	1. Current 5-year plan is under review and being updated. It describes past, present, and future hazards. These hazards are managed and implemented using the standard operating plan strategies. 2. At this time, an Emergency Operations Plan Update is still in development. Expected process to the finalized during the next 2 years. 3. 2016 Sacramento County Flood Safety Plan is in place. As well, as a Hazard Plan concerted with Sacramento County with GEI as the interface. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter. 4. Update of the 2016 LHMP continues to include valuable information about the priority of hazards RD 556 faces. Once accepted this data and information can be used to the highest and best protection of the District and its communities.
Capital Improvements Plan	N	
Economic Development Plan	N	

Local Emergency Operations Plan	In development	While EOP is in development, there is unofficial protocol of those that live and work on the island. They have used this protocol over long period of time to respond to flood and other related hazards. The EOP provides continuity for the District and the expected process is to finalize during the next 2 years.
Continuity of Operations Plan	Y	While EOP is in development, there is unofficial protocol of those that live and work on the island. They have used this protocol over long period of time to respond to flood and other related hazards. The EOP provides continuity for the District and the expected process is to finalize during the next 2 years.
Transportation Plan	N	
Stormwater Management Plan/Program	Y	This category is included in the District standard operations and maintenance procedures. Patrols are dispatched At critical times. Before and after storms, patrols know where to look, inspect and take action to proactively provide flood risk reduction. Procedures are in place to keep water flow moving.
Engineering Studies for Streams	Y	District is contracted with local engineering company who provides counseling and advice of Operations and Management for risk reduction, levee integrity, and mitigation relating to water/flood flows. Engineer provides and satisfies agency interface as well as Fiscal advice.
Community Wildfire Protection Plan	Y	In the event of such hazard, the community Reverse 911 and phone tree would be initiated. Detailed communication from WGFD command center would be put into action.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	N	
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: CBC 2019
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	Y	Standard County Building Permit requirements.
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	Sacramento County Zoning Code reduces both hazard and growth and development. The District is a mixture of zoned agriculture and residential property which, in itself also limits development. The District is mostly zoned agriculture which limits growth and development.
Subdivision ordinance	N	
Floodplain ordinance	Y	Yes, Sacramento County Floodplain Ordinance restricts development in the floodplain

Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	Y	AE Zone
Elevation Certificates	Y	Sacramento County requires Elevation Certificates for new construction. Other outside resources such as insurance companies and mortgage companies may choose to require EC also. There is emphasis and funding from FEMA to raise existing homes to provide safer residential properties against hazards. Thereby reducing risk.
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	Y	5-Year Plan continues to include monitoring for such hazards. Through the Districts standard operating plan, patrols are dispatched at critical times. Special attention is given to inspection of critical erosion sites. The District is responsible for its own main levee repair and maintenance in which procedures are outlined in the general patrol guidelines. Patrols take action to proactively provide erosion or sediment reports.
Other	Y	Pre permit submissions requires an owner to receive RD approval before proceeding forward with permits.
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. RD 556 will create a Five Year Plan to develop projects that reduce risk to life and property. RD 556 would like to expand and improve to reduce risk by: Research and development into the project levee standard deficiencies for the Georgiana Slough. This capability is a District priority, but expenditures and allowances of financial resources often slows or stalls efforts to implement preventive maintenance plans. Work with BALMD to develop a flood response strategy for RD 556 flooding and over topping of the cross levee.		

Source: RD 556

9.6.2. Administrative/Technical Mitigation Capabilities

Table 9-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 556.

Table 9-8 RD 556's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	

Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Drainage system is effective. Developing a tree trimming and vegetation clearing plan RD 556 has planned maintenance programs that include vegetation management. Levees are mowed, vegetation is trimmed, and roadways are clear for patrol and emergency vehicles to have access.
Mutual aid agreements	Y	RD 1002 is contracted with a local engineering company who provides counseling, review, and implementation on risk reduction, levee integrity, and mitigation related to mitigation capabilities. Unofficial coordination between many community members and local residents responding to their respective duties during a hazard. This is very effective risk reduction coordination.
Other	N	
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	Y	Determined via the Sacramento County Flood Safety Plan and Emergency Operations Plan that is in development
Emergency Manager	Y	Determined via the Emergency Operations Plan (in development) and in use until plan adoption. The EM also coordinates the many community members and local residents responding to their respective duties during a hazard
Community Planner	Y	County Board of Supervisors through town meetings, board or trustees, and interface with District Engineer.
Civil Engineer	Y	Staff is trained to coordinate with agencies and perform tasks in an emergency situation. The Engineer provides interface with agencies and their staff.
GIS Coordinator	N	
Other	N	
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Reverse 911, phone tree, detailed and organized communication from WGFD command center would be put into action.

Hazard data and information	Y	1. Current 5-year plan is under review and being updated. It describes past, present, and future hazards. These hazards are managed and implemented using the standard operating plan strategies. 2. At this time, an Emergency Operations Plan Update is still in development. Expected process to the finalized during the next 2 years. 3. 2016 Sacramento County Flood Safety Plan is in place. As well, as a Hazard Plan concerted with Sacramento County with GEI as the interface. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter. 4. Update of the 2016 LHMP continues to include valuable information about the priority of hazards RD 1002 faces. Once accepted this data and information can be used to the highest and best interest of the District.
Grant writing	N	
Hazus analysis	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
RD 556 must organize a more appropriate warning system among trustees, public and staff. Also needs to have a plan in place to determine an Emergency Manager to coordinate Emergency Response activities. This are being worked on now to expand capabilities.		

Source: RD 556

9.6.3. Fiscal Mitigation Capabilities

Table 9-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 9-9 RD 556's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Delta Levees Subventions program to maintain levee system.
Authority to levy taxes for specific purposes	Y	Proposition 218 provides the District with the limited ability to raise benefit assessments through a vote of property owners.
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Storm water utility fee	Y	Benefit Assessments are applied for drainage
Incur debt through general obligation bonds and/or special tax bonds	N	
Incur debt through private activities	Y	~~Bonds are obtained from the Bank of Rio Vista~~ Districts may borrow from a financial institution can be an option
Community Development Block Grant	N	
Other federal funding programs	N	
State funding programs	Y	State or local approved grants would be another financial resource for expenditure on top priority hazards that have been identified. Such funding would offer expenses on operations and maintenance to improve levee rehabilitation and vegetation management. Delta Levee Subventions Program Delta Levee Special Projects Proposition 84 and 1E
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
The involvement of Federal agencies funds would help in reducing risk. RD 556 is in the Subventions Program. Participation in this program will help expand capabilities and reduce risk.		

Source: RD 556

9.6.4. Mitigation Education, Outreach, and Partnerships

Table 9-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 9-10 RD 556's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	Walnut Grove Volunteer Fire Department
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Department of Water Resources Delta Flood Emergency Preparedness Cal OES River Delta Unified School District.
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Public-private partnership initiatives addressing disaster-related issues	Y	Through neighboring RD's, unofficial partnerships are in place for assistance in the event of a hazard.
Other	Y	RD 556 is contracted with a local engineering company who provides counseling, review, and implementation on risk reduction, levee integrity, and mitigation related to mitigation capabilities. Unofficial coordination between many community members and local residents responding to their respective duties during a hazard is in place. This is a very effective risk reduction coordination.
How can these capabilities be expanded and improved to reduce risk?		
Greater public outreach from State agencies to community organizations to provide information about emergency response. As a small number of people district, current planned coordination for RD 556 is consistently reviewed, implemented, and quite effective. Continuation of improving outreach programs in coordination with State agencies and neighboring RD's may be helpful in community education about disaster related issued.		

Source: RD 556

9.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

The US Army Corps of Engineers performed an erosion repair project along the Sacramento River levee summer 2015 to create a riparian bench and resolve erosion issues. The District will perform vegetation removal on the Sacramento River and Georgiana Slough to reveal erosion issues. Once problematic areas are identified the District will perform repair projects to improve the levee system and reduce risk.

The District is also planning:

- A Dry Cross levee interface with BALMD.
- Erosion Repair on the Sacramento River and Georgiana Slough.

9.7 Mitigation Strategy

9.7.1. Mitigation Goals and Objectives

The RD 556 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

9.7.2. Mitigation Actions

The planning team for the RD 556 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Dam Failure
- Floods: 1%/0.2% annual chance
- Levee Failure
- Severe Weather: Heavy Rains and Storms
- Subsidence

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. 2021 Emergency Operations Plan (EOP) – Currently in development

Hazards Addressed: Floods, Subsidence, Heavy Rain and Storms, and Dam Failure

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD556. The EOP is coordination between RD556 team members to clarify and ensure conformance and focus to prevent duplication efforts when a solution is available and planned.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, a dry cross levee interface with BALMD and erosion repair on the Sacramento River and Georgiana Slough. In general, these projects will contain many levee and flood management improvements including but not limited to, levee repairs, erosion control and repair, riparian bench restorations, crown raising to address subsidence, vegetation management and

removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2021 Emergency Operations Plan (EOP) – Currently in development; 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021; Regional Flood Management Plan; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; FEMA hazard mitigations, the Army Corps of Engineers; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Action 2. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.

Hazards Addressed: Floods, Subsidence, Heavy Rain and Storms, and Dam Failure

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD556. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, a dry cross levee interface with BALMD and erosion repair on the Sacramento River and Georgiana Slough. In general, these projects will contain

many levee and flood management improvements including but not limited to, levee repairs, erosion control and repair, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021 Regional Flood Management Plan; and 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; FEMA hazard mitigations, the Army Corps of Engineers; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Action 3. Regional Flood Management Plan Projects

Hazards Addressed: Floods, Subsidence, Heavy Rain and Storms, and Dam Failure

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD556.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects brought to light in the Small Communities Plans. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, a dry cross levee interface with BALMD and erosion repair on the Sacramento River and Georgiana Slough. In general, these projects will contain many levee and flood management improvements including but not limited to environmental projects such as burrowing animal mitigations, levee repairs, erosion control, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and

maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; and 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Delta Annex Chapter 10 Reclamation District 563

10.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 563 (RD 563 or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 563, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

10.2 Planning Process

As described above, the RD 563 followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 10-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 10-1 RD 563 – Planning Team

Name	Position/Title	How Participated
Chris Neudeck, KSN, Inc	District Engineer	Attended meetings, collected data, reviewed draft docs
Bill Darcie, KSN, Inc.	Project Manager	Attended meetings, collected data, reviewed draft docs

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 10-2.

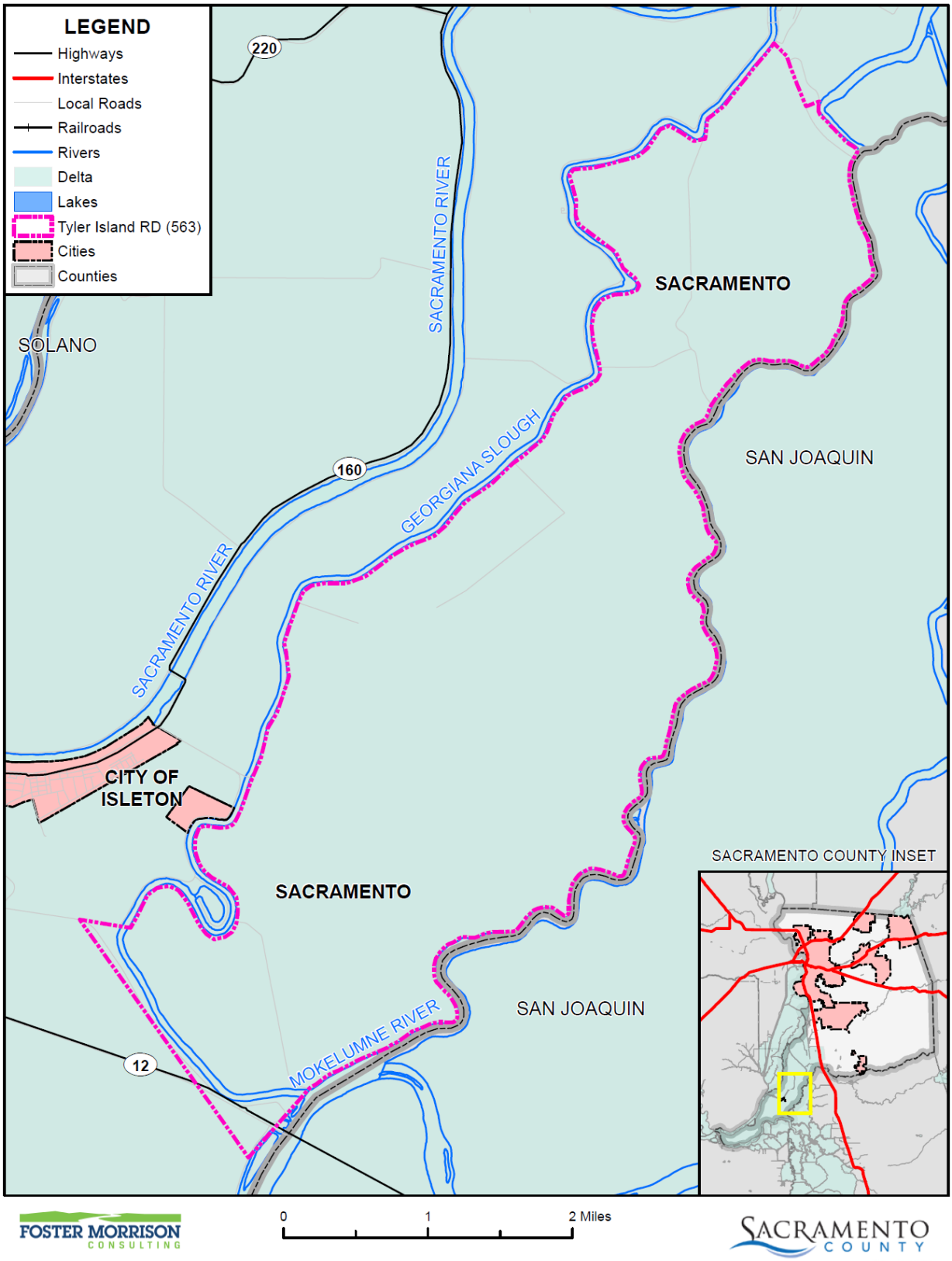
Table 10-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Development of RD 563 Flood Safety Plan	Elements in the Hazard Assessment used in the development of the Flood Safety Plan, which includes an Emergency Operations Plan – Basic Plan (EOP), and hazard specific annex (the Flood Contingency Map).

10.3 District Profile

The District profile for RD 563 is detailed in the following sections. Figure 10-1 displays a map and the location of the District within Sacramento County.

Figure 10-1 RD 563



Data Source: Tyler Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

10.3.1. Overview and Background

Reclamation District No. 563, also known as Tyler Island, is responsible for maintaining the levee and drainage system that provides flood protection for primarily agricultural land, along with a small portion of infrastructure, residential, commercial, industrial, and governmental land use. Tyler Island is located in the Northern Delta between the Walnut Grove to the north, Staten Island to the east, Bouldin Island to the south, and Andrus Island to the West. The Island is surrounded by three major waterways, Snodgrass Slough to the north, the Mokelumne River to the east, and Georgiana Slough to the west. The segment of levee along Georgiana Slough is considered a Project Levee, while the segment along the North Mokelumne is considered a Non-Project Levee. There are three land access points onto the island including Walnut Grove Road to the north, the Walnut Grove bridge crossing of the Mokelumne River in the northeast, and the Tyler Island Road bridge crossing of Georgiana Slough in the southwest. Much of the District's levees are topped with paved or gravel Sacramento County roads including Walnut Grove Road to the north, Tyler Island Road which wraps around the southern two-thirds of the District, and Race Track Road to the northwest. The remainder of the District's levees are topped with a minimum 16' wide all-weather gravel road surface.

Reclamation District No. 364 (Upper Tyler Island) was formed on August 6, 1880, and Reclamation District No. 532 (Lower Tyler Island) was formed on February 11, 1891. On May 7, 1894, a petition was filed with the Sacramento County Board of Supervisors to form the current Reclamation District No. 563, which included the lands within the existing Reclamation District Nos. 364 and 532, along with lands that up to that time did not fall within the boundaries of an organized Reclamation District. Upon the formation of Reclamation District No. 563, District Nos. 364 and 532 ceased. Today Reclamation District No. 563 encompasses a total area of 8,990 acres, surrounded by 22.9 miles of levee, all located within Sacramento County.

The District's Board of Trustees is made up of three Trustees who meet regularly on a quarterly basis.

10.4 Hazard Identification

RD 563 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 10-3).

Table 10-3 RD 563—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Occasional	Limited	Low	–
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Extensive	Occasional	Critical	Low	High
Earthquake	Extensive	Occasional	Limited	Medium	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Medium	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Extensive	Occasional	Critical	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Limited	Unlikely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Likely	Critical	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Critical	High	Low
Subsidence	Extensive	Likely	Critical	Medium	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Unlikely	Negligible	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

10.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

10.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 10.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 10-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

10.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers RD 563's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 10-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 563's physical assets, valued at over $8.0 million, consist of the buildings and infrastructure to support District's operations.

Table 10-4 RD 563 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Drainage Conveyances (92,650 ft.)	Essential Services	$2.0 mil	Flood, Levee Failure, Liquefaction
Pump Station #1 (including all station components)	Essential Services	$2.0 mil	Flood, Levee Failure, Liquefaction
Pump Station #2 (including all station components)	Essential Services	$2.0 mil	Flood, Levee Failure, Liquefaction
Pump Station #3 (including all station components)	Essential Services	–*	Flood, Levee Failure, Liquefaction
West Thornton-Walnut Grove Gas Field	Essential Services	$2.0 mil	Flood, Levee Failure, Liquefaction
Total		**$8,000,000**	

Source: RD 563

* The gas field is not owned by the District, but is protected by its levees. No replacement value was available to the District Planning Team.

The Delta Risk Management Strategy Phase 1 report estimates the total assets within Reclamation District No. 563 to be $91,184,000, and does not include the value of the land. The Public Policy Institute estimates the land value to be $33,202,759, and the asset value to be $92,866,000. Recent land sales of similar properties and soil types in the region indicate the current land values are approximately $62,930,000. The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10% of the land value, for a total of approximately $6,293,000. This does not take into account two bridges on the Island which are collectively valued at approximately $50,000,000. The total value of land and assets is approximately $119,223,000. Given that this is a unique property is in a very desirable location with many opportunities for other uses, the value could be in excess of the stated amount.

General Infrastructure

According to the Delta Protection Commission's Economic Sustainability Plan for the Sacramento-San Joaquin Delta, there are over a dozen natural gas transmission and petroleum oil pipelines that cross Tyler Island from companies such as Stream Energy, Towne Exploration, Pacific Gas and Electric, Lodi Gas, and Royale. The District is also situated in the middle of the West Thornton-Walnut Grove Gas Field. This gas field is part of a significant series of oil/gas fields that ranges from Sherman Island at its southwest-most point to Glanville Tract at its northeast-most point and includes the Rio Vista Gas Field, the largest natural gas field in California.

According to the State of California Department of Conservation Division of Oil, Gas & Geothermal Resources, there are fifty-four plugged and abandoned gas wells, thirty-three plugged and abandoned dry holes, twenty-five completed gas wells, and two active drilling gas wells located on Tyler Island. The island retains significant value as a component of the State's gas production and transmission network through this portion of the Delta.

Electrical service to the island residents and District pump stations is provided by Pacific Gas and Electric (PG&E). The transmission lines are fed from the town of Walnut Grove to the north, Staten Island to the east, and Brannan-Andrus to the west. Loss of this power supply would render the District drainage pumps useless, as well as cut power to the residences on the island. There are also many local telephones lines located within the District.

The District is located just south of the town of Walnut Grove and contains the bridge crossings of Walnut Grove Road, also called Sacramento County Road J11, across the North and South forks of the Mokelumne River, and Tyler Island Bridge Road across Georgiana Slough. While there has not historically been a problem with access being impeded at these bridges directly due to flooding at Reclamation District No. 563, these, and several other roads on the District, are major egress routes for the towns of Walnut Grove, Isleton, and Ryde, and provide access to Staten Island and Andrus Island specifically, and through much of the Delta in general. Boats have broken loose from local marinas and floated up against bridges in high water events which have threatened to destroy bridges in this area in the past. Destruction of these egress routes could severely impede flood control operations for multiple reclamation districts in the area, as well as limit evacuation capabilities in the region.

Local Assets

The District's levee system protects over 8,990 acres of prime farmland, approximately one dozen residences and several non-residential, government, commercial, industrial, and agriculture related structures. The Delta Risk Management Strategy (DRMS) Phase 1 report estimates the total assets within the District to be $91,184,000, and does not include the value of the land. The Public Policy Institute (PPIC) estimates the land value to be $33,202,759, and the asset value to be $92,866,000. Recent land sales of similar properties and soil types in the region indicate the current land values are approximately $62,930,000. The value of other assets including homes, buildings, irrigation, drainage and appurtenant structures have been estimated to be 10 percent of the land value, for a total of approximately $6,293,000. This does not take into account two bridges on the Island which are collectively valued at approximately $50,000,000. The total value of land and assets is approximately $119,223,000. Given that this is a unique property is in a very desirable location with many opportunities for other uses, the value could be in excess of the stated amount.

For the purposes of this report, no economic value has been placed on the environmental benefits provided by the interior lands within the island and protected by the levees. The costs of replacing these environmental benefits are likely substantial, and the costs to mitigate for environmental or habitat losses currently range from $65,000 to $145,000 per acre.

Natural Resources

RD 563 has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

The Reclamation District No. 563 levee provides protection for valuable habitat essential for many threatened and endangered species. In general, Delta lands, including those protected by the District's levees, provide forage and cover for local and migratory populations of birds and terrestrial wildlife

including many special status species. The levees also provide important waterside habitat and shoreline for various fisheries that includes several special status species. Flooding of Delta islands destroys habitat and kills most terrestrial species present.

In the District, according to a survey done in 2002, a total of 53.0 acres of levee-associated habitat and 38,997 linear feet of SRA habitat exist. Most of the levee-associated vegetation recorded on Tyler Island (44.7 acres) was riparian forest (trees greater than 20ft.tall). Riparian forest stands with Willow, Alder, and/or Oregon Ash consisted of 29.2 acres. Stands with Oak and/or Cottonwood accounted for 10.7 acres (24.0% of all RF). Additionally, Walnut trees totaled 2.5 acres. Other species accounted for 2.3 acres and associated with Tyler levees include: Box Elder, Black locust, Elderberry, Sycamore, Pine, and Button Bush. Most of the above habitat was recorded along Georgiana slough.

The second most common habitat type was shrub/scrub (7.8 acres). Observations involved individual plants from 5 to 19 feet tall. Over half (4.6 acres) of all shrub/scrub included Himalayan Blackberry and/or California Wild Rose. Both species can serve as forage and cover for birds and small mammals. Willow and Alder were also well represented (2.8 acres or 36%). All other shrub/scrub species only accounted for 0.37 acres or 5.0% of the total.

Freshwater marsh species were not very prevalent on Tyler Island (0.5-acre total). Tule species made up the vast majority of all freshwater marsh species recorded here. Cattail was only observed in one area and represents a negligible amount of freshwater marsh on Tyler.

Special Status Species identified on Tyler Island include three Western Pond Turtles (*Clemmys marmorata*) and a single Swainson Hawk (*Buteo swainsoni*). The Western Pond Turtles were identified at two separate locations (two individuals at one and a single turtle at the other). A Swainson Hawk was also identified on Tyler Island. "Special status" refers only to nesting populations of Swainson Hawks.

Historic and Cultural Resources

The District Planning Team noted that there are no known sites in the District.

Information on Historic and Cultural Resources for Sacramento County can be found in Section 4.3.1 of the Base Plan.

Growth and Development Trends

Reclamation District No. 563 is zoned almost entirely (96%) as agricultural land. The remainder of the District is zoned as Industrial, Miscellaneous, Pipeline, Residential, Roadway, and Gas Well. The land on the District is owned by more than fifty different entities ranging from private landowners and utility companies to the local county government.

Development since 2016

The District Planning Team noted that there has been no growth and or development in the District during the last planning period.

Future Development

Planned levee improvements will help regain PL84-99 eligibility for the Project levee section, but won't remove the island from a flood zone (i.e. flood related permits/development requirements will remain the same). As such, a change in vulnerability is unlikely.

Rock Slope Protection Project

The District's first priority is to ensure the protection of the existing levee by adding quarry stone riprap above the existing riprap to any portions of the waterside slope of the levee requiring additional rock slope protection. This will prevent erosion and reduce future erosion repairs. Prior to submitting a project proposal, a thorough riprap inventory of the District must be completed to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project. The quantities and costs provided in this Plan are planning level estimates based on input from the District and from the District's most recent survey.

The anticipated planning-level costs of the Rock Slope Protection Project consisting of additional riprap as needed is approximately $1.6 million. Costs are provided in this Plan as planning level estimates based on input from the District and from the District's most recent survey and inspection. A thorough riprap inventory of the District must be completed prior to submitting a project proposal to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project. Bulletin 192-82 Levee Project

The District will then bring those portions of levee below the Bulletin 192-82 Standard to six inches above the Bulletin 192-82 Standard with a District minimum crown width of 24 feet to allow for future levee raises to address climate change and sea level rise. This work will likely be divided into several phases or projects, depending on the funding available. A more detailed description of the proposed Bulletin 192-82 Project is included in District's 5-year plan.

The Bulletin 192-82 Project sites are proposed to be limited to the following locations as shown in Table 10-5.

Table 10-5 Bulletin 192-82 Project Sites

Start Station	End Station	Length in Feet
22+00	331+13	30,913
336+46	342+15	569
345+59	349+40	381
350+32	353+02	270
362+30	372+79	1,049
377+50	382+50	500
402+50	417+50	1,500
422+50	447+50	2,500
452+50	457+50	500

Start Station	End Station	Length in Feet
462+50	492+50	3,000
502+50	532+50	3,000
537+50	552+50	1,500
558+67	560+17	150
563+22	577+50	1,428
597+18	607+50	1,032
622+50	627+50	500
662+54	663+25	71
687+50	732+75	4,525
767+14	778+36	1,122
822+01	836+88	1,487
878+69	888+56	987
892+78	920+59	2,781
957+50	1192+50	23,500
1197+50	1202+00	450

Source: RD 563

The cost estimate provided in this report treats all Bulletin 192-82 project sites as a single project.

The costs involved with constructing a minimum 16-foot wide crown in accordance with the Bulletin 192-82 Standard is approximately $101 million. The incremental costs involved with widening the crown to 24 feet to allow for future raises in freeboard to address climate change and sea level rise is approximately $32 million. A more detailed cost estimate breakdown is included in District's 5-year plan. Costs provided are planning level estimates based on input from the District and from the District's most recent survey and inspection. A design-level survey and inspection of the District must be completed prior to submitting a project proposal to determine more definitive quantities and costs required to complete the project.

Levee Failure Repair Project

In 2017, a large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Between Station 403+00 and Station 450+00 along the North Fork of the Mokelumne River, the District's levee experienced a significant landside slope failure due to under and through seepage. Emergency and temporary repair included placing a rock berm extending landward around the failure and then adding fill material to the damaged levee prism to fill the void. An engineered long-term repair strategy has been developed and submitted to FEMA for Federal Disaster Assistance, yet it remains in appeal for FEMA funding at the time of this report. A more detailed description of the proposed Levee Failure Repair Project is included in District's 5-year plan.

The Levee Failure Repair Project sites are proposed to be limited to the following locations as shown in Table 10-6.

Table 10-6 – Levee Failure Repair Project Sites

Start Station	End Station	Length in Feet
410+00	425+00	1,500

The anticipated planning-level costs of the Levee Failure Repair Project are approximately $3.6 million. A more detailed cost estimate breakdown is included in District's 5-year plan. Cost provided is a planning level estimate based on input from the District and from the District's most recent survey and inspection. A design-level survey and inspection of the District must be completed prior to submitting a project proposal to determine more definitive quantities and costs required to complete the project. Levee Seepage Repair Project.

In 2014, DWR issued to the District a Notice of Eligibility for Funding of Critical Repairs through its Flood System Repair Project (FSRP) Program. The critical levee reach that was identified has historically experienced significant under and through seepage. A more detailed description of the proposed Levee Seepage Repair Project is included in the District's 5-year plan.

The Levee Seepage Repair Project sites are proposed to be limited to the following locations as shown in Table 10-7.

Table 10-7 – Levee Seepage Repair Project Sites

Start Station	End Station	Length in Feet
700+00	724+40	2,440

Source: RD 563

The anticipated planning-level costs of the Levee Seepage Repair Project is approximately $6.8 million. The cost provided is a planning level estimate based on input from the District and from the District's most recent survey and inspection. A design-level survey and inspection of the District must be completed prior to submitting a project proposal to determine more definitive quantities and costs required to complete the project.

10.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 10-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on

past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

In general, the most vulnerable District assets include the levees and supporting structures that the District owns.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

District pump stations and drainage conveyances are at risk to power outages and/or power failure. In the absence of power, localized flooding can occur because existing pump stations currently do not have backup power systems. In addition, if power outages occur near the end of the flood, it will hinder dewatering operations.

Earthquake

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time. Potential earthquakes on the Hayward, Calaveras, and San Andreas fault could also affect the Delta area.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to

structures during earthquakes. Seismic shaking maps for the area show Sacramento County and the District fall within a low to moderate shake risk, with most of the moderate risk in the Delta area of the County.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquakes or that affected the District in any meaningful way.

After the most recent 2014 Napa Earthquake, the District performed levee inspections and verified the continued operation of the pump stations around the island to check the levee integrity and ensure there was no damage to District assets as a result of the earthquake.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured buildings can be very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. RD 563 is within the less hazardous Zone 3.

Impacts from earthquake in the District will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to levees, infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees. All assets in the District are at risk to the effects of a damaging earthquake.

Other vulnerabilities to RD 563 from an earthquake event include overtopping of levees, erosion, boils and other damage to the levees compromising their function.

Assets at Risk

The levees' structures, pump stations and drainage conveyances are potentially at risk to an earthquake. All natural resources could also be affected by an earthquake causing damage to the levee structure should the island flood due to an earthquake, though no evidence of damage has been observed to date.

Earthquake: Liquefaction

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the County are rebuilt or leveed areas are dewatered and the levees rebuilt. In Sacramento County, the Delta and areas of downtown Sacramento are at risk to liquefaction. The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand and silt in the levees and their foundations indicates that liquefaction is also a possibility.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquake liquefaction. Delta levees are composed of material that contain pockets, rather than long continuous lenses, of sand. Though it has a low likelihood of future occurrence, liquefaction is a recognized potential risk.

Vulnerability to and Impacts from Liquefaction

Earthquake is discussed above, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas. In Sacramento County, two of these areas have been identified: downtown Sacramento and the Delta area, which could lead to a possible collapse of delta levees and any above ground structures. While this levee failure differs from the levee failure discussion below which generally focuses on levee failure due to high water conditions or other types of structural failure, the resulting impacts would be similar and include those related to a large flood event. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees. All assets in the District are at risk to the effects of liquefaction.

The seismic events of 1989 and 2014 did not induce liquefaction on the Delta levees.

Assets at Risk

The levees' structures, pump stations and drainage conveyances are potentially at risk to earthquake liquefaction. All natural resources in the District would be at risk to liquefaction and associated levee failures.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

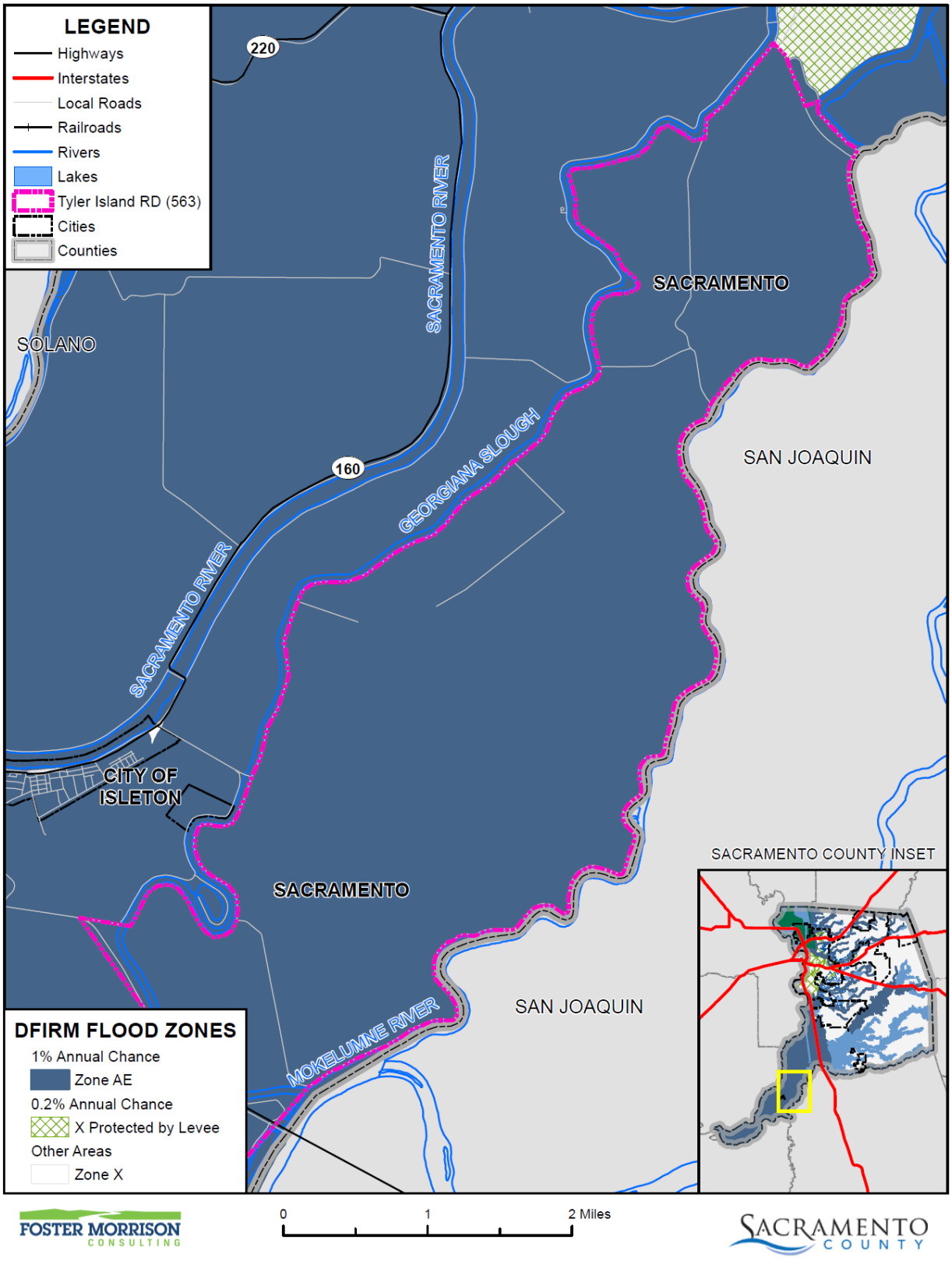
Tyler Island is located between two significant waterways, the North Fork of the Mokelumne River to the east, and Georgiana Slough to the south and west. Flooding on any of these waterways could cause problems for RD 563. Any overtoppings or other failures due to the proximity of these waterways are specifically noted below.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and RD 563 have been subject to historical flooding.

Location and Extent

RD 563 has areas located in the 1% annual chance floodplain. This is seen in Figure 10-2.

Figure 10-2 RD 563 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Tyler Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 10-8 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 10-8 RD 563– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 10-9. These events also likely affected the District to some degree.

Table 10-9 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The 5-year plan for RD 563 included the following events of flooding in the District.

- 1906, 1907, and 2017 - A series of regional flood events occurred. Flooding can occur with compound effects of a storm, high releases from upstream dams, snowmelt, and is influenced by tidal movement. More information can be found in the Past Occurrences Section of Levee Failure.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Assets at Risk

Should a flood breach the levees, the entirety of the assets of RD 563 would be at risk. Levee failure is discussed later in this section. Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Flood: Localized Stormwater Flooding

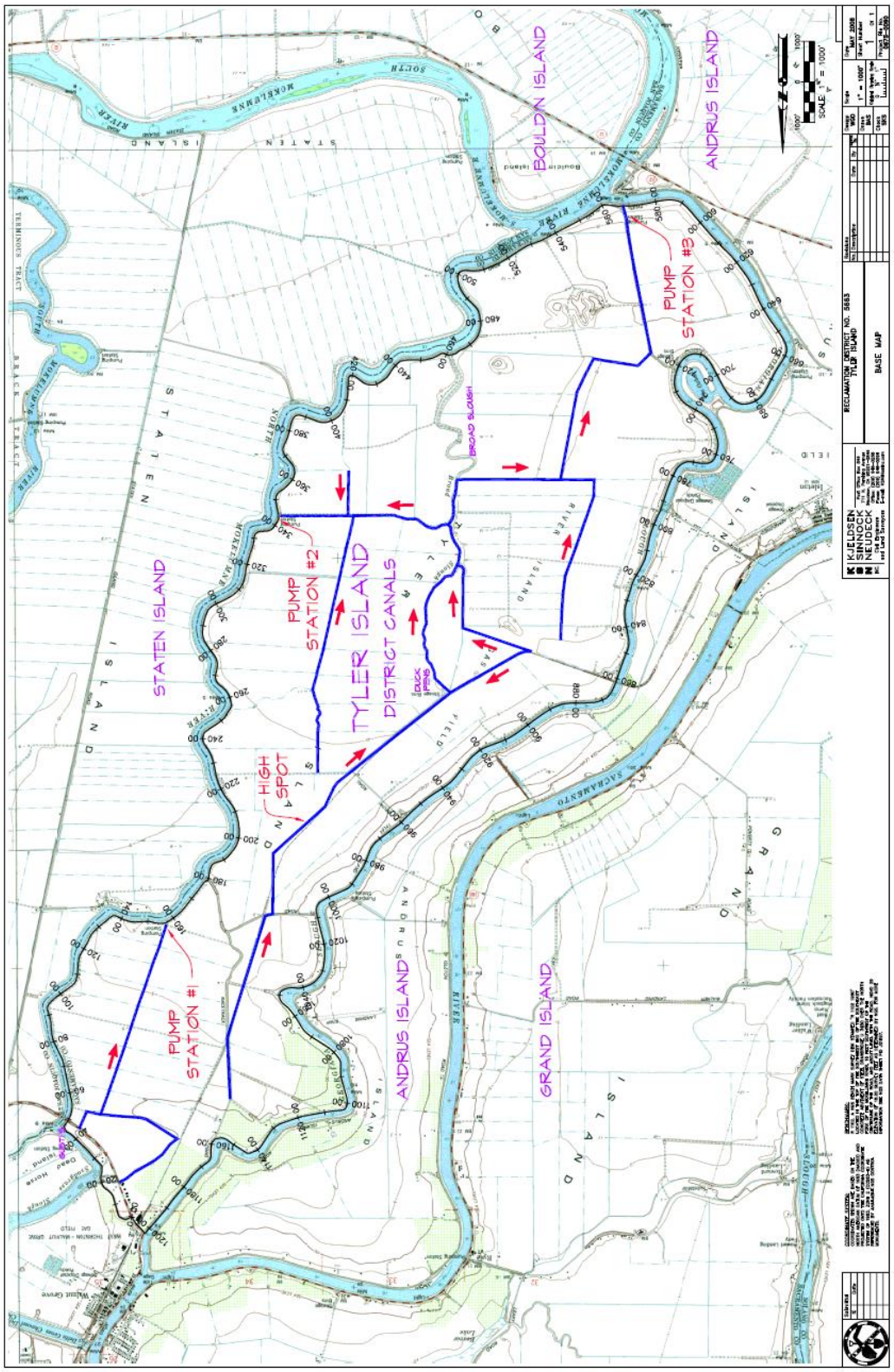
Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Historically, RD 563 has been at risk to flooding primarily during the spring months when river systems in the County swell with heavy rainfall. Localized flooding also occurs throughout the Planning Area at various times throughout the year with several areas of primary concern unique to the District. The District has a drainage system set up to deal with localized flooding. This is shown on Figure 10-3.

Figure 10-3 RD 563 Drainage System



Source: RD 563 2013 5-Year Plan

Location and Extent

RD 563 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

The District tracks localized flooding areas, which are located throughout the District.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. However, the District could face localized flooding issues if power outage or Public Safety Power Shutoff occurs during a major storm.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Assets at Risk

The District Planning Team noted that all District assets are at risk to localized flooding; however, this flooding is likely to be a nuisance-type of flood, and would not have lasting impacts on the District. Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

The Tyler Island levee provides a public benefit by maintaining water quality and water supply reliability for cities and farms in the San Joaquin Valley, San Francisco Bay area, and Southern California. Tyler Island is situated upstream of where fresh river water and salty bay water meet and mix. Under typical summer salinity conditions in the lower Sacramento River, salinity rises sharply at the outlet of the river into the bay. The Tyler Island levee is critical to controlling salinity intrusion to the interior Delta. A levee break would increase the rate and area of mixing and would allow the saline bay water to move further upstream, jeopardizing the fresh water supply exported from the Delta for the Central Valley Project water supply, the State Water Project, and the Contra Costa intake.

Most flooding occurs in winter and spring when major saltwater intrusion is less likely. There are occasional levee failures under low-flow conditions, which can cause major short-term water-quality problems. For instance, the Andrus Island levee failed in the summer of 1972.

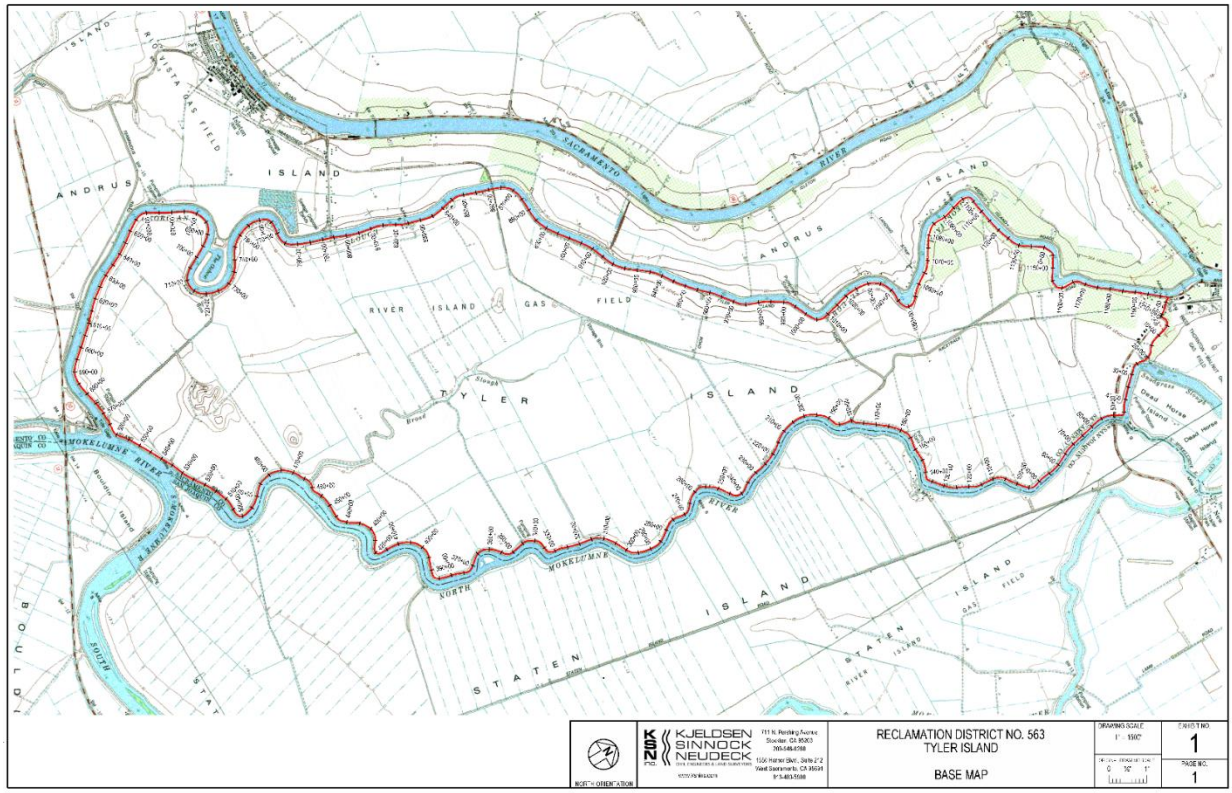
According to sources cited in the 5-Year Plan, salt concentrations in the central and western Delta quickly showed an increase up to six times their pre-failure levels, and additionally may have been a contributing factor in high mortality of juvenile bass that year. It took a large volume of extra reservoir releases to flush the salty water from the west Delta. Similar effects could occur if the Tyler Island levee was to fail under low flow conditions.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee

failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 10-4.

Figure 10-4 RD 563 – Levee Protected Areas



Source: RD 563

Table 10-10 summarizes needed and partially completed levee improvement projects on the Project Levee segment of Tyler island (along Georgiana Slough).

Table 10-10 RD 563 – Levee Improvements

Category	Item	Remarks	Station	Issue No.	Repair Complete Y/N, Date
Levee Embankments	Slope Stability	LS, Active slumping on LS slope with 16-in tall head scarp extends 25-ft. Tension crack up to 6-in deep above the slump. Animal burrow directly below slump.	1069+75	466	
Levee Embankments	Slope Stability	LS, Active slope failure. Slump at mid LS slope has up to 20-in vertical displacement and extends 50-ft. Near standing water at LS toe.	1071+80	467	Y

Category	Item	Remarks	Station	Issue No.	Repair Complete Y/N, Date
Levee Embankments	Slope Stability	LS, Active slope failure on LS slope. Tension cracking up to 6-in deep and 4-in wide. Extends 30-ft. Vertical displacement of soil mass at least 6-in.	1079+19	474	Partial Repair
Levee Embankments	Slope Stability	LS, Active slump on LS slope. Tension crack above slump is 6-in deep, 3-in wide and extends 100-ft. Vertical displacement of soil mass is at least 3-in.	1082+00	475	
Levee Embankments	Slope Stability	LS, Active slope failure on lower LS slope with vertical displacement of approximately 8-in. Tension cracking 2-in wide and 7-in deep extends 20-ft.	1084+08	476	
Levee Embankments	Slope Stability	LS, Active slope failure on LS. Nearly vertical slope, 5-ft high with minimal vertical displacement, but with shallow plane sloughing. Tension cracking 6-in deep, 15-ft long and 3-in	1188+55	568	
Levee Embankments	Erosion/Bank Caving	WS, Erosion at levee toe more than 2-ft into levee prism, extends 100-ft.	628+70	53	Y
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS slope more than 2-ft into prism. Some soil sliding near levee hinge extends 150-ft. Riprap at toe was an inadequate repair.	631+18	57	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS slope more than 2-ft into levee prism extends 50-ft. Riprap at toe was an inadequate repair.	636+12	59	Y
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS toe more than 2-ft into levee prism, extends 30-ft.	657+90	76	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS slope covered with riprap, 300-ft long, cuts into prism more than 2-ft. Riprap is ineffective or was an	659+73	79	Y
Levee Embankments	Erosion/Bank Caving	WS, Erosion on lower WS slope, 4-ft deep, over 2-ft into prism, extends 60-ft.	680+98	91	
Levee Embankments	Erosion/Bank Caving	WS, Erosion by pipe through levee. Large scour of 20-ft diameter and 5-ft deep. Cuts greater than 2-ft into levee prism.	772+78	201	Y
Levee Embankments	Erosion/Bank Caving	WS, Erosion at WS toe. Up to 4-ft deep and extends 20-ft. Cuts greater than 2-ft into levee prism.	778+16	207	
Levee Embankments	Erosion/Bank Caving	WS, Erosion at WS toe. Up to 5-ft deep. Extends 100-ft. Cuts greater than 2-ft into levee prism.	790+76	224	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS slope. Up to 7-ft deep and extends 15- ft. Cuts greater than 2-ft into levee prism.	795+55	234	

Category	Item	Remarks	Station	Issue No.	Repair Complete Y/N, Date
Levee Embankments	Erosion/Bank Caving	WS, Erosion at WS toe. 3-ft deep and extends 120-ft. Cuts greater than 2-ft into levee prism.	818+75	250	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on lower WS slope. Up to 4-ft deep and extends 30-ft. Cuts greater than 2-ft into levee prism.	826+98	256	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on lower WS slope. 5-ft deep and extends 20- ft. Cuts greater than 2-ft into levee prism.	837+25	259	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS slope. Up to 5-ft deep and extends 40- ft. Cuts greater than 2-ft into levee prism.	842+65	264	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS toe. Up to 6-ft deep. Extends 20-ft. Cuts greater than 2-ft into levee prism.	862+50	286	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS toe up to 4-ft deep. Extends 15-ft. Cuts greater than 2-ft into levee prism.	863+52	288	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS toe by pipe. Up to 3-ft deep and extends15-ft. Cuts greater than 2-ft into levee prism.	885+12	314	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS toe, 3-ft deep, extends 50-ft, and cuts more than 2-ft into levee prism.	896+95	328	
Levee Embankments	Erosion/Bank Caving	WS, Erosion at WS toe up to 4-ft deep, extends 20-ft. Cuts more than 2-ft into levee prism.	898+70	329	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS near toe. 3-ft deep extends 100-ft. Cuts more than 2-ft into levee prism.	909+19	332	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS toe, up to 5-ft deep, extends 300-ft. Cuts more than 2-ft into levee prism.	920+90	338	
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS toe up to mid-slope extends 120-ft, 5-ft deep. Cuts more than 2-ft into levee prism.	926+75	342	Y
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS mid-slope, up to 10-ft deep, extends 60- ft. Cuts more than 2-ft into levee prism.	991+40	393	Partial Repair
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS toe caused by pipe through levee, up to 3- ft deep, 10-ft wide, Cuts more than 2-ft into levee prism.	1009+25	403	Y
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS toe, 10-ft wide, up to 3-ft deep, Cuts more than 2-ft into prism.	1015+60	416	Y

Category	Item	Remarks	Station	Issue No.	Repair Complete Y/N, Date
Levee Embankments	Erosion/Bank Caving	WS, Erosion on WS slope up to 6-ft deep, extends120-ft. Cuts more than 2-ft into prism.	1061+85	454	Partial Repair
Levee Embankments	Erosion/Bank Caving	Start Point: WS, Erosion on WS toe. 4-ft deep. Greater than 2-ft cut into levee prism. End Point 0558.	1168+25	555	
Levee Embankments	Erosion/Bank Caving	End Point: WS, Erosion at WS toe. Start Point 0555.	1169+87	558	

Source: RD 563

Past Occurrences

The 5-year plan for RD 563 included the following events of levee failure in the District.

- 1906 and 1907 – A series of regional flood events caused the inundation of several islands including Reclamation District No. 563.
- **1982** – A series of large storms that produced heavy rain and high winds caused heavy runoff and high tide conditions that impacted the Districts levee, as well as the entire Sacramento – San Joaquin Delta region. The resulting impacts to the District's levee included water overtopping the levee, increased seepage through the levee, subsidence and partial failure of the levee landside slope, and severe erosion to the waterside slope including degradation of the existing rock slope erosion protection. $1.44 million in damages were sustained in this event.
- **1986** – Due to the extreme storm event, multiple days of heavy rain, strong winds from extreme low pressure gradients, high tides and runoff affecting the entire Sacramento-San Joaquin Delta, the District's levee failed in two locations along the North Fork of the Mokelumne River at approximate levee stations 228+00 and 238+00. More than $9 million in damages were sustained in this event.
- **1997** - A series of large storms that produced heavy rain and high winds caused heavy runoff and high tide conditions that impacted the Districts levee, as well as the entire Sacramento – San Joaquin Delta region. The District claimed costs for flood event related erosion repairs, emergency response – flood fight, and engineering technical assistance. Due to the improvements to the District's levee since the 1986 flood event, and well organized flood fight response, the District's levees and sustained only minor damage and performed well. $781,912 in damages were reported.
- **2006** Winter Storms. (FEMA 1628-DR) A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. High winds during this time caused damage to the District's rock slope protection at various locations, road damage from levee patrols and repair equipment and seepage problems. Repairs were made to the rock slope protection and roads. The seepage site was stabilized with a gravel blanket. Overall the levee performance was good.
- **2017** High Water Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency erosion repairs, rodent hole repairs, deployment of muscle wall and emergency response patrols and labor occurred during the event. Between Levee Station 403+00 and 450+00 the District levee experienced a significant landside slope failure due to under and through seepage. Emergency and temporary repair included placing a rock berm extending landward around the failure and then adding fill material to the damaged levee prism to fill the void. An engineered long-term repair strategy has been developed and submitted for assistance and remains in

appeal for FEMA funding at the time of this report. The District had well organized flood fight response, and was able to immediately address the slope failure site which kept the island from flooding. Other than the slope failure site, the District's levees and sustained only minor damage and performed well.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

The two primary vulnerabilities that threaten the levee system on Tyler Island involve levee stability and levee geometry. The Tyler Island levee system has a history of levee stability problems including settlement, movement, seepage, and slope failure. Documentation of the levee's performance is extensive. There are several historical seepage sites along the district due to threats ranging from foundation and structural soil deficiencies to rodent damage. Waterside erosion also continues to be a constant threat, especially along the Project Levee portion of Georgiana Slough. The levee break in 1986 and the ensuing inundation of the entire District, however, stands as the most poignant reminder of levee vulnerability. Levee improvements since that time have greatly improved the District's levee system and the levee has performed well in subsequent flood events.

Georgiana Slough which borders the District Project Levee, is a major corridor to transport Sacramento River water to the State and Federal water project pumps located in the southern Delta. Failure of the Project Levee could impact the operation of those facilities.

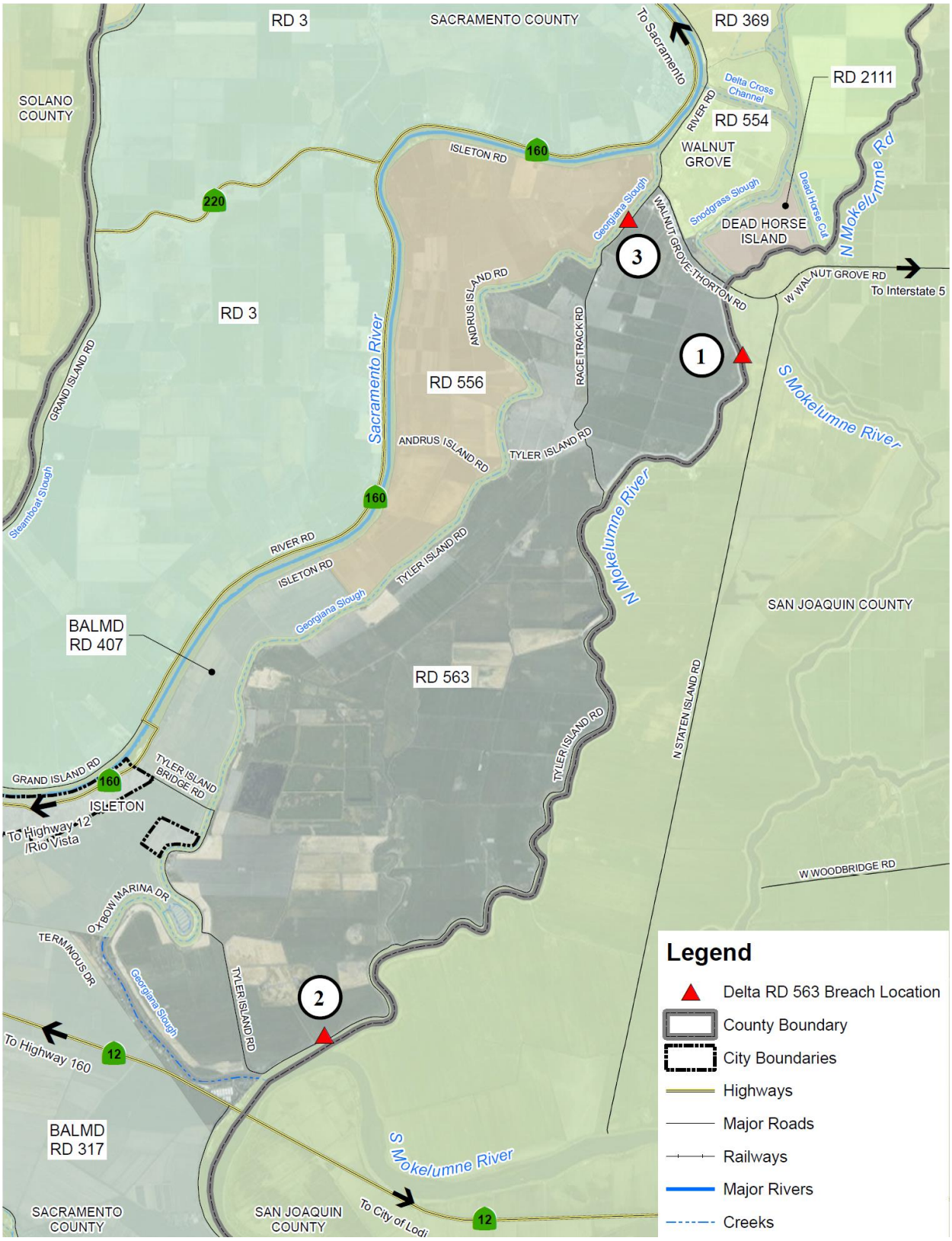
StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

For RD 563, Figure 10-5 details the locations in the Delta within Reclamation District 563 where flooding could occur. The red triangle denotes hypothetical potential levee breach locations. RD 563 has three potential levee break scenarios. Maps for Scenario 1 regarding time to one foot inundation (Figure 10-6),

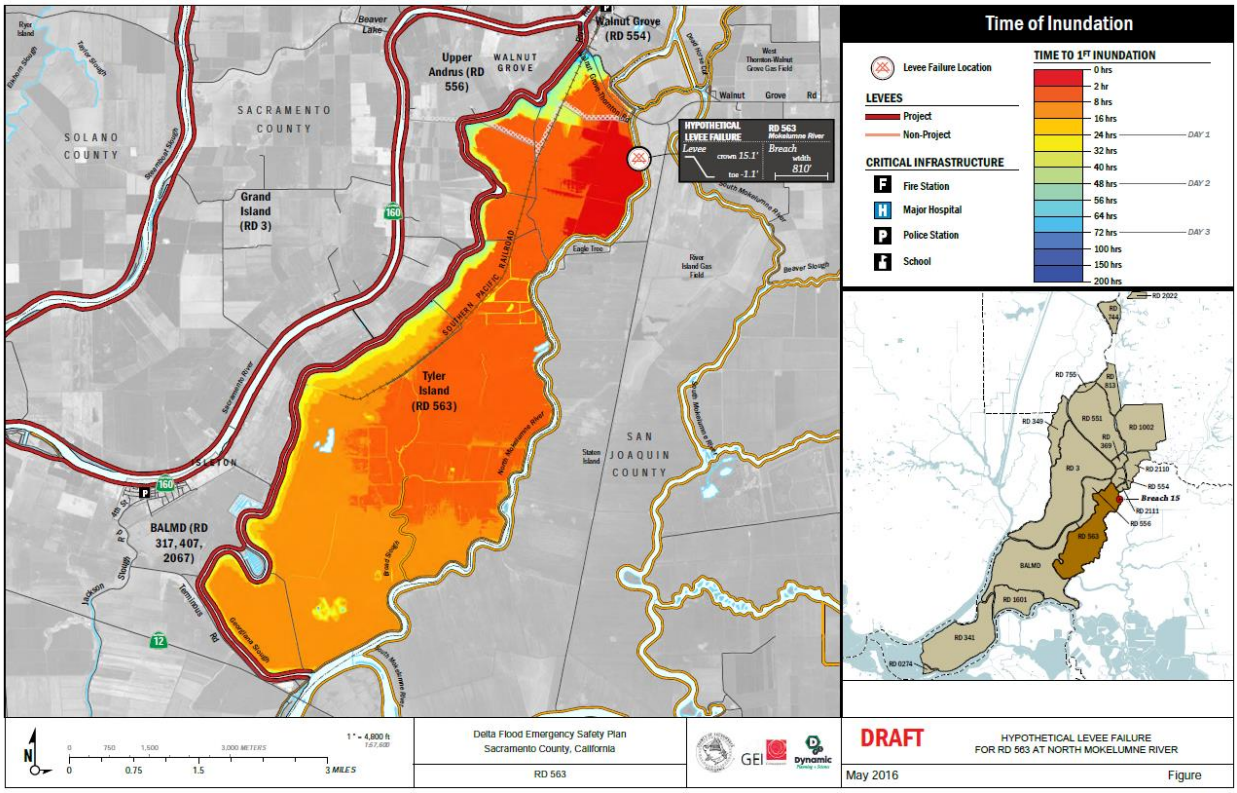
estimated flood depths (Figure 10-7), and suggested evacuation routes (Figure 10-8) are displayed below. Maps for Scenario 2 and 3 can be found on the Sacramento County stormready.org website.

Figure 10-5 RD 563 – Potential Levee Breach Location



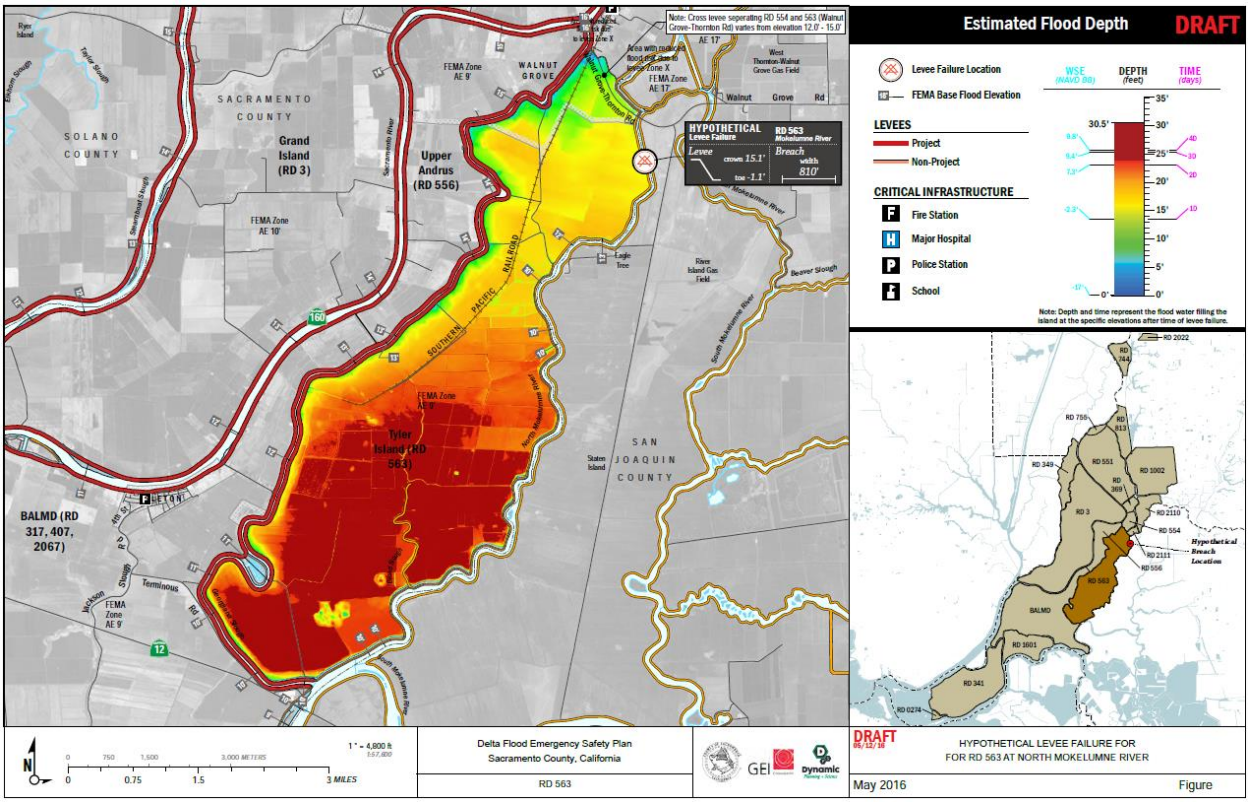
Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 10-6 RD 563 – Time to One Foot Inundation after Levee Breach



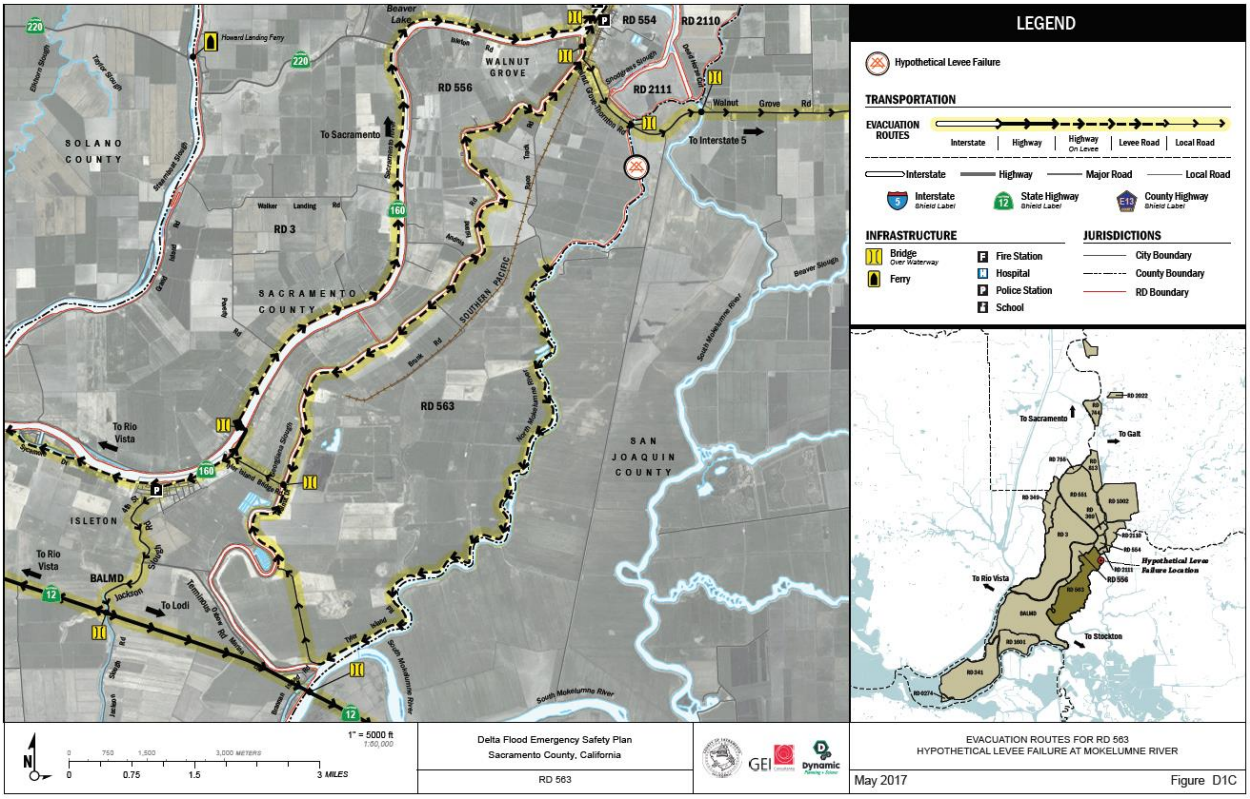
Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 10-7 RD 563 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 10-8 RD 563 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 16, 2021

Assets at Risk

Should the levees fail, all District assets would be at risk.

A failure or breach of the District's levee system could result in flooding of the District to depths of approximately 25 feet on average. Costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract Flood. All information used was gathered from the final FEMA Project Worksheets used to close out the claims for all of the public agencies involved in the disaster event (FEMA 1529-DR). Additional costs for work not claimed to FEMA included work performed by the United States Army Corps of Engineers; these costs were established from the invoiced amount provided by the Contractor. For Reclamation District No. 563, the estimated cost of a flood event resulting from a single levee failure would be approximately $31,600,000 based on the costs from the 2004 Jones Tract flood event, with costs for distinct emergency and repair activities. The cost analysis above does not include damage to privately owned property and improvements.

Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

The 5-year plan for RD 563 included the following events of severe weather in the District.

- 1986 – Due to the extreme storm event, multiple days of heavy rain, strong winds from extreme low pressure gradients, high tides and runoff affecting the entire Sacramento-San Joaquin Delta, the District's levee failed. More information can be found in the Past Occurrences Section of Levee Failure above.
- 1997 – A series of large storms that produced heavy rain and high winds caused heavy runoff and high tide conditions that impacted the Districts levee, as well as the entire Sacramento – San Joaquin Delta region. More information can be found in the Past Occurrences Section of Levee Failure above.
- 2017 High Water Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency erosion repairs, rodent hole repairs, deployment of muscle wall and emergency response patrols and labor occurred during the event. Between Levee Station 403+00 and 450+00 the District levee experienced a significant landside slope failure due to under and through seepage. Emergency and temporary repair included placing a rock berm extending landward around the failure and then adding fill material to the damaged levee prism to fill the void. An

engineered long-term repair strategy has been developed and submitted for assistance and remains in appeal for FEMA funding at the time of this report. The District had well organized flood fight response, and was able to immediately address the slope failure site which kept the island from flooding. Other than the slope failure site, the District's levees and sustained only minor damage and performed well.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

However, it is the secondary effects of heavy rain and storms that are of concern to RD 563. Heavy rains can cause flooding, levee failure, and stream bank erosion.

Assets at Risk

Flooding, levee failure, and stream bank erosion can cost RD 563 million in damages. The District Planning Team noted that flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes

form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

The 5-year plan for RD 563 included the following events of winds and tornadoes in the District.

- 1986 – Due to the extreme storm event, multiple days of heavy rain, strong winds from extreme low-pressure gradients, high tides and runoff affecting the entire Sacramento-San Joaquin Delta, the District's levee failed. More information can be found in the Past Occurrences Section of Levee Failure above.
- 1997 Storms. A series of large storms that produced heavy rain on a heavy snowpack in the Sierras and high winds caused extraordinary heavy runoff and high tide conditions that impacted the District's levee, as well as the entire Sacramento – San Joaquin Delta region. The District claimed costs for flood event related erosion repairs, emergency response – flood fight, and engineering technical assistance. Due to the improvements to the District's levee since the 1986 flood event, and well organized flood fight response, the District's levees sustained only minor damage and performed well during this otherwise historical Flood Event.
- 2006 Flood Event. Rip rap was placed on waterside slopes to mitigate damage caused from high winds.
- 2017 High Water Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency erosion repairs, rodent hole repairs, deployment of muscle wall and emergency response patrols and labor occurred during the event. Between Levee Station 403+00 and 450+00 the District levee experienced a significant landside slope failure due to under and

through seepage. Emergency and temporary repair included placing a rock berm extending landward around the failure and then adding fill material to the damaged levee prism to fill the void. An engineered long-term repair strategy has been developed and submitted for assistance and remains in appeal for FEMA funding at the time of this report. The District had well organized flood fight response, and was able to immediately address the slope failure site which kept the island from flooding. Other than the slope failure site, the District's levees and sustained only minor damage and performed well.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power shortage and failure can be found in the beginning of Section 10.5.3.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Occasional structure damage
- Erosion of levees and other areas

When paired with highwater, heavy runoff, high tide, and high wind, impacts to District levees, as well as the entire Sacramento – San Joaquin Delta region, include serious levee erosion that could result in overtopping that possibly lead to failure.

Assets at Risk

The District Planning Team noted that the entire levee structures are at risk from wind. The District Planning Team noted that all-natural resources are at risk if wind caused levee failure in the District.

Subsidence

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Subsidence is the gradual settling or sinking of the earth's surface over manmade or natural underground voids with little or no horizontal motion. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. Subsidence is worsened when groundwater drawdown exceeds the ability of the ground to naturally recharge. This is more common during periods of drought.

Location and Extent

There is no scientific scale to measure subsidence. Subsidence is measured in inches or feet of elevation change over time. Subsidence has a long speed of onset, as it occurs over many years. The duration of subsidence is long, as it is rare for subsidence to be reversed. In Sacramento County, the Delta in the southeast portion of the County is highly at risk to subsidence. In the Delta, subsidence affects the islands as well as the levees.

Past Occurrences

There have been no state or federal disasters in the County related to subsidence.

The 5-year plan for RD 563 included the following events of subsidence in the District.

- 1982 – A series of large storms that produced heavy rain and high winds causing subsidence in the District. More information can be found in the Past Occurrences Section of Levee Failure above.

Vulnerability to and Impacts from Subsidence

Historically, the County has been at risk from subsidence. Vulnerability in the County from subsidence comes from several different causes:

- Compaction of Unconsolidated Soils by Earthquake Shaking (Liquefaction)
- Compaction by Heavy Structures
- The Erosion of Peat Soils
- Fluid Withdrawal

These were discussed in detail in Section 4.3.16 of the Base Plan.

Since reclamation of the island began, elevations have fallen to as much as 20 feet below sea level, requiring protection by over 1,125 miles of man-made levees throughout the Delta. Drainage is provided by a network of ditches that collect and transport shallow groundwater, irrigation runoff, and levee seepage to pump stations that discharge back into the Delta waterways. These ditches create an unsaturated root zone for crops, and provide a more stable levee foundation.

Assets at Risk

All levee structures in RD 563 are at risk to subsidence. The District Planning Team noted that all natural resources are at risk from subsidence.

10.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

10.6.1. Regulatory Mitigation Capabilities

Table 10-11 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 563.

Table 10-11 RD 563 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2020	The District's Five-Year Plan identifies hazards that may affect RD 563. Some mitigation strategies are proposed.
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	Y	A District-specific Flood Safety Plan consisting of an Emergency Operations Plan – Basic Plan and Annex – A *Flood* (Flood Contingency Map) was completed in 2019 for the District.
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	

Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. The Emergency Operations Plan development process alone helps to increase the capabilities of the District to respond to emergencies and disasters. Continued funding available to maintain these plans would be helpful.		

Source: RD 563

10.6.2. Administrative/Technical Mitigation Capabilities

Table 10-12 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 563.

Table 10-12 RD 563's Administrative and Technical Mitigation Capabilities

Administration	**Y/N**	**Describe capability Is coordination effective?**
Planning Commission	N	
Mitigation Planning Committee	Y	RD 563 and KSN, Inc. staff.
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	
Mutual aid agreements	Y	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	Y	KSN, Inc.
Community Planner	N	
Civil Engineer	Y	KSN, Inc.
GIS Coordinator	Y	KSN, Inc.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Sacramento County has an alert and warning system that covers the District.
Hazard data and information	Y	KSN, Inc.
Grant writing	Y	KSN, Inc.

Hazus analysis	N
Other	
How can these capabilities be expanded and improved to reduce risk?	
These capabilities can be expanded by utilization of additional funding opportunities to pay for the services provided by KSN, Inc. so the District can use the General Fund dollars to fund additional District priorities.	

Source: RD 563

10.6.3. Fiscal Mitigation Capabilities

Table 10-13 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 10-13 RD 563's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	Levy Assessment Program but not taxes
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Storm water utility fee	Y	Part of our Levee Assessment Program
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	Y	Hazard Mitigation Grant Funding – This has not been used in the past, but may be used in the future; BRIC Grant – this has not been used in the past, but may be used in the future; FEMA post-disaster recovery
State funding programs	Y	DWR Levee Subventions and Special Projects Program (used for O&M activities), Statewide Emergency Response Program – Delta
Other		
How can these capabilities be expanded and improved to reduce risk?		
Continued availability of the Delta Subventions and Special Projects funding is critical for levee health. Pursuing federal grants is generally not feasible since small, rural areas are unable to meet the required local match. Therefore, areas like RD563 are unable to apply for federal grants. If State of Federal partners could assist small, unincorporated communities to meet the local cost share, it would help agencies have access to more federal dollars.		

Source: RD 563

Potential Cost Sharing Partners

At this time, it is unclear if cost sharing partners exist. Inquiries will be made, but it is not likely that other funding is available. At this time, it is assumed that the Delta Levees Program will be the only source of funding.

Requested Cost Sharing with the Delta Levees Special Projects Program

Based on the District's current assessment income and expenses for routine levee maintenance, drainage, flood response, and pay down of debt related to prior flood events and projects, the ability to pay by the District for new projects is limited. The District anticipates that funding from the Delta Levees Special Projects Program will be available with a 90 percent cost share ratio for typical projects identified in this Plan. The District anticipates that the remaining 10 percent of the funding for these projects will be required to be paid by the District. It is expected that not all of the recommended projects identified in this Five Year Plan will require and/or be eligible for funding from the Delta Levees Special Projects Program. The anticipated funding sources and cost share ratios through the Delta Levees Program for the recommended projects are shown below in Table 10-14.

Table 10-14 - Anticipated Delta Levees Program Funding Sources

Project	Anticipated Delta Levees Program Funding Source	Proposed State Cost Share	Proposed District Cost Share
Rock Slope Protection Project	Subventions	75%	25%
Bulletin 192-82 Levee Project	Special Projects	90%	10%
Levee Failure Repair Project	Special Projects	90%	10%
Levee Seepage Repair Project	Special Projects	90%	10%

Source: RD 563

10.6.4. Mitigation Education, Outreach, and Partnerships

Table 10-15 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 10-15 RD 563's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	N	
Natural disaster or safety related school programs	N	

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
DWR Flood Methods Course and Just In Time Training Program, and SEMS/NIMS	Y	Training Policy is outlined in Attachment 1 of RD563's Emergency Operations Plan (EOP), which includes the SEMS/NIMS courses (SEMS 100, 200, 700 and/or G0402).
How can these capabilities be expanded and improved to reduce risk?		
Additional Funding to provide these types of programs. The District will look to other grant opportunities (Cal OES, FEMA, CA DWR) to fund additional mitigation efforts.		

Source: RD 563

10.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

The entire Tyler Island levee system is inspected daily by the landowners, Trustees, and/or District staff who are familiar with all aspects of its functions. The District Engineer typically performs inspections at the request of the District, or more frequently when warranted. During high water or severe weather events, inspection frequency is increased to meet the demand. Like all Federal Project Levees, the Georgiana Slough Project Levee portion of the District is inspected in the fall and spring by the Department of Water Resources levee inspectors. Reports are compiled and submitted to the District. The District staff also inspects the Federal Project Levee in the winter and summer, and submits reports back to the Department of Water Resources.

10.7 Mitigation Strategy

10.7.1. Mitigation Goals and Objectives

RD 563 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

10.7.2. Mitigation Actions

The planning team for RD 563 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Earthquake
- Earthquake: Liquefaction
- Flood: 1%/0.2% annual chance
- Flood: Localized Stormwater Flooding
- Levee Failure
- Severe Weather: Heavy Rains and Storms (Thunderstorms/Hail, Lightning)
- Severe Weather (Wind and Tornadoes)
- Subsidence

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Rock Slope Protection Project

Hazards Addressed: Earthquake, Earthquake: Liquefaction, Flood: 100/200/500-year, Flood: Localized Stormwater Flooding, Levee Failure, River/Stream/Creek Bank Erosion, Severe Weather: Heavy Rains and Storms (Thunderstorms/Hail, Lightning), Severe Weather (Wind and Tornadoes), and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to improve the Tyler Island levees over the next five years to a level of protection that meets, or exceeds, the U.S. Army Corps of Engineers' (USACE) PL84-99 Levee Standard.

Project Description: The District would like to ensure the protection of the existing levee by adding supplementary quarry stone riprap above the existing riprap to any portions of the waterside slope of the levee requiring supplementary rock slope protection. This will prevent erosion and avoid ongoing repairs to the levee structure.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District's 5-Year Plan

Responsible Office/Partners: RD 563

Project Priority: High

Cost Estimate: $813,000

Benefits (Losses Avoided): Preservation of 563 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: Delta Levees Programs, HMGP and BRIC Grant Programs, seeking cost sharing partners for project ongoing.

Timeline: 1-10 years depending on regulatory process and funding

Action 2. Levee Geometry Levee Improvement Project

Hazards Addressed: Earthquake: Earthquake, Liquefaction; Flood: 100/200/500-year, Levee Failure, River/Stream/Creek Bank Erosion; Severe Weather: Heavy Rains and Storms (Thunderstorms/Hail, Lightning), Wind and Tornadoes (highwater paired with high winds); and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to improve the Tyler Island levees over the next five years to a level of protection that meets, or exceeds, the U.S. Army Corps of Engineers' (USACE) PL84-99 Levee Standard. This will address the hazards listed above.

Project Description: The District would like to address the issue. If sufficient funding is available, the segments of levee improved during this phase will include portions of the levee that meet the HMP Criteria, but do not meet the design template for this project, due to the many relatively short stretches of levee that do not meet the PL 84-99 Standard in close proximity to longer stretches of levee that do not meet the HMP Standard. After the entire levee meets or exceeds the HMP Criteria, the District will bring any remaining portions of levee below the PL 84-99 Standard to six inches above the PL 84-99 Standard.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District's Five-year Plan

Responsible Office/Partners: RD 563

Project Priority: High

Cost Estimate: $20,000,000

Benefits (Losses Avoided): Preservation of 563 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: Delta Levees Program, HMGP and BRIC Grant Programs, seeking cost sharing partners for project.

Timeline: 1-10 years depending on regulatory process and funding

Action 3. Levee Failure Repair Project

Hazards Addressed: Earthquake: Earthquake, Liquefaction; Flood: 100/200/500-year, Levee Failure, River/Stream/Creek Bank Erosion; Severe Weather: Heavy Rains and Storms (Thunderstorms/Hail, Lightning), Wind and Tornadoes (highwater paired with high winds); and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is repair locations of significant slope failure on the levee as a result of the large storm.

Project Description: In 2017, a large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. The District's levee experienced a significant landside slope failure due to under and through seepage along the levee that protects against the North Fork of the Mokelumne. An engineered long-term repair strategy has been developed and submitted to FEMA for Federal Disaster Assistance, yet it remains in appeal for FEMA funding.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: Currently submitted under FEMA's Post Disaster Assistance program; District Five-year Plan

Responsible Office/Partners: RD 563

Project Priority: High

Cost Estimate: $3,600,000

Benefits (Losses Avoided): Preservation of 563 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Preventing significant water quality impacts to the State's water supply, Improving Water Supply Reliability

Potential Funding: FEMA's Post-Disaster Assistance, HMGP, BRIC, and potential cost-sharing partners

Timeline: 1-10 years depending on regulatory process and funding

Action 4. Levee Seepage Repair Project

Hazards Addressed: Earthquake, Earthquake: Liquefaction, Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure, River/Stream/Creek Bank Erosion; Severe Weather: Heavy Rains and Storms (Thunderstorms/Hail, Lightning, Wind and Tornadoes), and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to improve a portion of Tyler Island levee that historically experienced significant under and through seepage.

Project Description: Dedicated for critical levee reaches that have been identified as historically experiencing or being vulnerable to significant under and through seepage. A study is needed to determine whether a cutoff wall, seepage berm, or a combination of both are needed to address the through and under seepage experienced on this levee system.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District Five-year Plan

Responsible Office/Partners: RD 563

Project Priority: High

Cost Estimate: $5,000,000

Benefits (Losses Avoided): Preservation of 563 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: FEMA's Post-Disaster Assistance, HMGP, BRIC, Delta Levees Program, and potential cost-sharing partners

Timeline: 1-10 years depending on regulatory process

Action 5. Backup Power Generator Project

Hazards Addressed: Climate Change, Earthquake, Earthquake: Liquefaction, Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure, River/Stream/Creek Bank Erosion; Severe Weather: Heavy Rains and Storms (Thunderstorms/Hail, Lightning), Wind and Tornadoes, and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to provide backup power to Reclamation District 563 facilities when power goes out.

Project Description: The District would like to ensure continued operation of District infrastructure during a Public Safety Power Shutoff through obtaining backup power generators.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District 5-year Plan

Responsible Office/Partners: RD 563

Project Priority: High

Cost Estimate: $150,000

Benefits (Losses Avoided): Preservation of 563 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners.

Timeline: 1-10 years depending on regulatory process

Action 6. Flood Exercise and Emergency Operations Plan Update

Hazards Addressed: Flood: 100/200/500-year, Flood: Localized Stormwater Flooding, Levee Failure, River/Stream/Creek Bank Erosion, Severe Weather: Heavy Rains and Storms (Thunderstorms/Hail, Lightning), and Severe Weather (Wind and Tornadoes)

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is update RD 563's Emergency Operations Plan and to perform flood exercises in preparation for flood season.

Project Description: The District would like to ensure continued training of staff with regards to flood fighting and associated activities. Updating RD 563's Emergency Operations Plan is essential to continue to protect infrastructure protected by the district's levees. The Emergency Operations Plan provides guidance on how the District will organize, coordinate with outside partners, flood fight, dewater, recover, and serves as a planning document for future flood fight operations.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: California Water Code Section 9650-51 (AB156), Central Valley Flood Protection Plan's emergency preparedness priority, the District's Five-year Plan, and Districts Flood Safety Plan

Responsible Office/Partners: RD 563

Project Priority: High

Cost Estimate: $100,000

Benefits (Losses Avoided): Preservation of 563 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: State – Delta Flood Emergency Response Grant Program, HMGP Grant Programs

Timeline: 1-10 years depending on regulatory process

Delta Annex Chapter 11 Reclamation District 1002

11.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 1002 (RD 1002 or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 1002, with a focus on providing additional details on the risk assessment and mitigation strategy for the District.

11.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 11-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 11-1 RD 1002 – Planning Team

Name	Position/Title	How Participated
Jeffrey McCormack	District Superintendent and Trustee	Provided annex input.
Norm Peters	President, Board of Trustees	Provided annex input.
Gilbert Labrie	Contract District Engineer	Provided annex input. Attended meetings
Barb McGowan	Assistant to Contract District Engineer	Provided annex input.

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 11-2.

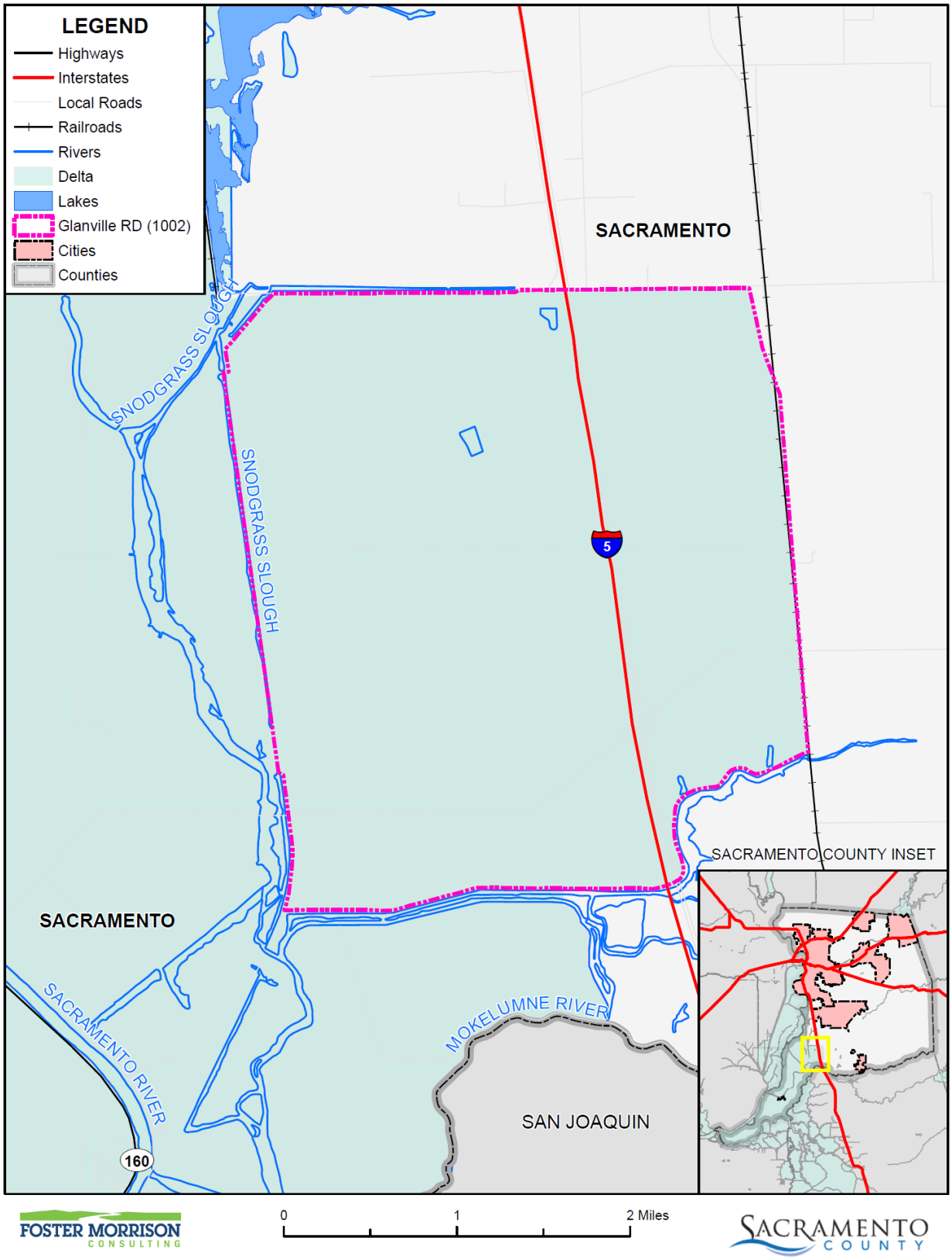
Table 11-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
2016 Sacramento County Flood Safety Plan (by GEI). Currently being updated in 2021	The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter.
2021 Emergency Operations Plan (EOP)	Coordination between District #1002 team members to clarify and ensure conformance and focus to prevent duplication efforts when a solution is available and planned.

11.3 District Profile

The District profile for the RD 1002 is detailed in the following sections. Figure 11-1 displays a map and the location of the District within Sacramento County.

Figure 11-1 RD 1002



Data Source: Glanville Tract Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

11.3.1. Overview and Background

Glanville Tract, Reclamation District 1002 (RD 1002 or District) was established on May 6, 1912, under water code Section 50000 et. seq. It has three trustees that are elected in 4-year, staggered terms. The Board of Trustees meets on an as needed basis. Glanville Tract is 6,829 acres and is surrounded by Lost Slough on the south, the Former SP Railroad Berm to the west, to the east is the Western Pacific Railroad Berm, and Lambert Rd to the North. Glanville Tract is located in Sacramento County in the Primary and Secondary Zone of the Delta. Approximately 13.4 miles of levees surround RD 1002 and are non-project levees.

As described in the Glanville Tract Flood Emergency Safety Plan, Reclamation District 1002 is responsible for maintenance, repair, and improvements of its nearly than 13.4 miles of levees and drainage system providing flood protection. The District maintains canals and ditches that provide drainage to the property owners. The levees protect the District, which is predominantly agricultural land, from flooding. Alfalfa, grain, orchards, tomatoes, potatoes, vineyards are the primary crops grown on the island; there is also a significant amount of irrigated pasture for cattle and goats.

There are 15 households on the Tract with a changing population of no more than 59 people. The maintenance of the levee system is critical to the economy supported by acres of prime agricultural land. Interstate 5 runs through the middle of the Tract, Lambert Road on the north, Franklin Boulevard on the east, and Twin Cities Road on the south.

11.4 Hazard Identification

RD 1002 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 11-3).

Table 11-3 RD 1002—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Limited	Occasional	Negligible	Low	–
Dam Failure	Extensive	Unlikely	Catastrophic	Low	Medium
Drought & Water Shortage	Significant	Likely	Critical	Low	High
Earthquake	Limited	Occasional	Limited	Low	Low
Earthquake Liquefaction	Significant	Occasional	Limited	Low	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	Medium	Medium
Floods: Localized Stormwater	Significant	Highly Likely	Medium	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Limited	Low	Medium
Levee Failure	Limited	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Occasional	Critical	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Low	Low
Subsidence	Limited	Occasional	Negligible	Low	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Likely	Limited	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

11.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

11.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 11.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 11-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

11.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers the RD 1002's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 11-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 1002's physical assets, valued at over $55 million, consist of the buildings and infrastructure to support the District's operations.

Table 11-4 RD 1002 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Levee	Infrastructure	$50,000,000	Localized Stormwater, Floods, Heavy Rains and Storms
Pumping Station	Infrastructure	$5,000,000	Levee Failure, Heavy Rains and Storms
Total		**$55,000,000**	

Source: RD 1002

Natural Resources

RD 1002 has a variety of natural resources of value to the District. There is a significant amount of riparian vegetation along Snodgrass Slough which is approximately 7 miles in length on the western and southern ends of Glanville Tract. There are also areas of freshwater marsh on the southeast corner of the district.

Historic and Cultural Resources

RD 1002 has a variety of historic and cultural resources of value to the District. There are several homes and structures that house the farmers and support agricultural activities on the island.

Growth and Development Trends

Due to zoning and floodplain restrictions, essentially no growth has occurred on the island in recent history. For this reason no growth is expected. As such, a change in vulnerability is unlikely.

Development since 2016

No District facilities have been constructed since 2016. As such, vulnerability remains unchanged.

Future Development

There are no current plans to expand District facilities.

11.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 11-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow.

Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Currently, there is no affect and no backup power is required. This could change if the length of outage is significant.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

Currently, there is no affect and no backup power is required. This could change if the length of outage is significant.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional/Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

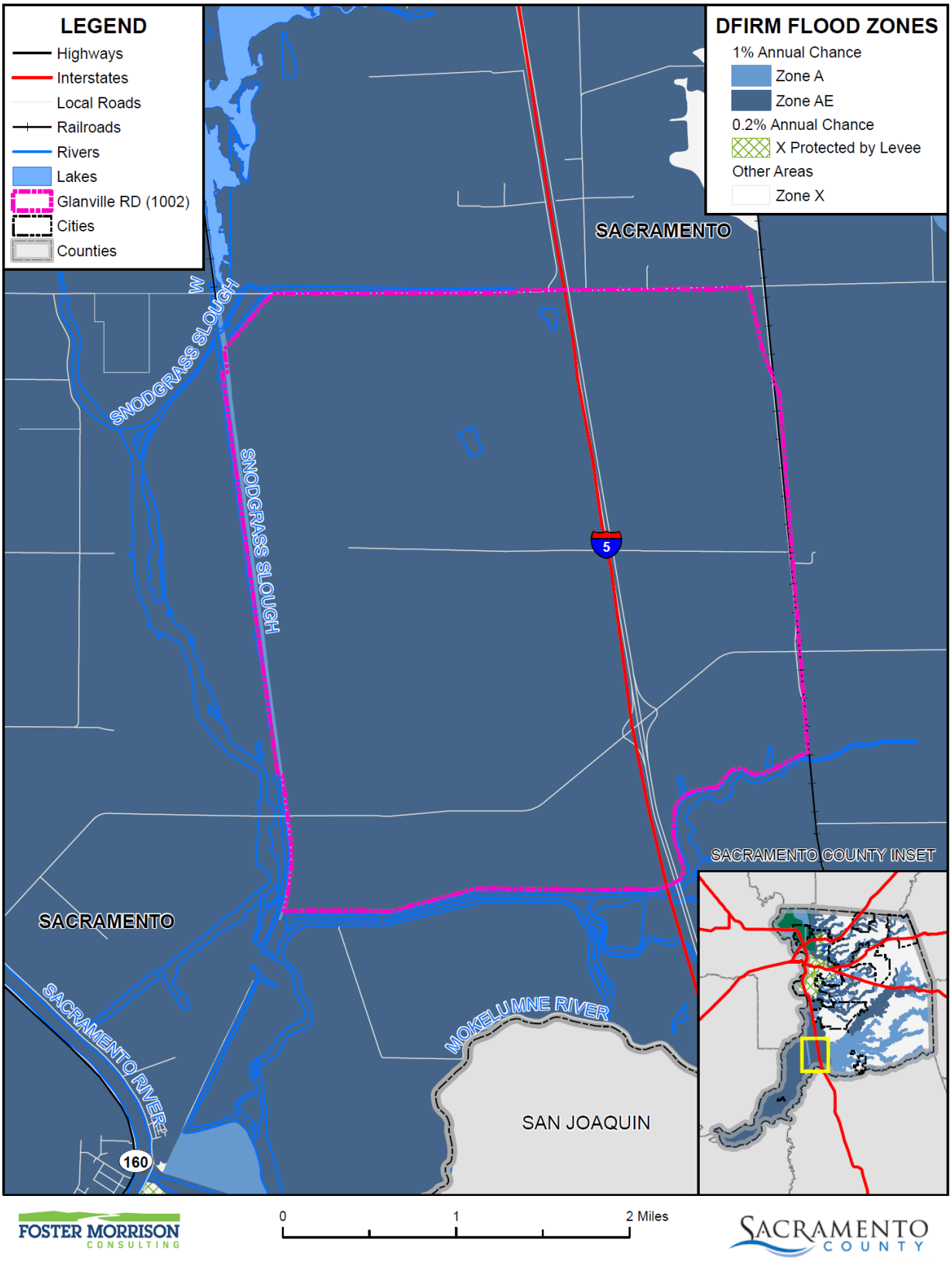
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and the RD 1002 have been subject to historical flooding.

Location and Extent

The RD 1002 has areas located in the 1% annual chance floodplain. This is seen in Figure 11-2.

Figure 11-2 RD 1002 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Glanville Tract Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 11-5 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 11-5 RD 1002– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 11-6. These events also likely affected the District to some degree.

Table 11-6 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The District has had to implement the use of sandbags in high water years. The District experienced flooding in 1986 and 1997 due to events that were closest to a 100-year flood event. High water events (HWE) since 2016 include:

- 2017 HWE: Initiated extra monitoring. Boil resulting from a beaver on Snodgrass Slough. Penetration leak on Lost Slough. Threat of overtopping on Lost Slough. Penetration (breach) at Franklin Blvd.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

A 100/200/500-year flood event could cause flooding within the District. A high water event, depending on the water elevation, could cause failure due to overtopping and/or could increase hydraulic gradients within the levee section resulting in landside seepage or boils. Continued seepage, if left unaddressed, could erode the levee and result in failure. Heavy flows could also cause erosion and scour on the waterside bank that could undermine the levee and cause failure.

The vulnerability and impact from a flood would close a section of Interstate 5 and Twin Cities Road which is a major local commuter route from East Bay to Elk Grove and Galt.

Assets at Risk

The levee system is very vulnerable to a 100/200/500-year flood. Riverine floods and storm water runoff flows could exceed the capacity of the levee system. The flood could also overtax the District's drainage system that could cause even further flooding. In sum, the pump systems and the levees themselves are at risk from flooding.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high peak flows of moderate duration.

Location and Extent

The RD 1002 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District noted the following past occurrences of localized flooding:

Some form of localized stormwater flooding occurs during most heavy rains. The most likely time this could have occurred in the past was during the wet years of 2011, 2006, 1997 and 1986. The District must address storm water runoff with sandbags to provide ample freeboard. The District noted the following events since 2016:

- 2017 HWE: Initiated extra monitoring. Stormwater resulted in excess electrical cost to pump the excess run off that was required to prevent localized flooding and to manage the threat of overtopping on Snodgrass Slough. Boiling resulting from a beaver on Snodgrass Slough. Seepage by the confluence of Snodgrass Slough and Lost Slough. Sandbag management and implementation. Installation of K-rail to close Franklin.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability,

collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Localized stormwater flooding can occur during heavy rains or seepage events that exceed the District's drainage capabilities. Lower areas around the island may be subject to flooding. Localized flooding can overtax the Districts drainage and levee system and create for a more hazardous situation involving the levee system by limiting the ability for inspection.

Assets at Risk

The District pump station could be at risk from localized flooding.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

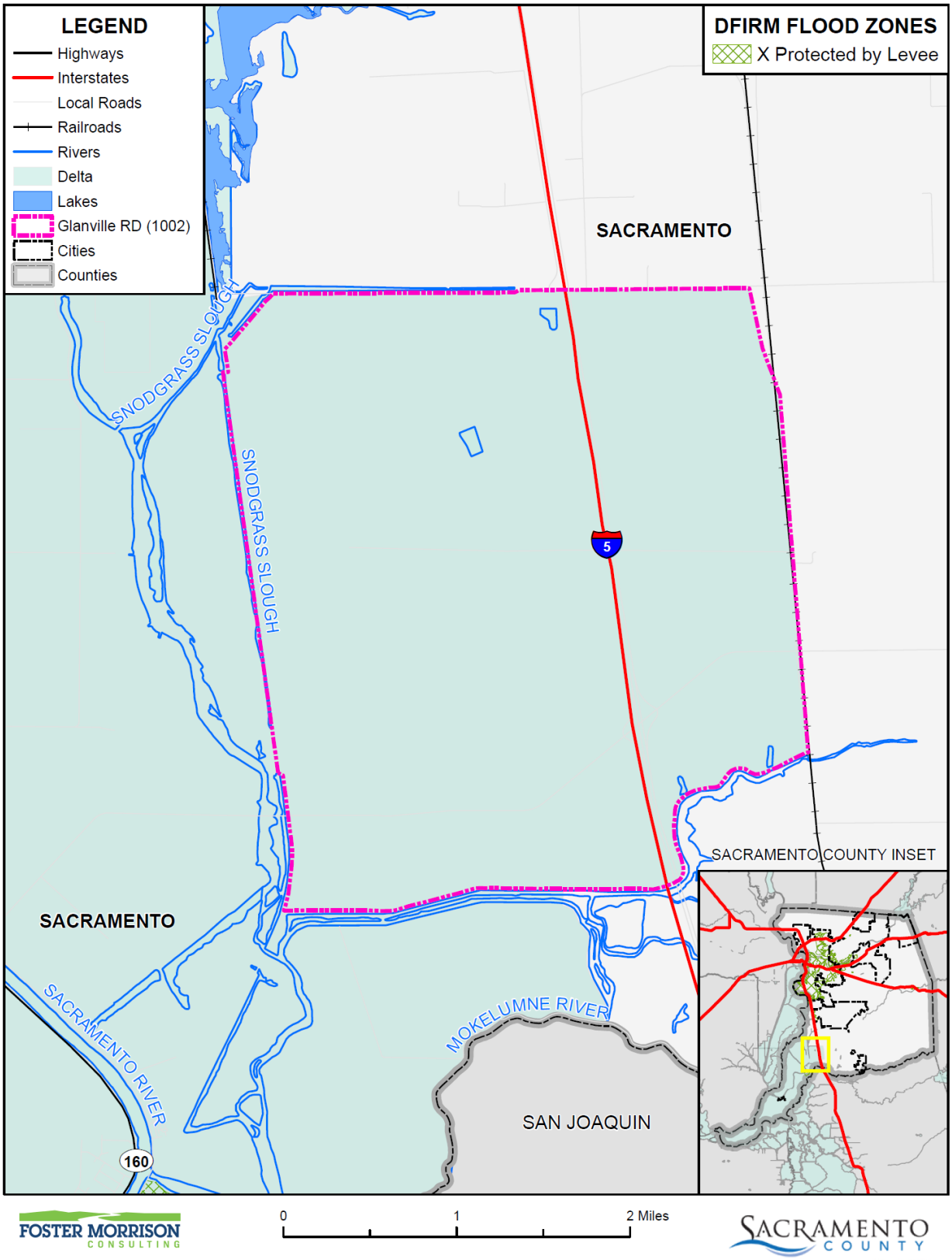
Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 11-3. As shown, the levees of the District are not certified on the FEMA DFIRMs as providing protection against

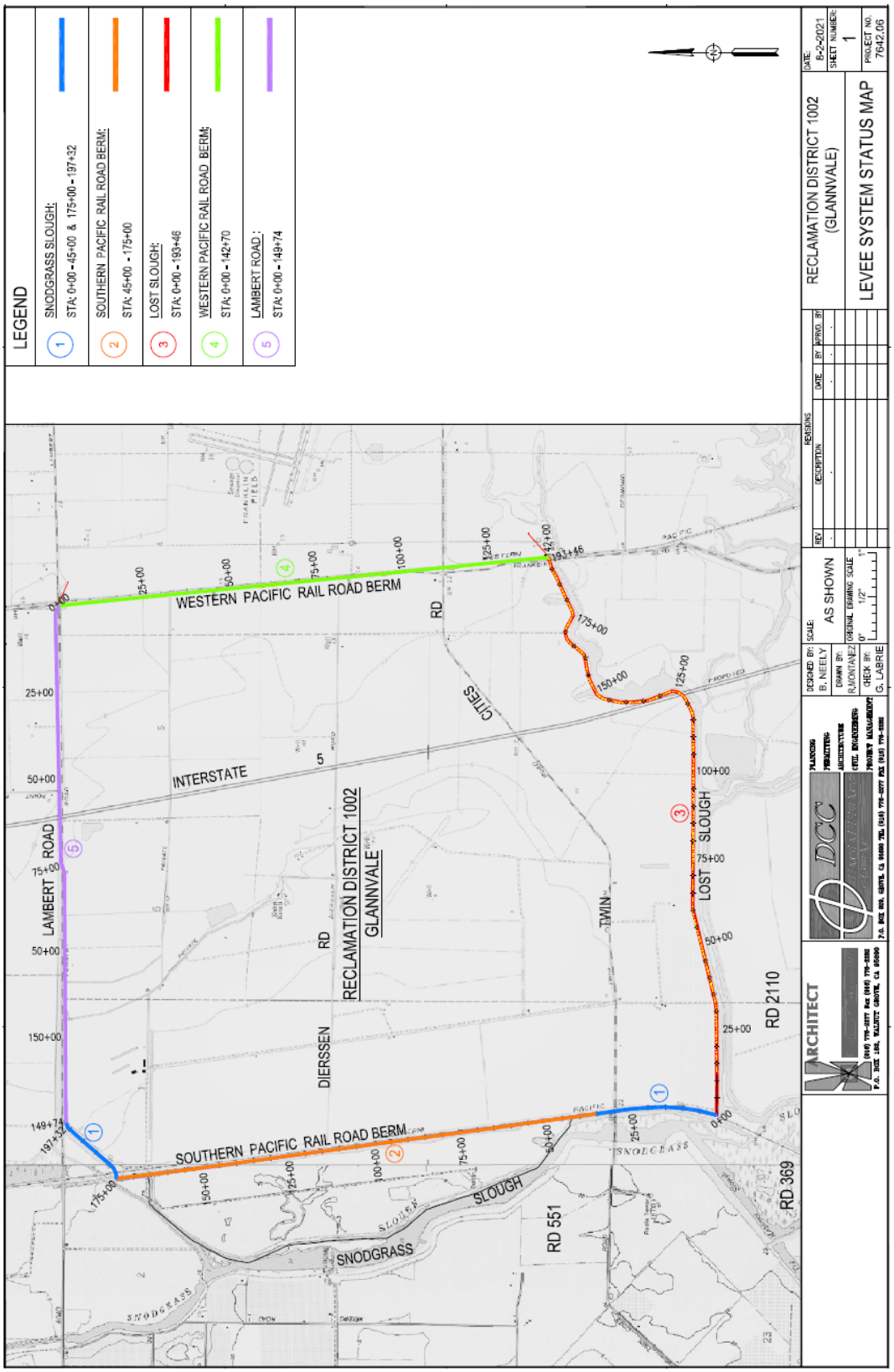
the 1% annual chance flood. A levee status map from RD 1002 and DCC Engineering (Dated 8/2/2021) is shown on Figure 11-4.

Figure 11-3 RD 1002 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Glanville Tract Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure 11-4 RD 1002 – Levee Status Map



Source: RD 1002, DCC Engineering

Past Occurrences

There have been no federal or state disaster declarations from levee failure. The District Planning Team noted that in 1986 the levees were overcome through an intentional levee break.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

For RD 1002 the problematic areas are near the south-western end of the District near the packing house where boils have occurred in the past. Also the eastern levee near the Cosumnes River Preserve was intentionally broken in 1986 and has been problematic since. The vulnerability and impact from a levee breach would close a section of Interstate 5 and Twin Cities Road which is a major local commuter route from East Bay to Elk Grove and Galt.

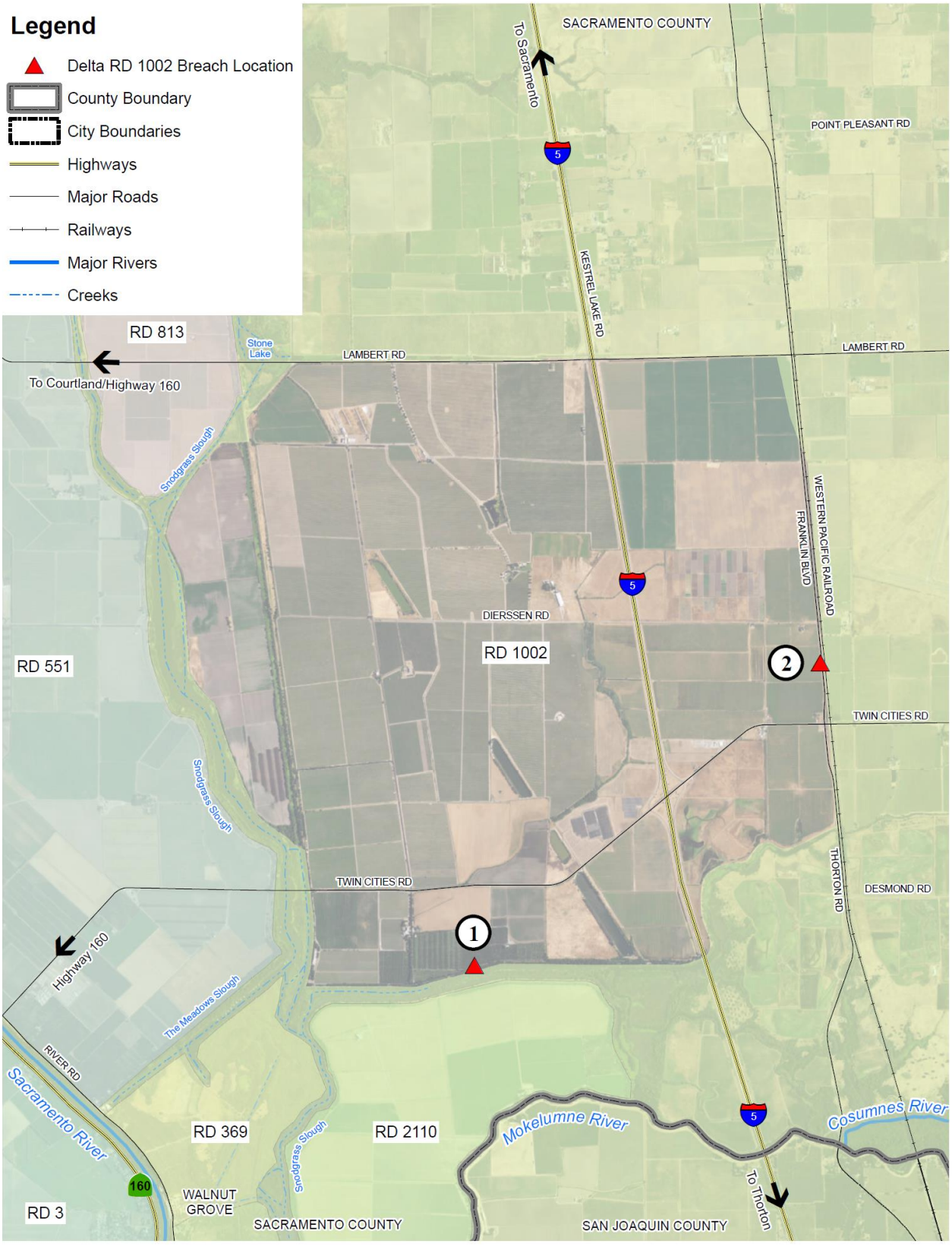
StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be the citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

For RD 1002, Figure 11-5 details the locations in the Delta within RD 1002 where flooding could occur. The red triangles denote potential levee breach locations. RD 1002 has two potential levee break scenarios. Maps for Scenario 1 regarding time to one foot inundation (Figure 11-6), estimated flood depths (Figure 11-7), and suggested evacuation routes (Figure 11-8) are displayed below. Maps for Scenario 2 can be found on the Sacramento County stormready.org website.

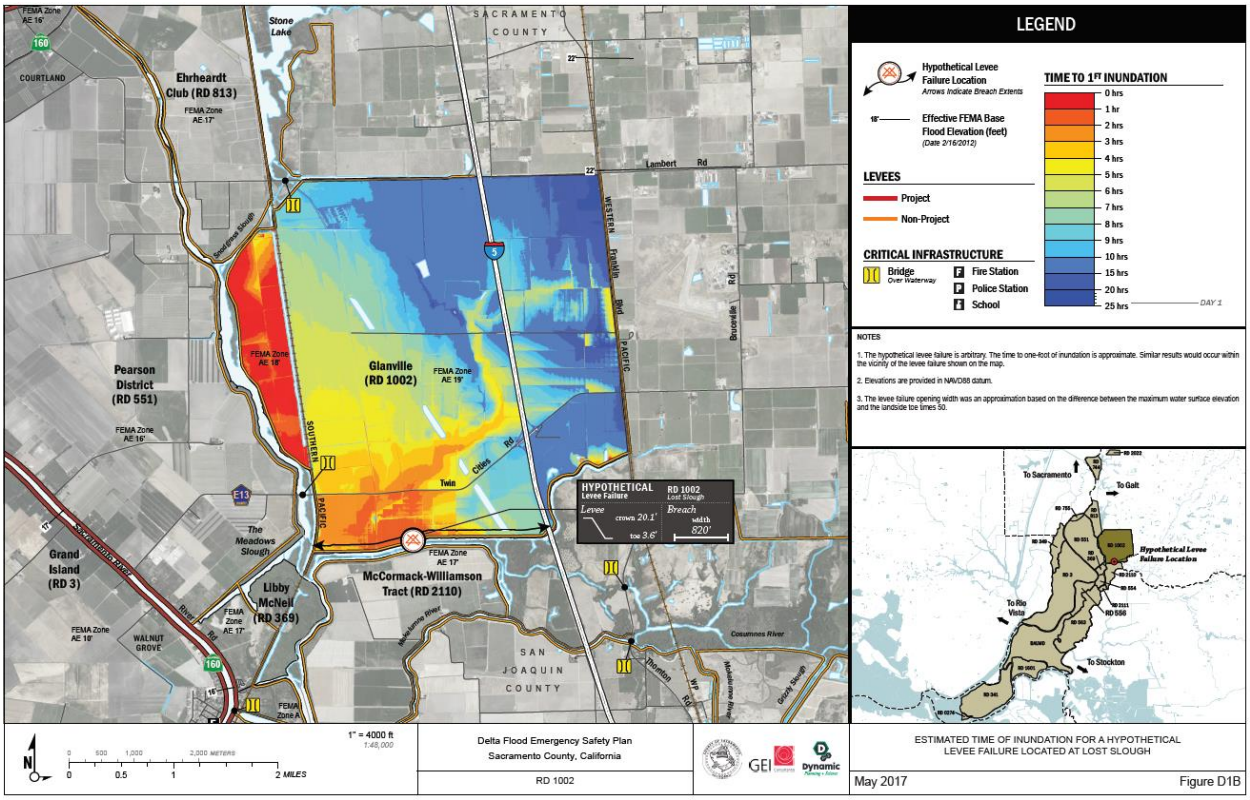
Note: This information is based on assumptions and scenarios developed as part of the flood safety planning done for Delta RDs in 2017; areas of possible flooding depicted in these maps may or may not reflect current conditions and would change depending on the location of breach areas and conditions during any given event. Current conditions should be verified with an LMA representative.

Figure 11-5 RD 1002 – Potential Levee Breach Location



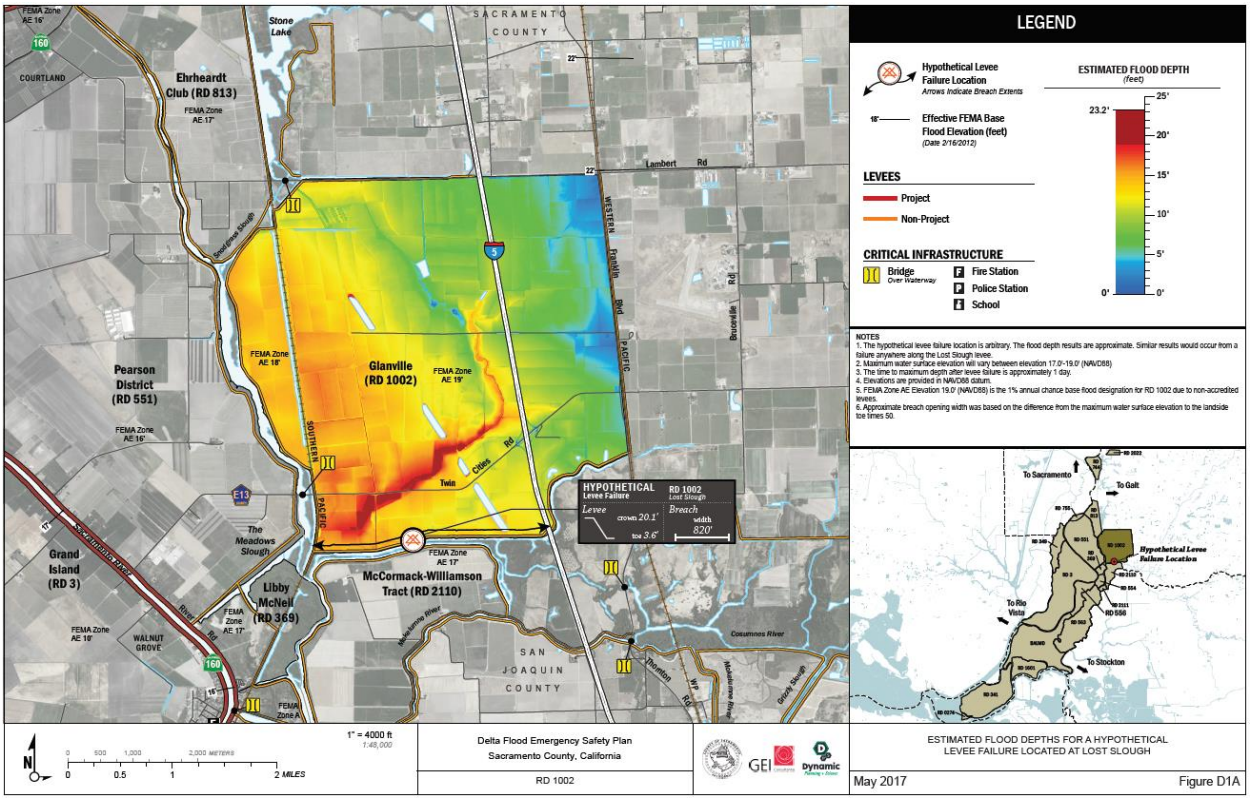
Source: Sacramento County Storm Ready – retrieved March 24, 2021

Figure 11-6 RD 1002 – Time to One Foot Inundation after Levee Breach



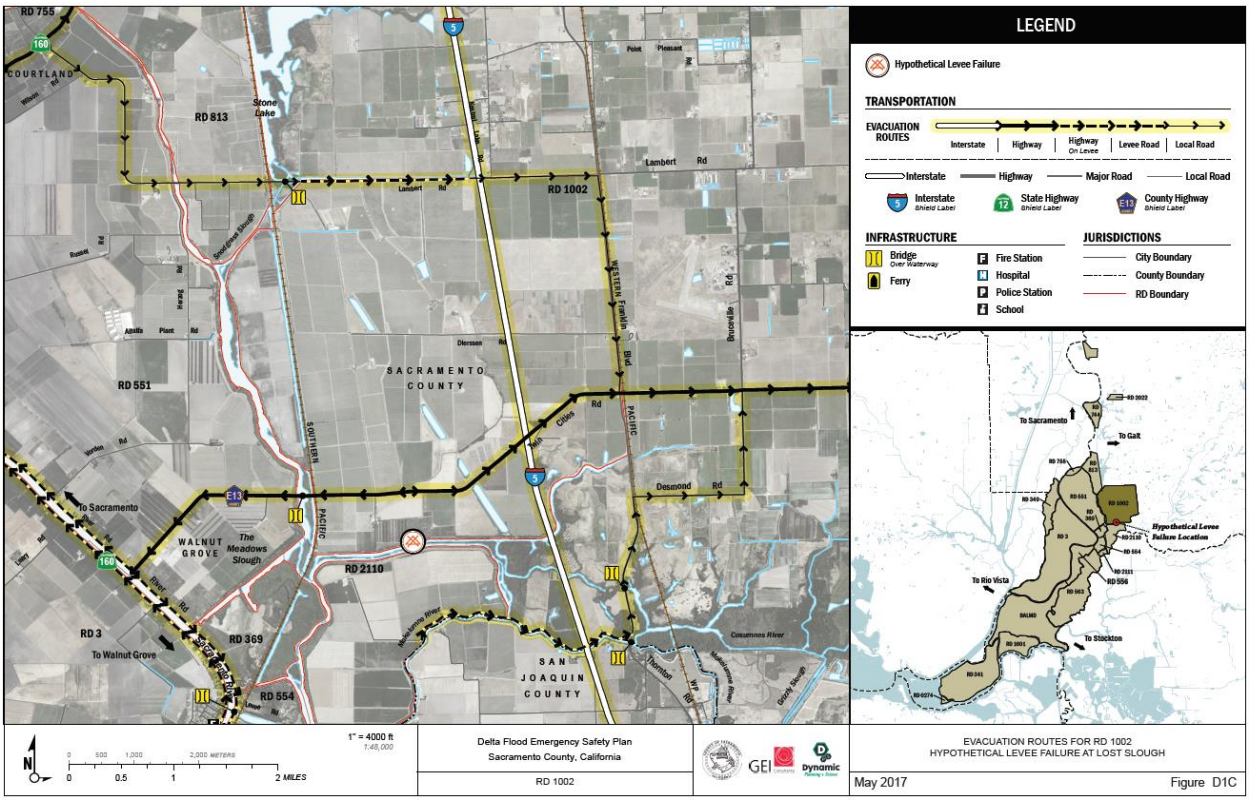
Source: Sacramento County Storm Ready – retrieved March 24, 2021

Figure 11-7 RD 1002 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 24, 2021

Figure 11-8 RD 1002 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 24, 2021

Assets at Risk

Levees are the most at risk of this hazard. An island inundation can create an open water situation where a large fetch could develop and erode the interior of other levees within the District. The pumping station if inundated can also be damaged from a levee break. Twin Cities Rd can remain as an evacuation route until it floods and requires closure.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

The last heavy rain and storm event the District experienced was in 2006, 1997 and 1986. No significant damages occurred due to these high water events. Events since 2016 include:

- 2017 HWE: Extra Monitoring. Severe weather resulted in excess electrical cost to pump the excess run off that was required to prevent localized flooding and to manage the threat of overtopping on Snodgrass Slough. Seepage by the confluence of Snodgrass Slough and Lost Slough. Sandbag management and implementation. Installation of K-rail to close Franklin.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

Heavy rains and storms can result in higher flood flows that could increase the hydraulic gradients within the levee section and result in seepage or if great enough, possibly overtopping. They can also increase flows and result in erosion of the waterside bank.

Vulnerability and impacts from severe weather heighten staffing responsiveness for extra monitoring of levees and water flow which in turn could result in erosion on the Sacramento River and Georgiana Slough. Severe Weather has the potential for implementation of flood fighting plans as a protection for levees and community members.

Assets at Risk

The District levees and pumping plant are at risk of damage from heavy rains and storms.

11.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

11.6.1. Regulatory Mitigation Capabilities

Table 11-7 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 1002.

Table 11-7 RD 1002 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y	1. Current 5-year plan is under review and being updated. It describes past, present, and future hazards. These hazards are managed and implemented using the standard operating plan strategies. 2. At this time, an Emergency Operations Plan is still in development. Expected process to the finalized during the next 2 years. 3. 2016 Sacramento County Flood Safety Plan is in place. As well, as a Hazard Plan concerted with Sacramento County with GEI as the interface. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter. 4. Update of the 2016 LHMP continues to include valuable information about the priority of hazards RD 1002 faces. Once accepted this data and information can be used to the highest and best protection of the District and its communities.
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	In development	While EOP is in development, there is unofficial protocol of those that live and work on the island. They have used this protocol over long period of time to respond to flood and other related hazards.
Continuity of Operations Plan	Y	The EOP provides continuity for the District and the expected process is to finalize during the next 2 years.
Transportation Plan	N	
Stormwater Management Plan/Program	Y	This category is included in the District standard operations and maintenance procedures. Patrols are dispatched at critical times. Before and after storms, patrols know where to look, inspect and take action to proactively provide flood risk reduction. Procedures are in place to keep water flow moving.
Engineering Studies for Streams	Y	District is contracted with local engineering company who provides counseling and advice of Operations and Management for risk reduction, levee integrity, and mitigation relating to water/flood flows. Engineer provides and satisfies agency interface as well as Fiscal advice.

Community Wildfire Protection Plan	N	In the event of such hazard, the community Reverse 911 and phone tree would be initiated. Detailed communication from WGFD command center would be put into action.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	N	RD 1002 is constantly reviewing or studying data for reduction of hazards and improvements to current plans to provide a safer environment to its community.
Research and Development of burrowing animals	N	Assist in research and develop plan for preparedness, management and control of burrowing animals. In very recent years, burrowing animals have become a hazard. Burrowing causes extensive damage to water infrastructure, banks, and levees, and creates a hazard for people, livestock, and machine operators. Potential levee and dike failures due to nutria burrowing have serious implications for flood protection, water delivery, and agricultural irrigation in California.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	Y	Version/Year: CBC 2019
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	1002 has been granted the right & authorization for development adjacent to levees through the County Flood Ordinance.
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	Y	Sacramento County Zoning Code reduces both hazard and growth and development. The District is mostly zoned agriculture which reduces growth and development.
Subdivision ordinance	N	
Floodplain ordinance	Y	Yes, Sacramento County Floodplain Ordinance restricts development in the floodplain
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	Y	Zone AE
Elevation Certificates	Y	Sacramento County requires Elevation Certificates for new construction. Other outside resources such as insurance companies and mortgage companies may choose to require EC also. There is emphasis and funding from FEMA to raise existing homes to provide safer residential properties against hazards. Thereby reducing risk.
Acquisition of land for open space and public recreation uses	N	

Erosion or sediment control program	Y	5-Year Plan continues to include monitoring for such hazards. Through the Districts standard operating plan, patrols are dispatched at critical times. Special attention is given to inspection of critical erosion sites. The District is responsible for its own main levee repair and maintenance in which procedures are outlined in the general patrol guidelines. Patrols take action to proactively provide erosion or sediment reports.
Other	N	The District has been granted the right & authorization for development adjacent to levees through the County Flood Ordinance. Pre permit submissions requires an owner to receive RD approval before proceeding forward with permits.
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. RD 1002 would like to expand and improve to reduce risk by implementing: 1. Research the continuity of multiple hazard plans and identify the projects that include mitigation strategies. Therefore, implementing mitigation strategies to improve District LOP for its communities. Thus, reducing risk to life and property. 2. Levee rehabilitation for the deficient areas on Lost Slough. 3. Vegetation management from deferred maintenance These capabilities to expand and improve upon are high priority to the District, but expenditures and allowances of financial resources have prevented implementation plans and forward progress of these two projects.		

Source: RD 1002

11.6.2. Administrative/Technical Mitigation Capabilities

Table 11-8 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 1002.

Table 11-8 RD 1002's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	N	
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	RD 1002 has planned maintenance programs that include vegetation management. Levees are mowed, vegetation is trimmed, and roadways are clear for patrol and emergency vehicles to have access. RD 1002 seeks to expand and improve on the following capabilities to reduce risk by implementing: 1. Levee rehabilitation for the deficient areas on Lost Slough. 2. Vegetation management from deferred maintenance Both of these capabilities to expand and improve upon are high priority to the District, but expenditures and allowances of financial resources have prevented implementation plans and forward progress of these two projects.

Mutual aid agreements	Y	RD 1002 is contracted with a local engineering company who provides counseling, review, and implementation on risk reduction, levee integrity, and mitigation related to mitigation capabilities. Unofficial coordination between many community members and local residents responding to their respective duties during a hazard. This is very effective risk reduction coordination.
Other	N	
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	Y	Determined via the Sacramento County Flood Safety Plan and Emergency Operations Plan that is in development
Emergency Manager	Y	Determined via the Emergency Operations Plan (in development) and in use until plan adoption. The EM also coordinates the many community members and local residents responding to their respective duties during a hazard.
Community Planner	Y	County Board of Supervisors through town meetings, board or trustees, and interface with District Engineer.
Civil Engineer	Y	Staff is trained to coordinate with agencies and perform tasks in an emergency situation. The Engineer provides interface with agencies and their staff.
GIS Coordinator	N	
Other	Y	Funding for additional staff would be very effective to improve upon agency task assignments, improvement with interface to the community, and be more effective throughout the District.
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Reverse 911, phone tree, detailed and organized communication from WGFD command center would be put into action.

Hazard data and information	Y	1. Current 5-year plan is under review and being updated. It describes past, present, and future hazards. These hazards are managed and implemented using the standard operating plan strategies. 2. At this time, an Emergency Operations Plan is still in development. Expected process to the finalized during the next 2 years. 3. 2016 Sacramento County Flood Safety Plan is in place. As well, as a Hazard Plan concerted with Sacramento County with GEI as the interface. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter. 4. Update of the 2016 LHMP continues to include valuable information about the priority of hazards RD 1002 faces. Once accepted this data and information can be used to the highest and best interest of the District.
Grant writing	N	
Hazus analysis	N	
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
RD 1002 would like to expand and hire personnel to reduce risk by: Continually be hands on to determine hazard and have a better understand and writing of mitigation strategies, their studies and implementation. Continue the development of an improved warning system to alert the community. Both of these capabilities to expand and improve upon are high priority to the District, but expenditures and allowances of financial resources have prevented implementation plans and forward progress of these two projects.		

Source: RD 1002

11.6.3. Fiscal Mitigation Capabilities

Table 11-9 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 11-9 RD 1002's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	Delta Levees Subventions program to maintain levee system.
Authority to levy taxes for specific purposes	Y	Proposition 218 provides the District with the limited ability to raise benefit assessments through a vote of property owners.

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	Unknown, would be dictated by Sacramento County
Storm water utility fee	Y	Benefit Assessments are applied for drainage
Incur debt through general obligation bonds and/or special tax bonds		
Incur debt through private activities	Y	Districts may borrow from a financial institution can be an option
Community Development Block Grant	N	
Other federal funding programs	N	
State funding programs	Y	State or local approved grants would be another financial resource for expenditure on top priority hazards that have been identified. Such funding would offer expenses on operations and maintenance to improve levee rehabilitation and vegetation management. Delta Levee Subventions Program Delta Levee Special Projects Proposition 84 and 1E
Other	N	Additional funding would allow more projects to be completed per year adding staff to better reduce the risk in the District.
How can these capabilities be expanded and improved to reduce risk?		
RD 1002 is in the Subventions Program. RD 1002 would like to reduce the risk from these items: 1. Levee rehabilitation for the deficient areas on Lost Slough. 2. Vegetation management from deferred maintenance 3. To continually be hands on to determine hazard and have a better understand and writing of mitigation strategies, their studies and implementation. These capabilities to expand and improve upon are high priority to the District, but expenditures and allowances of financial resources have prevented implementation plans and forward progress of these projects.		

Source: RD 1002

11.6.4. Mitigation Education, Outreach, and Partnerships

Table 11-10 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 11-10 RD 1002's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	Fish and Wildlife – Preparedness of burrowing animals, Eradication of Nutria Department of Water Resources Delta Flood Emergency Preparedness, Cal OES Rotary Club of Walnut Grove, River Delta Historical Society, River Delta Unified School District.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Local schools provide a small amount of public education to students for their general school safety. Multiple agencies hold town meetings to distribute topic specific information.
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	Y	Through neighboring RD's, unofficial partnerships are in place for assistance in the event of a hazard.
Other	N	
How can these capabilities be expanded and improved to reduce risk?		
The District could develop a public outreach program it informs residents of disaster related issues. As a small number of people district, current planned coordination for RD#1002 is consistently reviewed, implemented, and quite effective. Continuation of improving outreach programs in coordination with State agencies and neighboring RD's may be helpful in community education about disaster related issued. Assist in research and develop plan for preparedness, management and control of burrowing animals. In very recent years, burrowing animals have become a hazard. Burrowing causes extensive damage to water infrastructure, banks, and levees, and creates a hazard for people, livestock, and machine operators. Potential levee and dike failures due to nutria burrowing have serious implications for flood protection, water delivery, and agricultural irrigation in California.		

Source: RD 1002

11.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

The District plans on removing dense vegetation along Snodgrass Slough to reveal areas with significant erosion. Once these areas are determined the District will develop a multi-year plan to address problematic areas. The current plans for vegetation management are still in planning. Resource funds are not allocated at this time.

The District is seeking to obtain access to information and mitigation in research and develop plan for preparedness, management and control of burrowing animals. In very recent years, burrowing animals have become a hazard. Burrowing causes extensive damage to water infrastructure, banks, and levees, and

creates a hazard for people, livestock, and machine operators. Potential levee and dike failures due to nutria burrowing have serious implications for flood protection, water delivery, and agricultural irrigation in California

11.7 Mitigation Strategy

11.7.1. Mitigation Goals and Objectives

The RD 1002 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

11.7.2. Mitigation Actions

The planning team for the RD 1002 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Regional Flood Management Plan Projects

Hazards Addressed: Floods, Subsidence, Heavy Rain and Storms, and Dam Failure

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD1002.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects brought to light in the Small Communities Plans. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, over topping on Snodgrass Slough, seepage by the confluence of Snodgrass Slough and Lost Slough, burrowing animals, and protecting Cal Trans and State HWY 5 at Franklin Blvd. In general, these projects will contain many levee and flood management improvements including but not limited to environmental projects such as burrowing animal mitigations, levee repairs, erosion control, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; and 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Action 2. 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021.

Hazards Addressed: Floods, Subsidence, Levee Failure, Heavy Rain and Storms, and Burrowing Animals.

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD1002. The plans include information that sets up SEMS/NIMS processes, identifies critical infrastructure and evacuation routes, and sets up monitoring and levee patrol protocols. The 2021 updates will include Flood Annex Maps that summarize information contained in the plans as well as including any missing protocols to bring them into full compliance with existing codes and any additional information/updates the Districts may have since the plans were originally completed. The updates should be complete by this winter.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, over topping on Snodgrass Slough, seepage by the confluence of Snodgrass Slough and Lost Slough, burrowing animals, and protecting Cal Trans and State HWY 5 at Franklin Blvd. In general, these projects will contain many levee and flood management improvements including but not limited to, levee repairs, erosion control and repair, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021. Regional Flood Management Plan; and 2021 Emergency Operations Plan (EOP) – Currently in development; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; FEMA hazard mitigations, the Army Corps of Engineers; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Action 3. 2021 Emergency Operations Plan (EOP) – Currently in development

Hazards Addressed: Floods, Subsidence, Heavy Rain and Storms, and Dam Failure

Goals Addressed: 1, 2, 3, 4, 5, 6

Issue/Background: Levee and flood management, operations, and improvements are all integral necessities for continued levee and flood protection. Projects need to be undertaken at various locations in the District, including RD1002. The EOP is coordination between RD1002 team members to clarify and ensure conformance and focus to prevent duplication efforts when a solution is available and planned.

Project Description: Multiple agencies will work in conjunction with the County to implement the mitigation projects contained in the Regional Flood Management Plan. The agencies will work to increase levee protection, additional levee improvements in all plans and improve levee integrity to manage flood risk and provide safer systems for the community. Specifically, over topping on Snodgrass Slough, seepage by the confluence of Snodgrass Slough and Lost Slough, burrowing animals, and protecting Cal Trans and State HWY 5 at Franklin Blvd. In general, these projects will contain many levee and flood management improvements including but not limited to, levee repairs, erosion control and repair, riparian bench restorations, crown raising to address subsidence, vegetation management and removal, proactive levee improvements, operations and maintenance improvements, structure rising, seepage repair and protection, encroachment modifications and fixes and repairs to the levee perimeters, bank and slope protections, encroachment modifications, and others.

Other Alternatives: No Action

Existing Planning Mechanism(s) through which Action Will Be Implemented: 2021 Emergency Operations Plan (EOP) – Currently in development; 2016 Sacramento County Flood Safety Plan (by GEI) and subsequent updating in 2021; Regional Flood Management Plan; and HMA 2021 BRIC and FMA Programs and subsequent mitigations.

Responsible Agency/ Department/Partners: County DWR and Reclamation Districts; FEMA hazard mitigations, the Army Corps of Engineers; State DWR, SAFECA, USACE, and others.

Cost Estimate: Estimated cost varies by nature and extent of each project.

Benefits (Losses Avoided): Proactive levee integrity management is to reduce risk to people in the communities, property, and environmental resources from a possible levee failure or other flood events.

Potential Funding: CA DWR grants, County, Reclamation Districts, FEMA, 2021 HMA Grants (BRIC and FMA), and others

Timeline: 2021 and ongoing, subject to funding, planning, permitting, and construction windows.

Project Priority (H, M, L): High

Delta Annex Chapter 12 Reclamation District 1601

12.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 1601 (RD 1601 or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document but, appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 1601, with a focus on providing additional details on the risk assessment and mitigation strategy for this District.

12.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 12-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 12-1 RD 1601 – Planning Team

Name	Position/Title	How Participated
Chris Neudeck, KSN, Inc	District Engineer	Attended meetings, collected data, drafted text, reviewed draft docs
Bill Darcie, KSN, Inc.	Project Manager	Attended meetings, collected data, drafted text, reviewed draft docs
Elizabeth Ramos, KSN, Inc.	Project Engineer	Attended meetings, collected data, drafted text, reviewed draft docs
Megan LeRoy, KSN, Inc.	Project Engineer	Attended meetings, collected data, drafted text, reviewed draft docs

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 12-2.

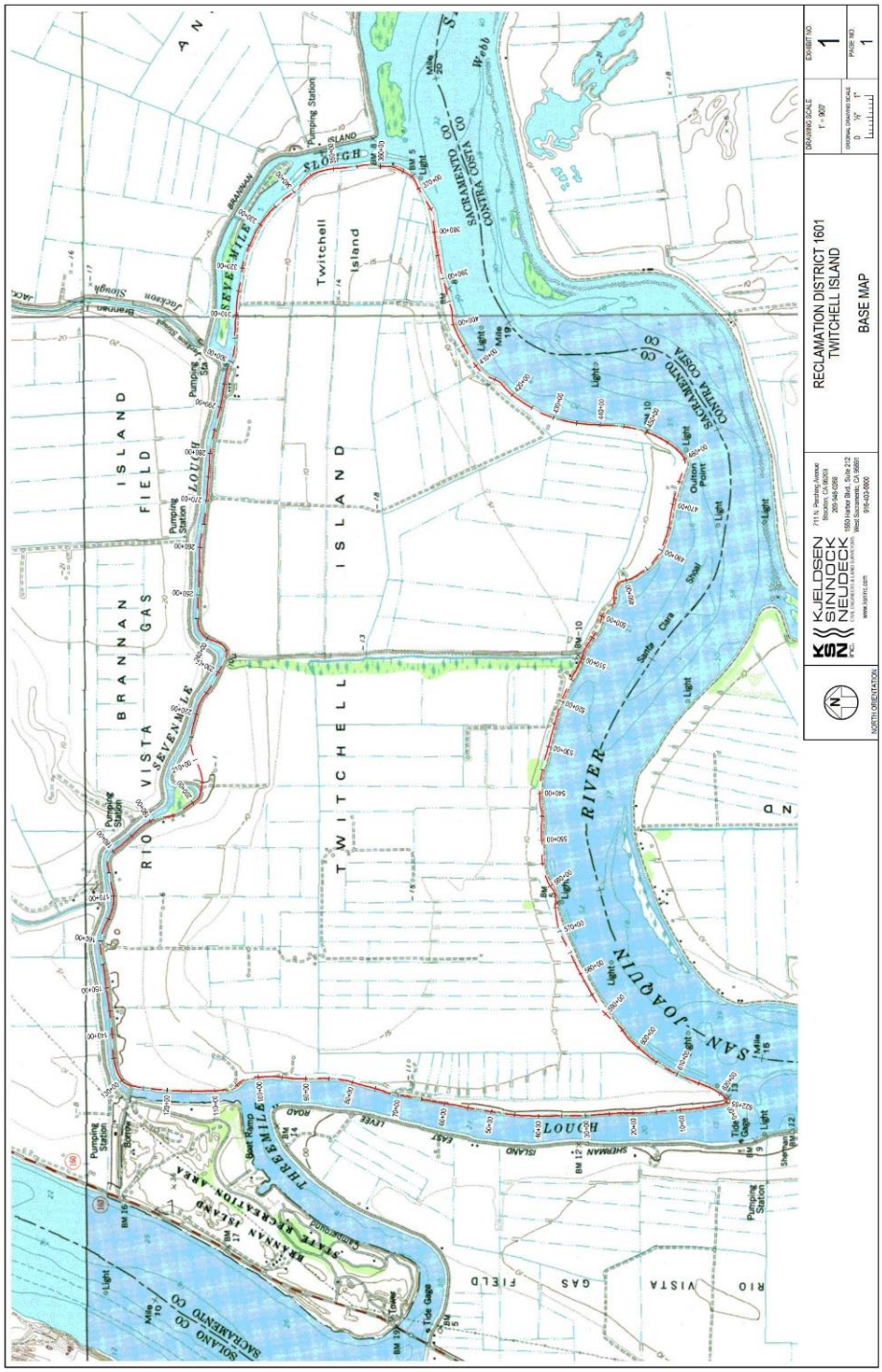
Table 12-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Development of RD 1601 Flood EOP	Elements in the Hazard Assessment used in the development of the Flood EOP

12.3 District Profile

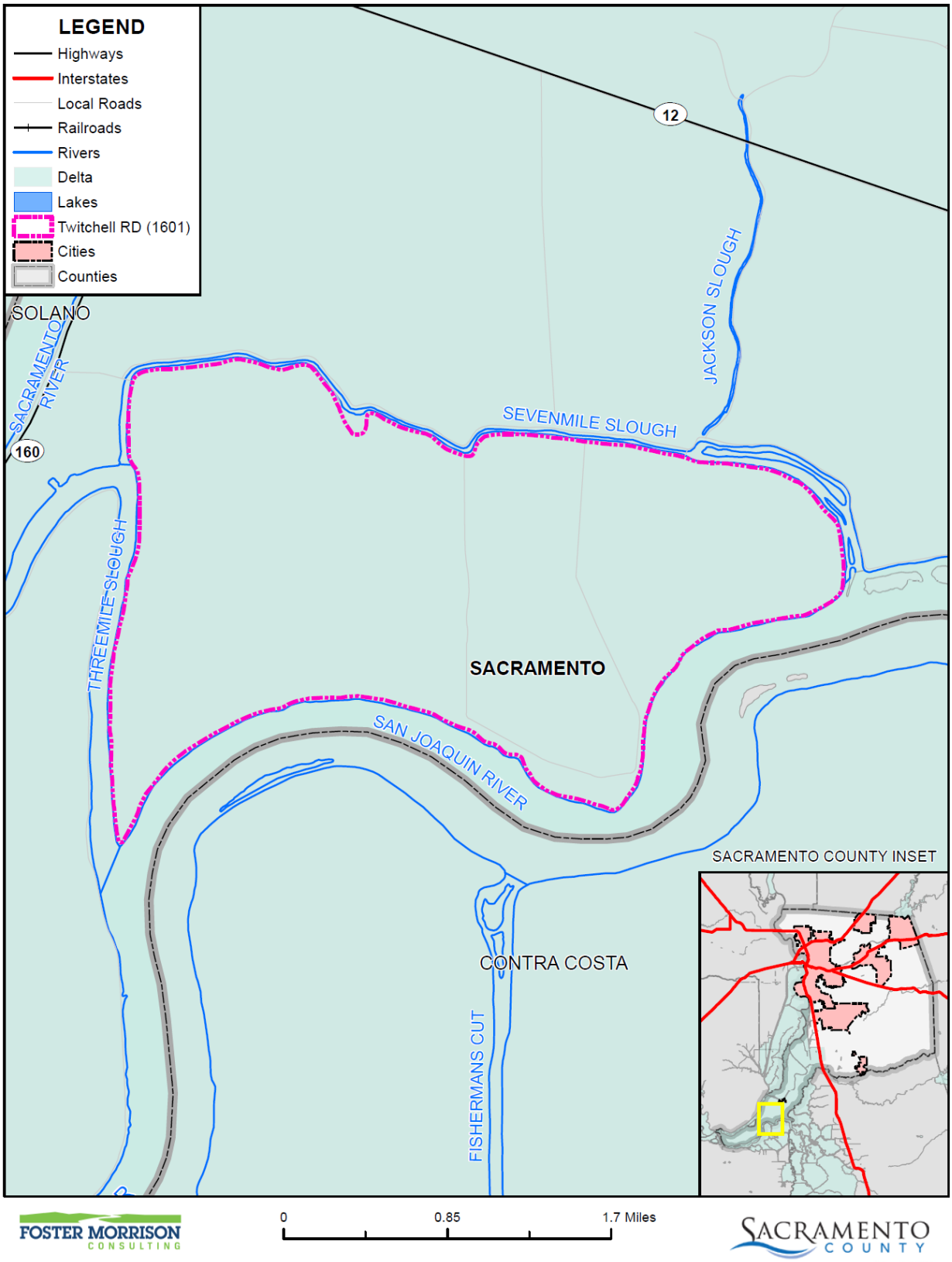
The District profile for RD 1601 is detailed in the following sections. Figure 12-1 and Figure 12-2 displays a map and the location of the District within Sacramento County.

Figure 12-1 RD 1601



Source: RD 1601 2010 5 Year Plan

Figure 12-2 RD 1601



Data Source: Twitchell Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

12.3.1. Overview and Background

Reclamation District No. 1601, also known as Twitchell Island, maintains 11.9 miles of levee made up of 2.5 miles of Federal Flood Control Project levee and 9.4 miles of non-project levee. The District is bordered by Sevenmile Slough, Threemile Slough and the San Joaquin River. Sacramento County maintains a paved road along Sevenmile Slough from levee station 127+50 to 303+00. The county road provides access and emergency evacuation to the East via Brannan-Andrus Island and State Highway 12 or to the West via State Highway 160.

The lands within the District were privately owned up until 1991 when the State of California purchased the majority of the property within the island. The State's interest in the island is primarily to ensure that the levees would be improved to protect against flooding of the island. Flooding in the Western Delta could severely degrade water quality within the Delta and impact the operations of the State and Federal water projects due to salt intrusion from areas downstream. Following the State's purchase of property on the island, the State, being the largest landowner, appointed the majority of the Trustee positions on the District's Board.

Continuous routine maintenance activities have occurred on the levees throughout the history of the island and include smaller projects not listed here. Types of work performed on a routine basis include erosion repairs, road repairs, debris removal, minor core trenching, ditch cleaning, pump repair and maintenance, vegetation control, and rodent control.

12.4 Hazard Identification

RD 1601 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 12-3).

Table 12-3 RD 1601—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Occasional	Limited	Low	-
Dam Failure	Limited	Unlikely	Negligible	Low	Medium
Drought & Water Shortage	Extensive	Occasional	Critical	Low	High
Earthquake	Extensive	Occasional	Limited	Medium	Low
Earthquake Liquefaction	Significant	Unlikely	Limited	Medium	Low
Floods: 1%/0.2% annual chance	Extensive	Unlikely	Catastrophic	High	Medium
Floods: Localized Stormwater	Extensive	Occasional	Critical	High	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Limited	Unlikely	Limited	Low	Medium
Severe Weather: Extreme Heat	Extensive	Likely	Limited	Low	High
Severe Weather: Heavy Rains and Storms	Extensive	Likely	Critical	High	Medium
Severe Weather: Wind and Tornado	Extensive	Likely	Critical	High	Low
Subsidence	Extensive	Likely	Critical	Medium	Medium
Volcano	Limited	Unlikely	Negligible	Low	Low
Wildfire	Limited	Unlikely	Negligible	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

12.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

12.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 12.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 12-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

12.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers RD 1601's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 12-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 1601's physical assets, valued at over $2.7 million, consist of the buildings and infrastructure to support the District's operations.

Table 12-4 RD 1601 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk
Pump Station #1 (including all station components)	Essential Services	$2,000,000l	Flood, Levee Failure, Liquefaction
Pump Station #2 (including all station components)	Essential Services	$2,000,000l	Flood, Levee Failure, Liquefaction
Drainage Conveyances	Essential Services	$350,000	Flood, Levee Failure, Liquefaction, Severe Weather
Underground Electric Crossing*	Essential Services	–	Flood, Levee Failure, Liquefaction
Overhead Electric Crossings*	Essential Services	–	Flood, Levee Failure, Liquefaction
Siphons*	Essential Services	–	Flood, Levee Failure, Liquefaction
Electric Pullbox Underground Docs	Essential Services	–	Flood, Levee Failure, Liquefaction
Total		**$2,700,000**	

Source: RD 1601

* These assets are not owned by the District, but are protected by its levees. No replacement value was available to the District Planning Team

The 2020 5-year plan noted that the total estimated value of the 3,634.88 acres of land within the District is $16,338,771.

There are several levee geometry standards and criteria that are recognized within the Delta. Twitchell Island uses the Hazard Mitigation Plan (HMP) Criteria and the Bulletin 192-82 Standard. HMP level is the 100-year Base Flood Elevation plus an additional foot of freeboard for agricultural Districts. The goal is to reach the 192-82 level of flood protection, which is the 300-year surface elevation plus 1.5-ft freeboard for agricultural Districts.

The Level of Protection assessment below is based on the DWR 2017 Light Detection and Ranging (LiDAR) Survey. It should be noted that LiDAR survey data is generally suitable for high-level assessments and planning efforts such as this Plan, but it has limitations for more refined analyses due to accuracy thresholds, data gaps underneath vegetation and/or structure cover, and lack of identification of planimetric surface features.

The DWR 2017 LiDAR survey data indicates that the District's levee meets the following standards and criteria as shown in Table 12-5**.**

Table 12-5 - Current Levee Assessment

Delta Agricultural Levee Standard/Criteria	Length of Levee that Meets Standard/Criteria	Percentage of Levee that Meets Standard/Criteria
Total Levee Length	62,255 feet	---

Delta Agricultural Levee Standard/Criteria	Length of Levee that Meets Standard/Criteria	Percentage of Levee that Meets Standard/Criteria
HMP Criteria	38,016 feet	61.1 %
Bulletin 192-82	7,000 feet	11.2 %

Costs Due to a Levee Failure or Breach

A failure or breach of the District's levee system could result in flooding of the District to depths of approximately 20 feet on average. Projected costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract flood event. All information used was gathered from the final FEMA Project Worksheets used to close out the claims for all of the public agencies involved in the disaster event (FEMA 1529-DR). Additional costs for work not claimed to FEMA included work performed by the United States Army Corps of Engineers; these costs were established from the invoiced amount provided by the Contractor.

In order to establish the unit costs for an anticipated flood cost model for Delta reclamation districts, the costs from the 2004 Jones Tract flood event were broken into component costs that can be applied to other districts using characteristic data for each district. The data used for the District includes the following:

- 3,560 acres of land
- 11.8 levee miles
- 20 feet average depth of District relative to BFE
- 82,600 linear feet of District maintained canals
- 71,200 acre-feet of floodwater to be evacuated from District

For the District, the estimated cost of a flood event resulting from a single levee failure would be approximately $32.1 million based on the costs from the 2004 Jones Tract flood event.

The cost analysis does not include damage to privately owned property and improvements. The actual financial impact to those properties and facilities would depend greatly on the replacement costs, the amount of insurance those properties might have, and where they are located relative to the location of the levee breach and depth of water at those locations. It should also be noted that a flood could potentially eliminate a cropping season.

Reclamation District Structures, Pumps, and Pipelines

Water for irrigation is supplied from the surrounding waterways via landowner and District owned siphons, and is routed through irrigation ditches located on the high end of the fields. Drainage of irrigation tail-water, storm drainage runoff, and subsurface seepage occurs through earth-lined drainage canals through the farmed portion of the island, draining toward the District pump station. The drainage canals are maintained regularly to remove accumulated debris and vegetation from the channels.

Excess water from the canal drainage collection system is conveyed to the District pump station located at Station 510+00. This pump station discharges into the San Joaquin River and has three 100-horsepower pumps that have a combined flow rate of approximately 22,000 gallons per minute.

The flow rates listed above are based on pump performance during conditions at the time of the pump test. These conditions are assumed to be indicative of normal operations of the pump stations. Pump capacities for any pump with a given motor vary, depending on the total dynamic head, impeller size, and efficiency.

The District's pump station is powered by electricity provided by Pacific Gas and Electric (PG&E). If the power supply to the island is disrupted, there is no backup power supply immediately available to the pumps, and it would be necessary to bring in backup generators to operate the pumps.

General Infrastructure

Approximately 35 producing gas wells are located within the District. Gas wells come in and out of production regularly, so to establish a firm number at any given time is difficult. The estimated value of these wells is $27,074,352, as of June 10, 2010. A network of collection pipelines connects the wells throughout the island, and two gas transmission pipelines transport gas off the island, transecting the District's levee at approximately Station 161+00 and Station 265+00. The 8-inch high-pressure pipeline crossing at Station 161+00 was installed in 2002 using horizontal directional drilling, and is located at a depth of 60 feet below the levee crown. The crossing at Station 265+00 utilizes a previously abandoned 8-inch PG&E pipeline that was capped in 2000. The capped 8-inch PG&E pipeline is located approximately 2 to 3 feet below the levee crown, as shown in the historic drawings produced by PG&E in 1953. Currently, the pipeline is approximately 4 feet below the levee crown. In 2002, PG&E abandoned the pipeline by cutting and capping the lines in the concrete containment bulkhead located on the landside levee slope. In 2007, Rosetta Resources reconnected a new 6-inch line to a sleeve that was installed inside the previously abandoned 8-inch pipeline running through the levee. All of the pipeline crossings were permitted by the District.

Local Assets

The total estimated value of the 3634.88 acres of land within the District is $16,338,771. The value is derived from the price per acre of $4,500 as stated in the Appraisal performed by Sean Hardin, California Department of Water Resources, Division of Engineering titled "Twitchell Island, West Delta Wildlife Management Plan, Parcel No. ND-1, Sacramento County," dated April 17, 2008, included in the appendices of this Plan.

The DRMS study values the assets on the island protected by the levees, at $12,106,000.

For the purposes of this report, no economic value has been placed on the environmental benefits provided by the interior lands within the island and protected by the levees. The costs of replacing these environmental benefits are likely substantial, and the costs to mitigate for environmental or habitat losses currently range from $65,000 to $145,000 per acre.

Natural Resources

RD 1601 has a variety of natural resources of value to the District. These natural resources parallels that of Sacramento County as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Twitchell Island has established a total of 15.12 acres of valuable permanent habitat and mitigation sites. Much of the habitat provided is riverine or palustrine, providing essential habitat for flora and fauna native to the Delta. The habitat areas provide a permanent, undisturbed environment for sensitive Delta species, as well as providing habitat, food and resting areas for migratory wildlife. The value of these habitat areas is undefined, but the loss of these areas could greatly impact the species that depend upon these valuable ecosystem components.

A habitat assessment was done in 2001 for the District. Findings from that were:

- One special-status plant (Blue Elderberry) was observed along the levee during the field survey.
- No special status animals were observed during field work;
- The Shaded Riverine Aquatic Habitat was found to total 1,642 lineal feet;
- The Riparian Forest habitat on the waterside of the levee consisted of individual trees or extensive reaches of continuous canopy. The Riparian Forest was found to total 3,285 lineal feet;
- The Shrub/Scrub habitat consists of willow, and blackberry on the waterside of the levee. The Shrub/Scrub was found to total 7,917 lineal feet;
- The Freshwater Marsh habitat of tules along the levee waterside toe was found to total 7,781 lineal feet;
- The landside levee slopes consisted of bare ground, ruderal vegetation, urbanized environment with cultivated plants, small areas of Shrub/Scrub habitat, and Riparian Forest of individual trees or continuous canopy with varying amounts of understory;
- The landside Riparian Forest along the levee was found to cover 465 lineal feet. The majority of this habitat was found along levee station 38+959 to39+396 in the toe ditch;
- The landside Shrub Scrub habitat along the levee was found to cover 177 lineal feet.

In 1993, a 4.04 acre habitat mitigation site was established and planted from Stations 545+00 to 560+00 and Stations 570+00 to 600+00, with a Conservation Easement established specifically for the mitigation site between stations 545+00 and 560+00. The overall mitigation site was designed to consist of 1.12 acres of palustrine emergent (freshwater marsh) habitat, 1.92 acres of lacustrine (open water) habitat, 2.3 acres of palustrine forest (riparian woodland) habitat, and 0.65 acres of annual grassland habitat. The flora planted were predominantly tule and cattail in the freshwater marsh, and white alder, red willow and sandbar willow in the riparian woodland. Two ponds totaling 1.92 acres were excavated to approximately 6 feet deep with approximately 1:1 side slopes to provide the open water habitat. The open water and annual grassland did not require plantings.

In 1999, an 8.08 acre habitat mitigation site was transferred to the Department of Fish and Game via a Transfer of Control and Possession and Conservation Agreement. The site runs parallel to the drainage canal at the District Pump station, reaching 5,440 feet northward along the canal from approximately Station 585+00, and provides various types of protected habitats, including palustrine shrub and scrub, palustrine forest, and freshwater marsh habitats. The site was initially established to mitigate 5.78 acres of palustrine emergent habitat lost due to levee repairs and rehabilitation at Stations 0+00 to 127+00 and 360+00 to 396+00. Much of the mitigation site was originally planted with feed corn). The site was enhanced in 2007 when 35 black willow trees were planted along the canal.

In 2000, a 3.0 acre habitat site was planted between levee Stations 570+00 and 600+00 that provides 1.4 acres of emergent tidal marsh habitat and 1.6 acres of shaded riverine aquatic habitat. This habitat area was created between the original levee and a new setback levee.

Openings were cut into the original levee, allowing water to circulate between the levees. The levee crown and landside slope of the old levee was re-vegetated, and the tidal bench and waterside slope of the setback levee were planted with native woody and herbaceous vegetation. Woody plants included willows, ash, box elder, alder, cottonwood, valley oak, dogwood, button willow, wild rose, wild blackberry, blue elderberry, and wild grape. Herbaceous plants included California hibiscus, grasses, sedges, rushes, and tules. The setback levee slope was planted with grasses only for maintenance purposes.

The habitat mitigation sites on Twitchell Island provide a variety of protected habitats. In general, Delta lands provide forage and cover for local and migratory populations of birds and terrestrial wildlife including many special status species. The levees also provide important waterside habitat and shoreline for various fisheries that includes several special status species.

Historic and Cultural Resources

The District Planning Team noted that there are no known historic and or cultural resources in the District at this time.

Growth and Development Trends

General growth in the District parallels that of the Sacramento County Planning Area as a whole. Information can be found in Section 4.3.1 of the Base Plan.

Development since 2016

The District Planning Team noted that there has been no growth and development in the District since the last planning period. No District facilities have been constructed since 2016. As such, a change in vulnerability is unlikely.

Future Development

More general information on growth and development in Sacramento County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Sacramento County Vulnerability and Assets at Risk of the Base Plan.

Proposed Rock Slope Protection Project

The District plans to ensure the protection of the existing levee by adding quarry stone riprap above the existing riprap to any portions of the waterside slope of the levee requiring additional rock slope protection. This will prevent erosion and reduce future erosion repairs. Prior to submitting a project proposal, a thorough riprap inventory of the District must be completed to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project. The quantities and costs provided in this Plan are planning level estimates based on input from the District and from the District's most recent survey.

The anticipated planning-level costs of the Rock Slope Protection Project consisting of additional riprap as needed is $3.6 million. Costs are provided in this Plan as planning level estimates based on input from the

District and from the District's most recent survey and inspection. A thorough riprap inventory of the District must be completed prior to submitting a project proposal to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project.

Proposed Bulletin 192-82 Levee Project

The District will bring those portions of levee along Threemile Slough and Sevenmile Slough below the Bulletin 192-82 Standard to six inches above the Bulletin 192-82 Standard with a District minimum crown width of 24 feet to allow for future levee raises to address climate change and sea level rise. This work will likely be divided into several phases or projects, depending on the funding available. The Bulletin 192-82 Levee Project sites are proposed to be limited to the following locations as shown in Table 12-6.

Table 12-6 Bulletin 192-82 Levee Project Sites

Start Station	End Station	Length in Feet
62+60	360+00	29,740
590+00	619+05	2,905

Source: RD 1601

The cost estimate provided in this report treats all Bulletin 192-82 project sites as a single project. The anticipated planning-level costs involved with constructing a minimum 16-foot-wide crown in accordance with the Bulletin 192-82 Standard is approximately $44.6 million. Furthermore, the incremental costs involved with widening the crown to 24 feet to allow for future raises in freeboard to address climate change and sea level rise is approximately $10 million. Quantities and costs are provided in this Plan as planning level estimates based on input from the District and from the District's most recent survey and inspection. A design-level survey and inspection of the District must be completed prior to submitting a project proposal to determine more definitive quantities and costs required to complete the project.

San Joaquin River Setback Levee Project

The District will also implement the levee improvement recommendations along the San Joaquin River in accordance with the 2009 GEI geotechnical report by constructing a toe berm and setback levee. The setback levee along the San Joaquin River also includes a channel margin habitat component that will provide approximately four miles of much needed "fish friendly" levees in this part of the Delta. This work will likely be divided into several phases or projects, depending on the funding available

The San Joaquin River Setback Levee Project sites are proposed to be limited to the following locations as shown in Table 12-7.

Table 12-7 San Joaquin River Setback Levee Project Sites

Reach	Start Station	End Station	Length in Feet
1	360+00	387+00	2,700
2	387+00	408+00	2,100
3	408+00	435+00	2,700
4	435+00	462+00	2,700

Reach	Start Station	End Station	Length in Feet
5	462+00	482+00	2,000
6	482+00	508+80	2,680
7	512+00	539+50	2,750
8	539+50	567+00	2,750
9	567+00	590+00	2,300
10	---	---	2,400

The cost estimate provided in this report treats all San Joaquin River Setback Levee Project sites as a single project. The anticipated costs of the San Joaquin River Setback Levee Project are approximately $153 million. The costs provided in this Plan for the San Joaquin River Setback Levee Project take into account that all environmental, permitting, and preliminary engineering for the overall project have been completed as part of DWR Project Funding Agreement No. TW-09-1.0 through the Delta Levees Special Projects Program.

12.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 12-3 as high or medium significance hazards. Impacts of past events and vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

The District Planning Team noted that the pump stations and drainage conveyances are potentially at risk to power outages and/ or power failure. In the absence of power, localized flooding can occur because existing pump stations do not have backup power. In addition, if power outages occur near the end of the flood, it will be a challenge to dewater the District.

Earthquake

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and

levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time. Potential earthquakes on the Hayward, Calaveras, and San Andreas fault could also affect the Delta area.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. Seismic shaking maps for the area show Sacramento County and the District fall within a low to moderate shake risk, with most of the moderate risk in the Delta area of the County.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. After the 2014 Napa Earthquake the District performed levee inspections and verified the continued operation of the pump stations around the island to check the levee integrity and ensure there was no damage to District assets as a result of the earthquake.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured buildings can be very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. RD 1601 is within the less hazardous Zone 3.

Impacts from earthquake in the District will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to levees, infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees. All assets in the District are at risk to the effects of a damaging earthquake.

The District Planning Team noted that all natural resources could be affected by an earthquake causing damage to the levee structure should the island flood due to an earthquake.

Assets at Risk

The District Planning Team noted that the levees structures, pump stations and drainage conveyances are potentially at risk to an earthquake, though no evidence of damage has been observed to date

Earthquake: Liquefaction

Likelihood of Future Occurrence–Unlikely
Vulnerability–Medium

Hazard Profile and Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the County are rebuilt or leveed areas are dewatered, and the levees rebuilt. In Sacramento County, the Delta and areas of downtown Sacramento are at risk to liquefaction. The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand and silt in the levees and their foundations indicates that liquefaction is also a possibility.

Past Occurrences

There have been no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquake liquefaction or that affected the District in any meaningful way. The seismic events of 1989 and 2014 did not induce liquefaction on the Delta Levees. Delta levees are composed of material that contain pockets, rather than long continuous lenses, of sand. Though it has a low likelihood of future occurrence, liquefaction is a recognized potential risk.

Vulnerability to and Impacts from Liquefaction

Earthquake is discussed above, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas. In Sacramento County, two of these areas have been identified: downtown Sacramento and the Delta area, which could lead to a possible collapse of delta levees and any above ground structures. While this levee failure differs from the levee failure discussion below which generally focuses on levee failure due to high water conditions or other types of structural failure, the resulting impacts would be similar and include those related to a large flood event. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees. All assets in the District are at risk to the effects of liquefaction.

Assets at Risk

The District Planning Team noted that the levees structures, pump stations and drainage conveyances are potentially at risk to liquefaction resulting from seismic activity. Additionally, all-natural resources in the District would be at risk to liquefaction of the levee foundations and associated levee failures.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

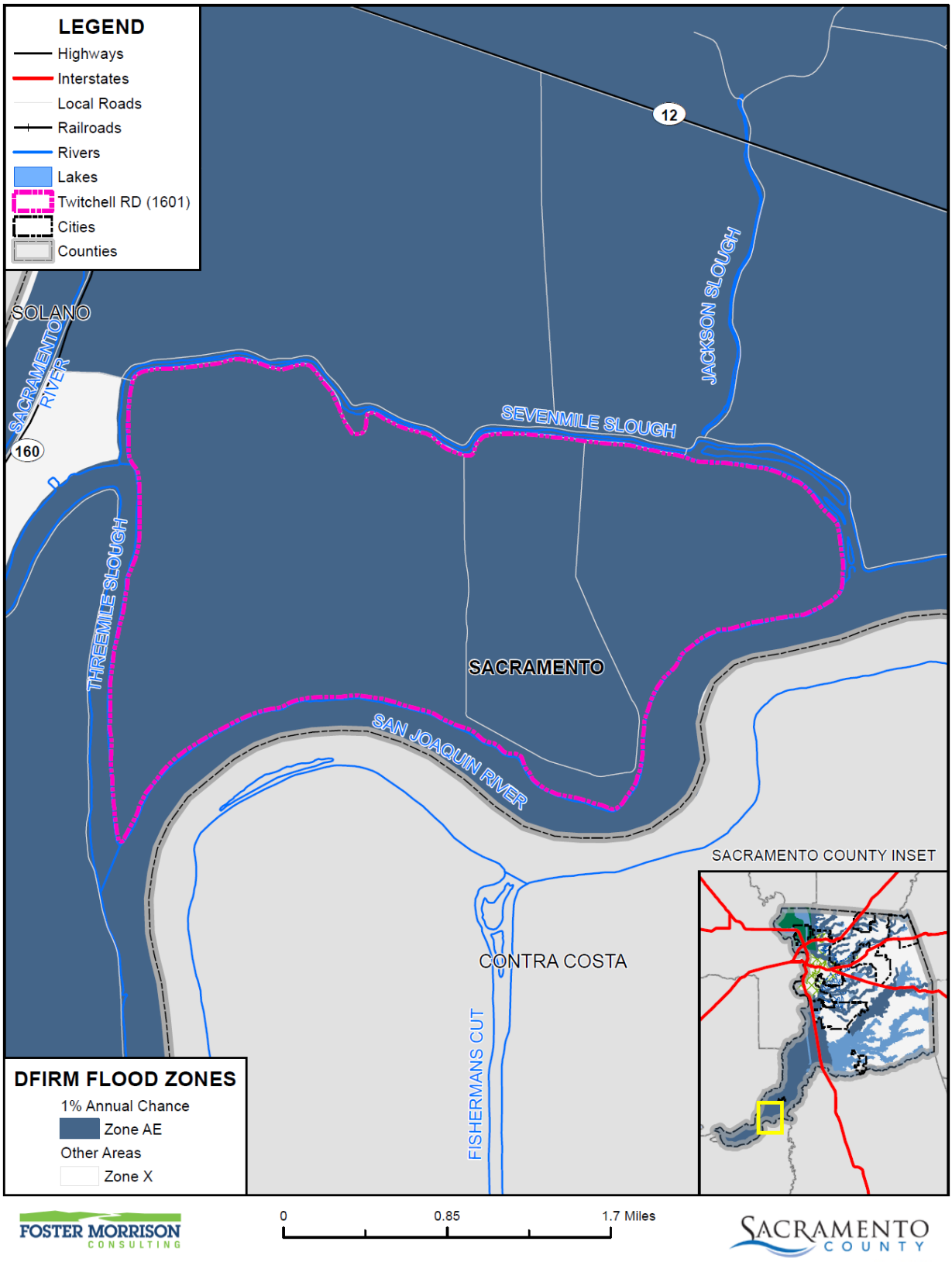
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and RD 1601 have been subject to historical flooding.

Location and Extent

RD 1601 has areas located in the 1% annual chance floodplain. This is seen in Figure 12-3.

Figure 12-3 RD 1601 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Twitchell Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 12-8 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 12-8 RD 1601– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	X
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District. Flooding can occur with compound effects of a storm, high releases from upstream dams, snowmelt, and is influenced by tidal movement.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 12-9. These events also likely affected the District to some degree.

Table 12-9 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

The 5-Year Plan for RD 1601 included a history of flooding in the District.

- 1986 Flood event. Poor levee performance, with several instances of boils that were treated with sandbag coffer dams. Individual boils were sandbagged on the landward levee slope at Stations 361+81, 365+50, 373+98, 405+87, 406+39, 408+49, 414+83, and 502+22, and groups of boils were sandbagged on the landward levee slope at Stations 500+64 to 501+69 and 534+94 to 536+52. Dredged fill material was placed on the waterward levee slope and the bottom of the slough in an attempt to seal a boil at Station 363+39 to 366+56. The State of California updated its flood Hazard Mitigation Plan (HMP), establishing both short-term and long-term guidelines for levee rehabilitation, including minimum requirements for levee geometry that were required to be met by 1991 in order to receive future federal disaster assistance.
- 1997 Flood Event. USACE made emergency repairs by placing a 250 foot long gravel blanket extending 60 feet past the landside levee toe at approximately Station 59+00. Further emergency repairs were made by the District by pulling rock up from the waterside toe of the levee to form two berms on the levee crown at the juncture of Sevenmile Slough and the San Joaquin River, and on the PL 84-99 levee along Threemile Slough, approximately Station 380+00 to 385+00.
- 1998 Flood Event. During the flood event of 1998, riprap was placed on waterside slopes to mitigate damage by high water and high winds,
- 2005 to 2006 Flood Event. A storm event starting on December 30, 2005, required emergency action beginning on January 1, 2006. Four long reach excavators were used to restore the rock slope protection at Stations 363+74 to 565+00 and 580+00 to 628+74 that was lost as a result of the extreme high water and winds along the San Joaquin River. The construction involved pulling the slipped rock up along the waterside slope from the waterside levee toe. Two angle blade bulldozers were used to clear debris on the levee crown and restore eroded sections of levee due to the high water and wind-generated waves splashing over the levee to the landside slope, including portions of the levee road that were no longer passable. The San Joaquin reach of the Twitchell Island levee was nearly overtopped. 25,000 feet of existing riprap was repositioned to form a break wall by Dutra Construction in 40 consecutive hours to protect the levee from extreme wind and wave wash.
- 2017 Flood Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency floodfight and repairs, rodent hole repairs, and emergency response patrols and labor occurred during the event. The District had well organized floodfight response, and was able to immediately address problems. The District's levees and sustained only minor damage and performed well. The total 2017 Event claims to FEMA was $118,691.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

RD 1601 (Twitchell Island) is one of the eight western islands, which collectively form a crucial group of islands which, if breached, could each individually greatly degrade water quality in the Delta from the transportation of tidal salt water through the major Delta channels where fresh and salt waters mix. Additionally, if the island did flood, the evaporative losses from the flooded island would have an additional detrimental impact to the overall water quality in the surrounding Delta waterways.

Assets at Risk

Should a flood breach the levees, the entirety of the assets of RD 1601 would be at risk. Additionally, flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate

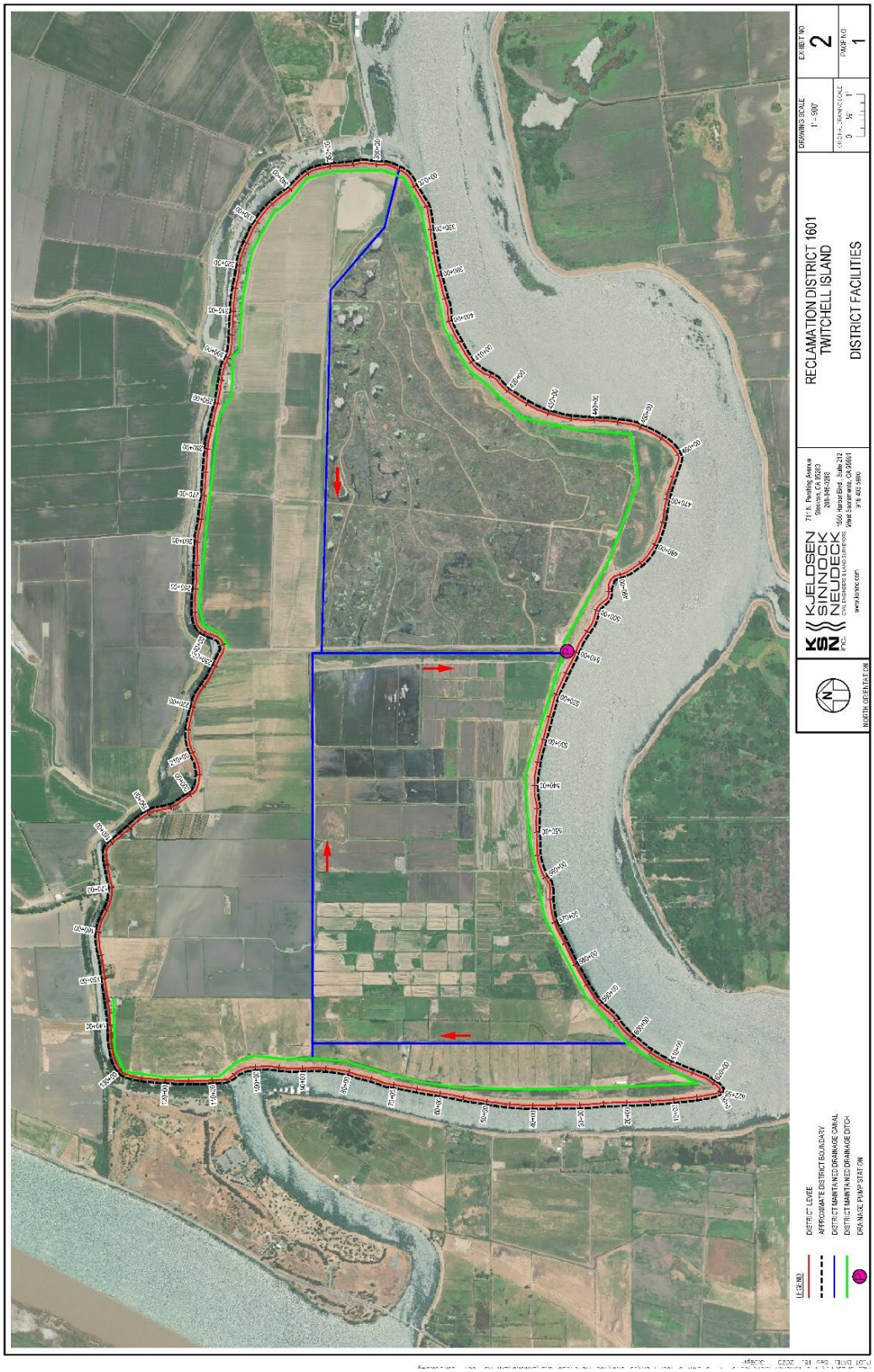
maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high

Location and Extent

RD 1601 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Historically, RD 1601 has been at risk to flooding primarily during the spring months when river systems in the County swell with heavy rainfall. Localized flooding also occurs throughout the Planning Area at various times throughout the year with several areas of primary concern unique to the District. The District has a drainage system set up deal with localized flooding. A map of this system can be seen on Figure 12-4

Figure 12-4 RD 1601 Drainage System



Source: RD 1601

The District has localized flooding areas at the District low spot in the center of the District

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District has not identified past events.

Vulnerability to and Impacts from Localized Flooding

Historically, much of the growth in the District and County has occurred adjacent to streams, resulting in significant damages to property, and losses from disruption of community activities when the streams overflow. Additional development in the watersheds of these streams affects both the frequency and duration of damaging floods through an increase in stormwater runoff.

Primary concerns associated with stormwater flooding include impacts to infrastructure that provides a means of ingress and egress throughout the community. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Assets at Risk

The District Planning Team noted that all District assets are at risk to localized flooding; however, this flooding is likely to be a nuisance-type of flood and would not have lasting impacts on the District. Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

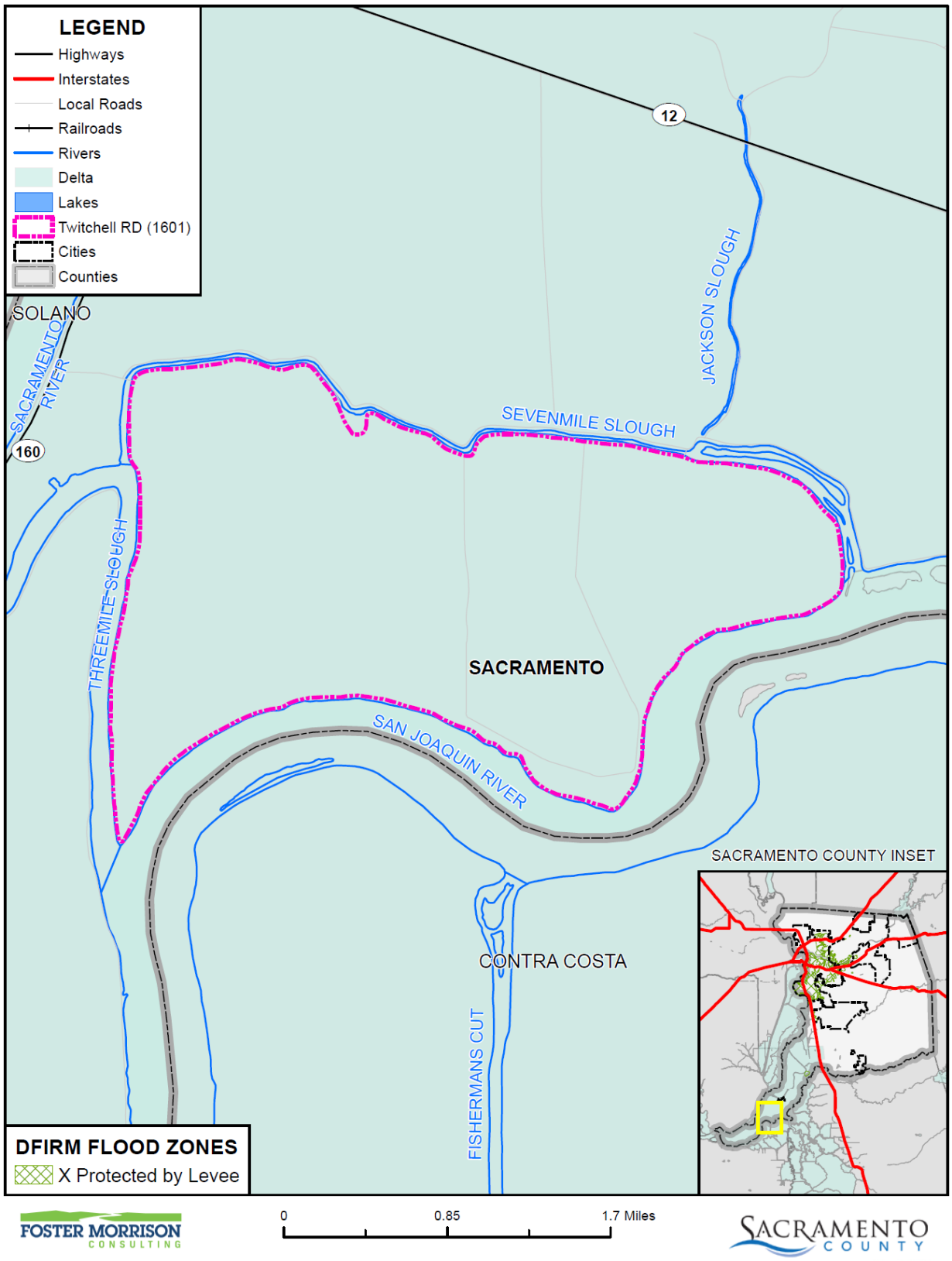
Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from

seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 12-5.

Figure 12-5 RD 1601 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Twitchell Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

The District is entirely protected by levees on all sides.

Past Occurrences

The 5-Year Plan documented the history of levee failures in RD 1601.

- 1906, 1907 & 1909: Flooding of entire island occurred from levee failure or overtopping.
- 1964: Levee at approximately Station 390+00 cracked and/or dropped in December 1964, requiring immediate repair.
- 1980: A large settlement crack occurred in the levee crown at Station 376+00 to 380+00, arcing from the landward to the center of the crown and back to the landward. Crack width was from 1 to 4 inches, with a vertical settlement of 3 to 6 inches. Rock revetment was added to the waterward levee slope. Dredged material was placed on the landward levee slope as the crack gradually opened further and settlement increased. The dredge material was moved off the slope to create a 25 foot wide by 1.5 foot high stability berm at the landward toe of the levee. A core trench was constructed at Station 415+00 to 421+00 to cut off seepage. Riprap placement and dredging occurred in response to a high water and wind event, and was funded by the Federal Disaster Assistance Administration (FDAA) in the amount of $100,550. The levee crown in was low at Station 530+00 to 532+00, and required sandbags to be placed along the waterward shoulder during high tides and high winds from the south in February. A crack occurred near the landward toe of the levee, with a width of 3 inches and length of 150 feet. Dredged material was placed in the low areas on the landside of the levee, on the landward slope, and in limited amounts on the levee crown. Boils occurred on the landward levee slope at Station 415+00 to 421+00, located 5 to 6 feet below the crown. High tides at this time were 5 feet below the levee crown. A backhoe was brought in to dig a core trench in the levee crown between 6 and 7 feet deep and 18 inches wide. The trench was dug in 8 to 10 foot segments, with each segment being inspected, backfilled in layers, and tamped with the backhoe bucket before digging the next trench segment. A crack approximately 5 feet below the levee crown was discovered opposite two of the boils, and appeared to extend through the levee on a diagonal. The crack was 6 to 8 inches wide, and 1/2 inch high.
- 2006: Seepage at Stations 445+00 to 450+00, 480+00, 500+00 to 510+00, 530+00 to 540+00, and 600+00 was stopped by coring and sealing the levee with a Bentonite mix after a failed attempt at Stations 535+00 to 540+00 to stop seepage using a vibratory wall by DWR.
- 2016-2014: Supplementation of existing riprap at several locations throughout the District due to erosion.
- 2017-2018: Construction of all-weather road on San Joaquin River levee toe from Station 360+00 to Station 622+55. This reach of levee is highly susceptible to extreme wave wash under high wind conditions along with seepage and landside slope deformation. Flood fighting relies heavily on access to the levee at all times by use of all-weather roads.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and

economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

The two primary vulnerabilities that threaten the levee system on Twitchell Island involve levee stability and levee geometry.

The Twitchell Island levee system has a long history of levee stability problems including settlement, movement, seepage, and slope failure. Documentation of the levee's performance is extensive. GEI Consultants, a geotechnical, environmental and water resources engineering firm, obtained information from the California Department of Water Resources documenting these problems as far back as 1955 during the course of research for the January 2009 "Geotechnical Investigation and Evaluation Report" performed for the San Joaquin River portion of the levees. The San Joaquin river levee reach has historically shown more problems relative to Stability. Deep organic soils and sands in conjunction with deep water and high winds cause this reach of levee to be extremely vulnerable to failure during high water and storm events. It should also be noted that the investigations did not locate an acceptable on-island borrow material suitable for levee projects. As of the last complete profile survey of the island in 2008, and taking into account completed projects through fiscal year ending June 30, 2010, there remain several locations along Sevenmile Slough that do not meet the Hazard Mitigation Plan (HMP) standard for geometry.

This standard requires the levee to be one foot above base flood elevation, and 1.5:1 waterside and 2:1 Landside slopes. There is approximately 3000' (5%) of District levee below the HMP Standard and approximately 28,000' (45%) below the PL84 Standard. These values were calculated by analyzing a combination of the most current District surveys, including the 2009 District Aerial Survey for the San Joaquin River levee and the 2006 KSN GPS Survey for the Threemile Slough and Sevenmile Slough levees. Levee centerline profiles were cut through each of the modeled survey surfaces and compared to water surface elevation profiles from the US Army Corps of Engineers' 1992 Sacramento-San Joaquin Delta Special Hydrology Study.

Sevenmile Slough is isolated from tidal waters by water control structures that, along with the balance of the levee system, meet the HMP standard. Up until 2006, the District was considered to have met the HMP standard; however, in 2006 the Federal Emergency Management Agency determined that because the entire Sevenmile slough levee did not meet the geometry required in HMP, that the District was not eligible for Federal Disaster Assistance. Thus, the vulnerability to the District is both a flood threat due to overtopping caused by low levee crown elevations and a financial threat because no Federal Disaster Assistance would be available for damages resulting from a declared disaster event.

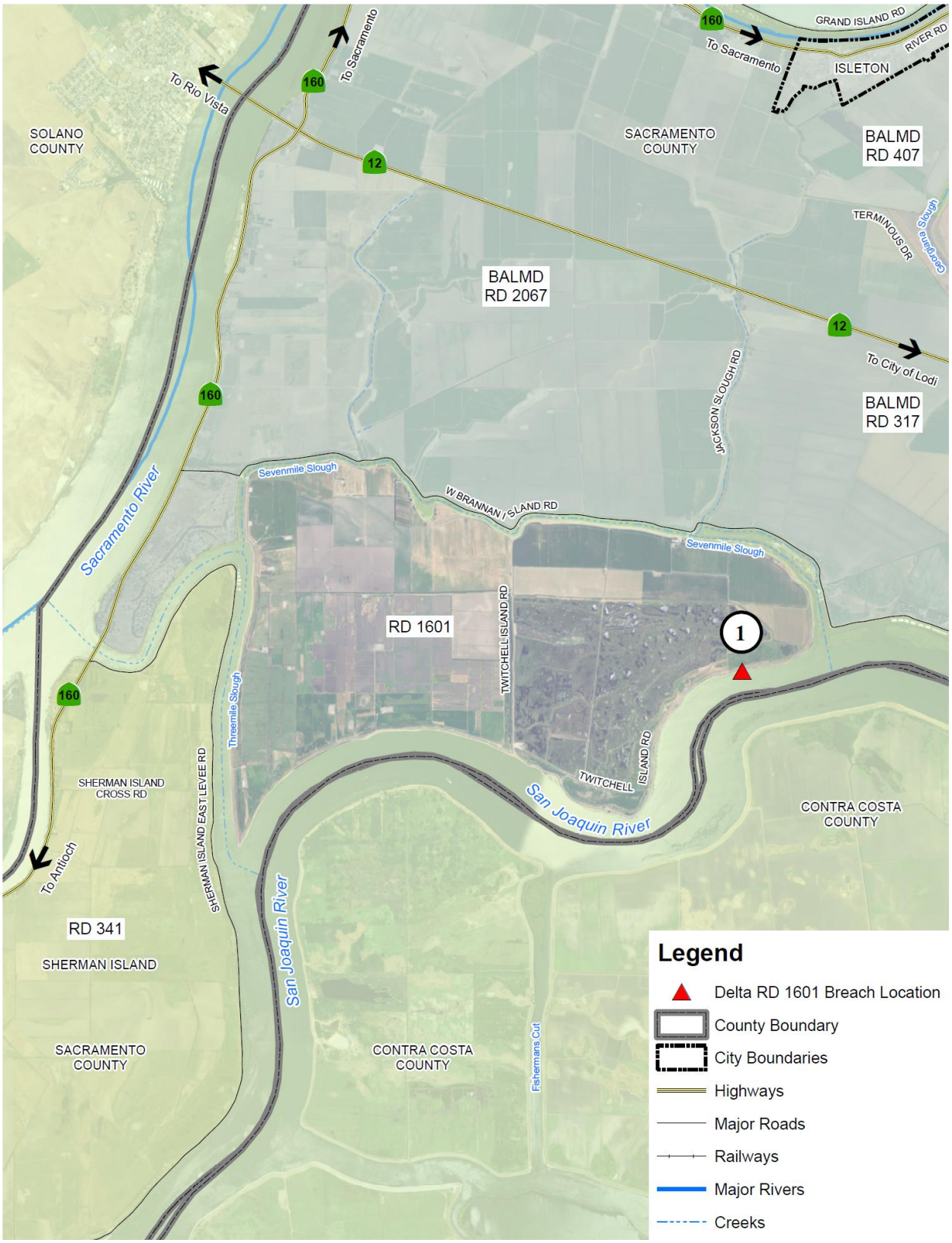
StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the

maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

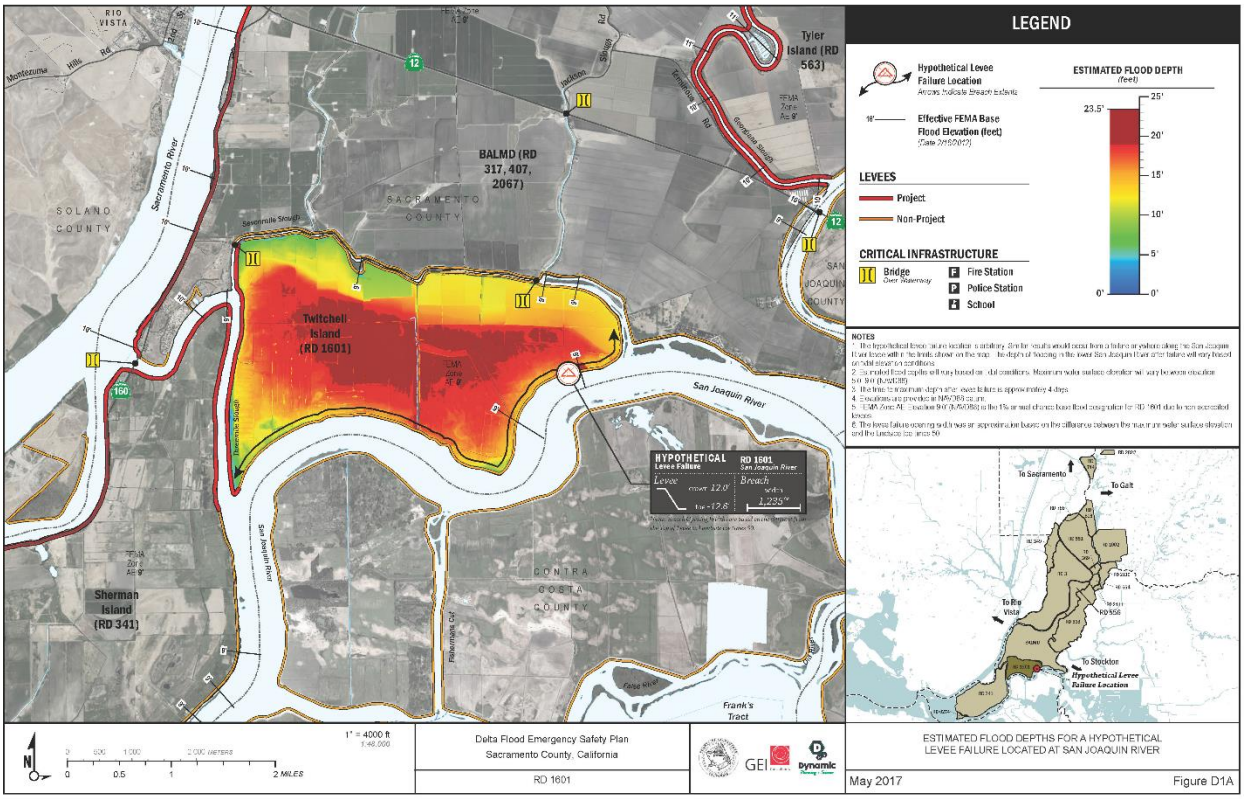
For RD 1601, Figure 12-6 details the locations in the Delta within Reclamation District 1601 where flooding could occur. The red triangles denote potential levee breach locations. RD 1601 has a hypothetical potential levee break scenario. Maps for the levee breach scenario regarding time to one foot inundation (Figure 12-7), estimated flood depths (Figure 12-8), and suggested evacuation routes (Figure 12-9) are displayed below.

Figure 12-6 RD 1601 – Potential Levee Breach Location



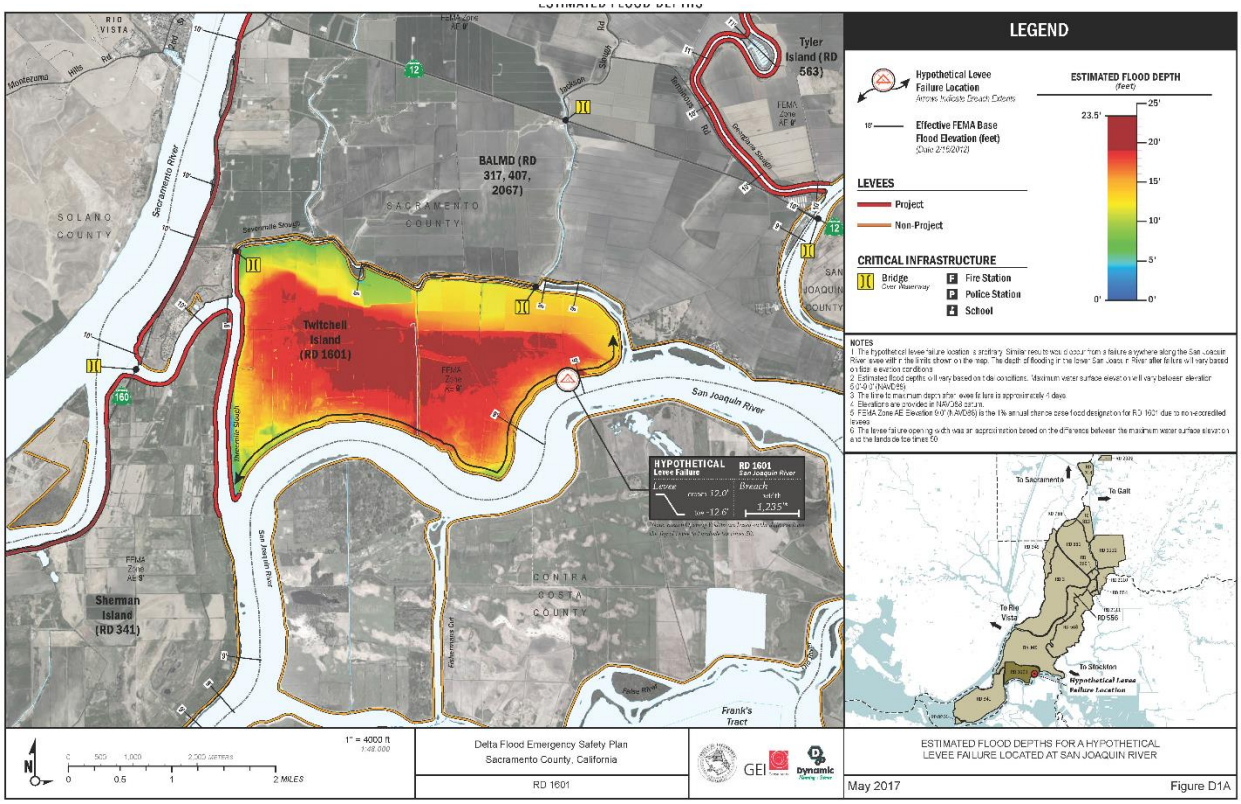
Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 12-7 RD 1601 – Time to One Foot Inundation after Levee Breach



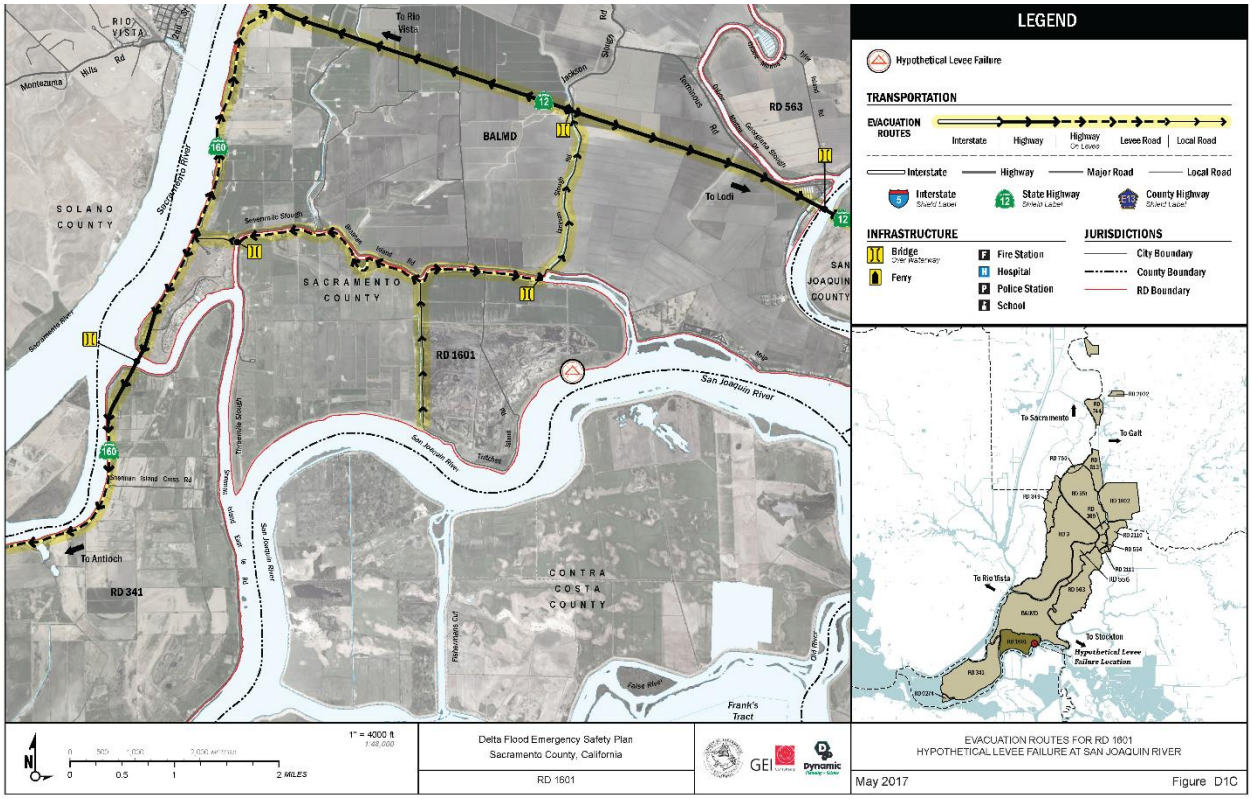
Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 12-8 RD 1601 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 12-9 RD 1601 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 16, 2021

Assets at Risk

Should the levees fail, all District assets would be at risk. Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

The 5-Year Plan for RD 1601 included a history of heavy rains in the District.

- 2005 to 2006. A storm event starting on December 30, 2005, required emergency action beginning on January 1, 2006. Four long reach excavators were used to restore the rock slope protection at Stations 363+74 to 565+00 and 580+00 to 628+74 that was lost as a result of the extreme high water and winds along the San Joaquin River. The construction involved pulling the slipped rock up along the waterside slope from the waterside levee toe. Two angle blade bulldozers were used to clear debris on the levee crown and restore eroded sections of levee due to the high water and wind-generated waves splashing over the levee to the landside slope, including portions of the levee road that were no longer passable. The San Joaquin reach of the Twitchell Island levee was nearly overtopped. 25,000 feet of existing riprap was repositioned to form a break wall by Dutra Construction in 40 consecutive hours to protect the levee from extreme wind and wave wash.
- 2017 Flood Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency floodfight and repairs, rodent hole repairs, and emergency response patrols and labor occurred during the event. The District had well organized floodfight response, and was able to immediately address problems. The District's levees and sustained only minor damage and performed well. The total 2017 Event claims to FEMA was $118,691. The 2017 water year was the second wettest water year ('82-'83 being the wettest) within the San Joaquin basin as measured by the California Hydrology and Flood Operations Office. Numerous storms occurred over the '16/17 winter months with a 5 station average of 25.2 inches and 17.70 inches in January and February, respectively. Flood water stages peaked in January and spiked again in February then receded in March with prolonged elevated stages occurring over the San Joaquin Delta through to September. In the late winter early spring 2017 an area of settlement was developed. A 1-foot-deep trough, 30 ft wide by 250 LF Scarp developed parallel to the levee and centered on STA 425+00. A geotechnical investigation was conducted on the area and resulted in no unusual findings. The area was recommended for future visual observations however not additional investigations are not warranted. Construction of an All Weather Road along the toe of the south levee segment was completed as a means to be provide all weather access for levee patrol. A significant seep was found during the event. A historic siphon within the Owl Harbor Marina was discovered as the cause for the seep and was removed from the levee.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

However, it is the secondary effects of heavy rain and storms that are of concern to RD 1601. Heavy rains can cause flooding, levee failure, and stream bank erosion. Flooding, levee failure, and stream bank erosion can cost RD 1601 millions in damages.

Assets at Risk

All assets are at risk from heavy rains and storms within the District.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Likely
Vulnerability–High

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

The 5-Year Plan for RD 1601 included a history of wind and tornadoes in the District.

- 1998 Flood Event. During the flood event of 1998, riprap was placed on waterside slopes to mitigate damage by high water and high winds.
- 2006 Flood Event. Rip rap was placed on waterside slopes to mitigate damage caused from high winds.
- 2017 Flood Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency floodfight and repairs, rodent hole repairs, and emergency response patrols and labor occurred during the event. The District had well organized floodfight response, and was able to immediately address problems. The District's levees and sustained only minor damage and performed well. The total 2017 Event claims to FEMA was $118,691

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power shortage and failure can be found at the beginning of Section 12.5.3 above, as well as in Section 4.3.3 of the Base Plan.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Occasional structure damage
- Erosion of levees and other areas

When paired with highwater, heavy runoff, high tide, and high wind, impacts to District levees, as well as the entire Sacramento – San Joaquin Delta region, include serious levee erosion that could result in overtopping that possibly lead to failure.

Assets at Risk

The District Planning Team noted that the entirety of the levee structures is at risk from wind. The District Planning Team noted that all natural resources in the District are at risk if winds caused a levee failure in the District.

Subsidence

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Subsidence is the gradual settling or sinking of the earth's surface over manmade or natural underground voids with little or no horizontal motion. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. Subsidence is worsened when groundwater drawdown exceeds the ability of the ground to naturally recharge. This is more common during periods of drought.

Location and Extent

There is no scientific scale to measure subsidence. Subsidence is measured in inches or feet of elevation change over time. Subsidence has a long speed of onset, as it occurs over many years. The duration of subsidence is long, as it is rare for subsidence to be reversed. In Sacramento County, the Delta in the southeast portion of the County is highly at risk to subsidence. In the Delta, subsidence affects the islands as well as the levees.

Past Occurrences

The 5-Year Plan documented the history of subsidence in RD 1601.

- 1982-1983: The flood event FEMA 677 DR caused waterside erosion, multiple cracks on the landside slope along with sinkholes, subsidence areas, and seepage areas. The levee was found to have problems with subsidence and seepage, and had cracks in the landward slope at Stations 374+00 to 378+00, 384+00 to 387+00, 405+00 to 409+00, 419+00 to 436+00, 526+00 to 530+00, 550+00 to 554+00, and 567+00 to 569+50. Import fill material was placed on the landward levee slope to flatten the slope, and a landside berm fill was constructed, with Mirafi fabric placed under the berm fill, except at Stations

384+00 to 387+00, 534+00 to 536+25, and 567+00 to 569+50. Sink holes were located at the landward toe of the levee at Stations 448+00, 550+00, and were filled with import fill material.
- 1985 to 1986: The levee was found to have problems with subsidence and seepage, and had cracks in the landward slope at Stations 363+39 to 367+00 and 582+00 to 588+34.

The District Planning Team noted that, in addition to the 5-Year Plan history, a 2006 storm event caused subsidence in the District. An area on the west side of Pump Station #1 suffered from subsidence. No events have occurred since 2016.

Vulnerability to and Impacts from Subsidence

Historically, the County has been at risk from subsidence. Vulnerability in the County from subsidence comes from several different causes:

- Compaction of Unconsolidated Soils by Earthquake Shaking (Liquefaction)
- Compaction by Heavy Structures
- The Erosion of Peat Soils
- Fluid Withdrawal

At the most local level, individual farmers or reclamation districts must maintain drainage networks on the islands and pump the agricultural drainage back into waterways. These costs increase gradually as subsidence progresses.

These were discussed in detail in Section 4.3.16 of the Base Plan.

Assets at Risk

The District Planning Team noted that all levee structures in the District are at risk to subsidence.

12.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

12.6.1. Regulatory Mitigation Capabilities

Table 12-10 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the RD 1601.

Table 12-10 RD 1601 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2020	5 Year Plan identifies hazards that may affect RD 1601. Some mitigation strategies are proposed. Yes, the plan can be used to implement mitigation actions.
Capital Improvements Plan	N	
Economic Development Plan	N	
Local Emergency Operations Plan	Y	A District-specific Flood Safety Plan, composed of an Emergency Operations Plan and an Annex – A Flood (the Flood Contingency Map) was completed in 2019 for RD1601.
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)		
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	
Other		

How can these capabilities be expanded and improved to reduce risk?
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. The Emergency Operations Plan development process alone helps to increase the capabilities of the District to respond to emergencies and disasters. Continued funding available to maintain these plans would be helpful.

Source: RD 1601

12.6.2. Administrative/Technical Mitigation Capabilities

Table 12-11 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 1601.

Table 12-11 RD 1601's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	Y	RD 1601 together with KSN (engineering firm) staff support this committee.
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	
Mutual aid agreements	Y	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	Y	KSN, Inc.
Community Planner	N	
Civil Engineer	Y	KSN, Inc.
GIS Coordinator	Y	KSN, Inc.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Sacramento County has an alert and warning system that covers the District.
Hazard data and information	Y	KSN, Inc.
Grant writing	Y	KSN, Inc.
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		

These capabilities can be expanded by utilization of additional funding opportunities to pay for the services provided by KSN, Inc. so the District can use the General Fund dollars to fund additional District priorities.

Source: RD 1601

12.6.3. Fiscal Mitigation Capabilities

Table 12-12 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 12-12 RD 1601's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	Levy Assessment Program but not taxes
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Storm water utility fee	Y	Part of our Levy Assessment Program
Incur debt through general obligation bonds and/or special tax bonds	Y	
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	Y	HMGP, FEMA Post-Disaster Assistance
State funding programs	Y	DWR Levee Subventions and Special Projects Program, DWR's Deferred Maintenance Program, Flood System Repair Program
Other		
How can these capabilities be expanded and improved to reduce risk?		
Continued funding from the Delta Levees Program is crucial. Federal funding programs are difficult to pursue because of the local cost share; if state or other partners could help the local cost share then small, rural communities it would gain more access to federal grants.		

Source: RD 1601

12.6.4. Mitigation Education, Outreach, and Partnerships

Table 12-13 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 12-13 RD 1601's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	N	
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	N	
Other	Y	DWR Flood Methods Course and Just In Time Training Program, and SEMS/NIMS. Training Policy is outlined in Attachment 1 of RD1601's Emergency Operations Plan (EOP), which includes SEMS/NIMS courses (SEMS 100, 200, 700; or can be covered through G0402).
How can these capabilities be expanded and improved to reduce risk?		
Additional Funding to provide these types of programs. The District will seek grants from Cal OES, CA DWR, FEMA and others to increase its mitigation capabilities.		

Source: RD 1601

12.6.5. Other Mitigation Efforts

The District has many other completed or ongoing mitigation efforts that include the following:

The entire Twitchell Island levee system consists of 2.5 miles of Federal Project Levee and 9.4 miles of Non-Project levee and is inspected daily by District staff who are familiar with all aspects of its function. The District engineer typically performs an inspection once a month or more frequently when warranted. The Federal Project Levee along Threemile Slough is inspected in the Fall and Spring by the Department of Water Resources levee inspectors. Reports are compiled and submitted to the District. The District staff also inspects the Federal Project Levee in the Winter and Summer and submits reports back to the Department of Water Resources. During high water or severe weather events, inspection frequency is increased to meet the demand. The entire levee is inspected continuously at one hour intervals.

12.7 Mitigation Strategy

12.7.1. Mitigation Goals and Objectives

RD 1601 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

12.7.2. Mitigation Actions

The planning team for RD 1601 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Earthquake
- Earthquake Liquefaction
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Levee Failure
- Severe Weather: Heavy Rains and Storms
- Severe Weather: Wind and Tornado

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Levee Improvement Project

Hazards Addressed: Earthquake, Earthquake: Liquefaction, Flood: 100/200/500-year, Flood: Localized Stormwater Flooding, Levee Failure, Severe Weather: Heavy Rains and Storms, Severe Weather: Wind and Tornadoes, and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to improve the Twitchell Island levees over the next five years to a level of protection that meets, or exceeds, the Bulletin 192-82 standard.

Project Description: The District will bring those portions of levee along Threemile Slough and Sevenmile Slough currently below the Bulletin 192-82 Standard to six inches above the Bulletin 192-82 Standard with a District minimum crown width of 24 feet to allow for future levee raises to address climate change and sea level rise. This project will also include addressing levee crown elevations where levee embankment

settlement has occurred. This work will likely be divided into several phases or projects, depending on the funding available.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District Five-year Plan

Responsible Office/Partners: RD 1601

Cost Estimate: $90 -100 million

Project Priority: High

Benefits (Losses Avoided): Preservation of 1601 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners.

Timeline: 1-10 years depending on regulatory process and funding

Action 2. Rock Slope Protection Project

Hazards Addressed: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to provide additional protection to the levee by installing additional riprap.

Project Description: The District plans to ensure the protection of the existing levee by adding quarry stone riprap above the existing riprap to any portions of the waterside slope of the levee requiring additional rock slope protection. This will prevent erosion and reduce future erosion repairs. Prior to submitting a project proposal, a thorough riprap inventory of the District must be completed to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District 5-Year Plan and Delta Levees Program

Responsible Office/Partners: RD 1601

Cost Estimate: $4 million

Project Priority: High

Benefits (Losses Avoided): Preservation of 1601 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners.

Timeline: 1-10 years depending on regulatory process and funding

Action 3. San Joaquin River Setback Levee

Hazards Addressed: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to provide "fish friendly" levees and additional flood conveyance.

Project Description: The District would like to implement the levee improvement recommendations along the San Joaquin River in accordance with the 2009 GEI geotechnical report by constructing a toe berm and setback levee. The setback levee along the San Joaquin River also includes a channel margin habitat component that will provide approximately four miles of much needed "fish friendly" levees in this part of the Delta. This work would likely be divided into several phases or projects, depending on the funding available.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District Five-year Plan

Responsible Office/Partners: RD 1601

Cost Estimate: $153 million

Project Priority: High

Benefits (Losses Avoided): Preservation of 1601 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: HMGP Grant Programs, seeking cost sharing partners for project.

Timeline: 1-10 years depending on regulatory process and funding

Action 4. Backup Power Project

Hazards Addressed: Climate Change, Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to provide backup power to Reclamation District 1601 facilities when power goes out.

Project Description: The District would like to ensure continued operation of District infrastructure during a Public Safety Power Shutoff through obtaining backup power generators, quick connects, and associated electrical improvements. The project would design and install main disconnect systems to allow for safe use of generators as needed during a power shutoff or power failure. The project would include one generator per district and improvements for a disconnect systems for each pump station.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District Five-year Plan

Responsible Office/Partners: RD 1601

Project Priority: High

Cost Estimate: $200,000

Benefits (Losses Avoided): Preservation of 1601 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: State – Delta Flood Emergency Response Grant Program, HMGP Grant Programs

Timeline: 1-10 years depending on regulatory process

Action 5. Flood Safety Plan Updates, Training, and Exercises

Hazards Addressed: Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is update RD 1601's Flood Safety Plan, participate in training, and to exercise the flood safety plan to ensure it can successfully be implemented. This is especially important to mitigate against the effects of staff turnover.

Project Description: The District would like to ensure continued training of staff, board members, and agents with response functions with regards to flood fighting and associated activities. Updating RD 1601's Flood Safety Plan is essential to continue to protect infrastructure protected by the district's levees. The Emergency Operations Plan provides guidance on how the District will organize, coordinate with outside partners, flood fight, dewater, recover, and serves as a planning document for future flood fight operations.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: California Water Code Section 9650-51 (AB156), Central Valley Flood Protection Plan's emergency preparedness priority, the District's Five-year Plan, and Districts Flood Safety Plan

Responsible Office/Partners: RD 1601

Project Priority: High

Cost Estimate: $100,000

Benefits (Losses Avoided): Preservation of 1601 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: State – Delta Flood Emergency Response Grant Program, HMGP Grant Programs

Timeline: 1-10 years depending on regulatory process

Delta Annex Chapter 13 RD 2111

13.1 Introduction

This Annex details the hazard mitigation planning elements specific to Reclamation District 2111 (RD 2111 or District), a previously participating jurisdiction to the 2016 Sacramento County Local Hazard Mitigation Plan (LHMP) Update. This Annex is not intended to be a standalone document, but appends to and supplements the information contained in the Base Plan document. As such, all sections of the Base Plan, including the planning process and other procedural requirements apply to and were met by the District. This Annex provides additional information specific to RD 2111, with a focus on providing additional details on the risk assessment and mitigation strategy for this community.

13.2 Planning Process

As described above, the District followed the planning process detailed in Chapter 3 of the Base Plan. In addition to providing representation on the Sacramento County Hazard Mitigation Planning Committee (HMPC), the District formulated their own internal planning team to support the broader planning process requirements. Internal planning participants, their positions, and how they participated in the planning process are shown in Table 13-1. Additional details on plan participation and District representatives are included in Appendix A.

Table 13-1 RD 2111 – Planning Team

Name	Position/Title	How Participated
Daniel Wilson	President	Attended meetings, collected data, drafted text and reviewed draft documents
Chiles Wilson	Trustee	Attended meetings, collected data, drafted text and reviewed draft documents
Dixie Wilson	Trustee	Attended meetings, collected data, drafted text and reviewed draft documents
Bill Darcie	Project Manager	KSN, Inc. Attended meetings, collected data, drafted text and reviewed draft documents
Elizabeth Ramos	Project Engineer	KSN, Inc. Attended meetings, collected data, drafted text, reviewed draft docs
Megan LeRoy	Project Engineer	KSN, Inc. Attended meetings, collected data, drafted text, reviewed draft docs

Coordination with other community planning efforts is paramount to the successful implementation of this LHMP Update. This section provides information on how the District integrated the previously approved 2016 Plan into existing planning mechanisms and programs. Specifically, the District incorporated into or implemented the 2016 LHMP through other plans and programs shown in Table 13-2.

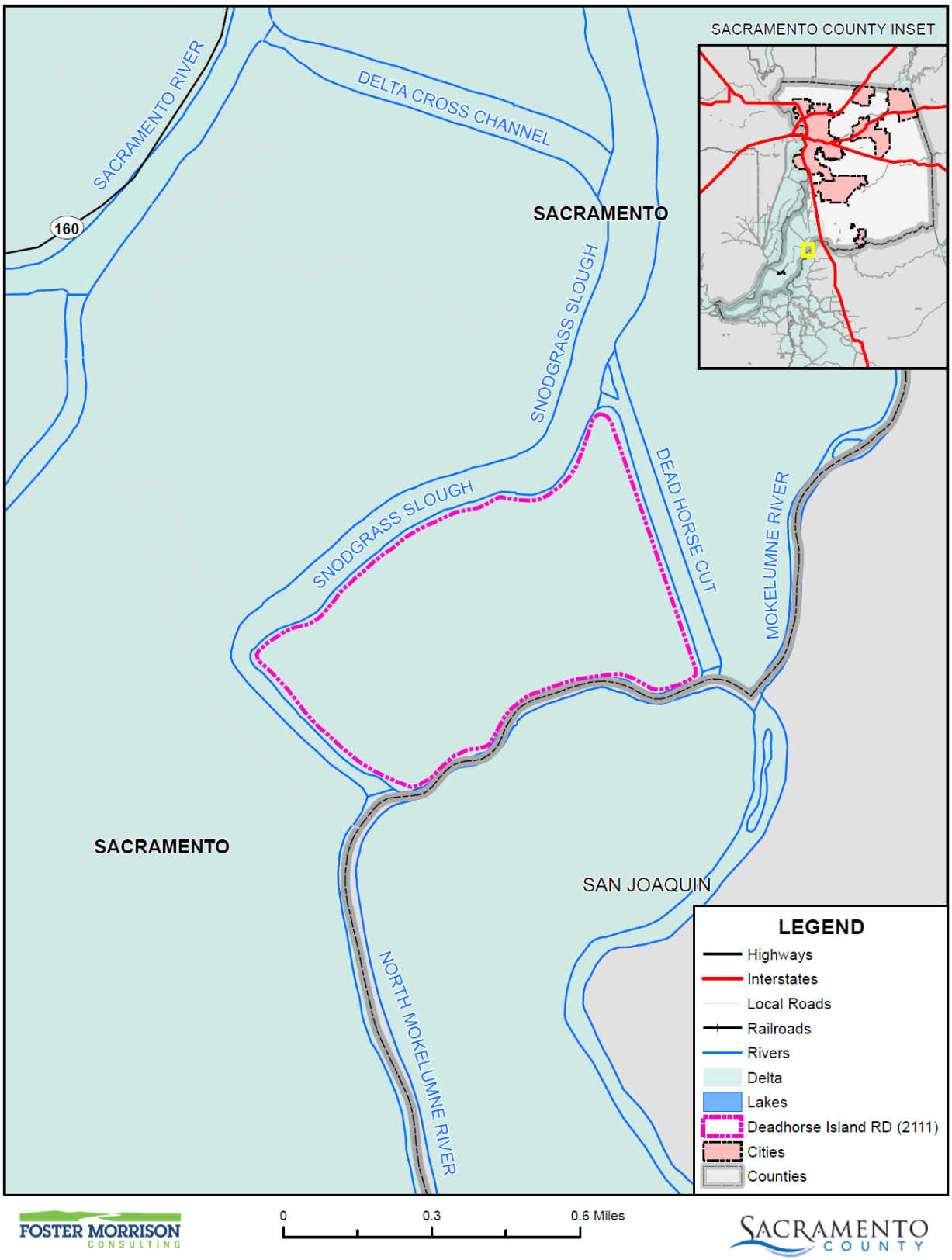
Table 13-2 2016 LHMP Incorporation

Planning Mechanism 2016 LHMP Was Incorporated/Implemented In.	Details: How was it incorporated?
Development of RD 2111 Flood Emergency Operations Plan	Elements in the Hazard Assessment used in the development of the Flood RD2111 Emergency Operations Plan

13.3 District Profile

The District profile for RD 2111 is detailed in the following sections. Figure 13-1 and Figure 13-2 display a map and the location of the District within Sacramento County.

Figure 13-1 RD 2111



Data Source: Deadhorse Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Figure 13-2 Reclamation District 2111 Map

Source: RD 2111

13.3.1. Overview and Background

Reclamation District No. 2111, Dead Horse Island is near the town of Walnut Grove, several miles to the west of Interstate 5 between Sacramento and Stockton. The District is protected by approximately 13,650 feet of non-project levee. The District has one landowner, who holds all of the lands within. Dead Horse Island is surrounded by Dead Horse Cut to the east, the North Mokelumne River to the south, and Snodgrass Slough to the north and west. The island is accessible by bridge from Staten Island, which connects to the southwest most portion of Dead Horse Island. The levee crown road is an all-weather gravel surface, and in one portion of the Island veers off the crown to avoid an existing structure; the levee crown is still accessible to truck traffic if necessary, in a flood event, and the required levee crown width for access is provided adjacent to the structure.

Reclamation District No. 2111 is responsible for maintaining the levee and drainage system that provides flood protection for Dead Horse Island, shown in Figure 13-1. The District was formed in 1980, and encompasses an area of 211 acres, surrounded by 2.58 miles of non-project levee, all located within Sacramento County. The District's Board of Trustees is made up of three Trustees who meet annually, or as necessary.

Dead Horse Island is located in the North Delta and is bordered by Dead Horse Cut to the east, the North Mokelumne River to the south, and Snodgrass Slough to the north and west. The District is located within the boundaries of the North Delta Water Agency. Emergency ingress and egress routes are via a private road on Staten Island off North Walnut Grove Road immediately east of the bridge over the North Fork of the Mokelumne River.

Dead Horse Island is located just downstream of the Delta Cross Channel. Water from the Sacramento River flows into both the South Fork and North Fork of the Mokelumne Rivers around the perimeter of Dead Horse Island as it flows toward the State and Federal Water Project Pumps near the City of Tracy. The Reclamation District No. 2111 levees provide the conduit for this water to enter both the North Fork and South Fork of the Mokelumne River, and are important to the proper function of the State and Federal Water Projects.

None of the waterways immediately surrounding Dead Horse Island is a significant commercial marine transportation route, but every waterway around Dead Horse Island is navigable during certain times of the year. A private dock and lagoon serve the Island at approximately Station 6+00. There are also two marinas across the waterways from the Island: a marina called "Wimpy's" near the southeast corner of the Island, and Walnut Grove marina across from the westernmost point of the Island. These marinas are major hubs for recreational boating in the area, and there is substantial boat traffic in the channels surrounding Reclamation District No. 2111, which increases the erosion to which the District levees are subject. The waterways surrounding Reclamation District No. 2111 are used extensively by recreational boaters and by marine contractors that perform levee maintenance, flood fight response and other construction activities.

13.4 Hazard Identification

RD 2111 identified the hazards that affect the District and summarized their location, extent, frequency of occurrence, potential magnitude, and significance specific to District (see Table 13-3).

Table 13-3 RD 2111—Hazard Identification Assessment

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Unlikely	Limited	Low	–
Dam Failure	Extensive	Unlikely	Limited	Low	Medium
Drought & Water Shortage	Extensive	Occasional	Critical	Low	High
Earthquake	Extensive	Unlikely	Negligible	Medium	Low
Earthquake Liquefaction	Significant	Unlikely	Negligible	Medium	Low
Floods: 1%/0.2% annual chance	Extensive	Occasional	Catastrophic	High	Medium
Floods: Localized Stormwater	Limited	Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Unlikely	Negligible	Low	Medium
Levee Failure	Extensive	Occasional	Catastrophic	High	Medium
Pandemic	Extensive	Likely	Limited	Low	Medium
Severe Weather: Extreme Cold and Freeze	Limited	Unlikely	Negligible	Low	Medium
Severe Weather: Extreme Heat	Limited	Unlikely	Negligible	Low	High
Severe Weather: Heavy Rains and Storms	Limited	Likely	Negligible	High	Medium
Severe Weather: Wind and Tornado	Limited	Likely	Negligible	High	Low
Subsidence	Limited	Unlikely	Critical	Medium	Medium
Volcano	Extensive	Unlikely	Catastrophic	Low	Low
Wildfire	Limited	Unlikely	Negligible	Low	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

13.5 Hazard Profile and Vulnerability Assessment

The intent of this section is to profile the District's hazards and assess the District's vulnerability separate from that of the Sacramento County Planning Area as a whole, which has already been assessed in Section 4.3 Hazard Profiles and Vulnerability Assessment in the Base Plan. The hazard profiles in the Base Plan discuss overall impacts to the Sacramento County Planning Area and describes the hazard problem description, hazard location and extent, magnitude/severity, previous occurrences of hazard events and the likelihood of future occurrences. Hazard profile information specific to the District is included in this Annex. This vulnerability assessment analyzes the property and other assets at risk to hazards ranked of medium or high significance specific to the District. For more information about how hazards affect the County as a whole, see Chapter 4 Risk Assessment in the Base Plan.

13.5.1. Hazard Profiles

Each hazard vulnerability assessment in Section 13.5.3, includes a hazard profile/problem description as to how each medium or high significant hazard (as shown in Table 13-3) affects the District and includes information on past hazard occurrences and the likelihood of future hazard occurrence. The intent of this section is to provide jurisdictional specific information on hazards and further describes how the hazards and risks differ across the Sacramento County Planning Area.

13.5.2. Vulnerability Assessment and Assets at Risk

This section identifies the District's total assets at risk, including values at risk, populations at risk, critical facilities and infrastructure, natural resources, and historic and cultural resources. Growth and development trends are also presented for the District. This data is not hazard specific, but is representative of total assets at risk within the District.

Assets at Risk and Critical Facilities

This section considers RD 2111's assets at risk, with a focus on key District assets such as critical facilities, infrastructure, and other District assets and their values. With respect to District assets, the majority of these assets are considered critical facilities as defined for this LHMP. Critical facilities are defined for this Plan as:

> ***Any facility, including without limitation, a structure, infrastructure, property, equipment or service, that if adversely affected during a hazard event may result in severe consequences to public health and safety or interrupt essential services and operations for the community at any time before, during and after the hazard event.***

A critical facility is classified by the following categories: (1) Essential Services Facilities, (2) At-risk Populations Facilities, (3) Hazardous Materials and Solid Waste Facilities.

Table 13-4 lists critical facilities and other District assets identified by the District Planning Team as important to protect in the event of a disaster. RD 2111's physical assets, valued at over $150,000, consist of the buildings and infrastructure to support the District's operations.

Table 13-4 RD 2111 Critical Facilities, Infrastructure, and Other District Assets

Name of Asset	Facility Type	Replacement Value	Which Hazards Pose Risk	
Drain Pump 10	Essential Services	$50,000	Out of floodplain	
Drain Pumps	Essential Services	$100,000	Out of floodplain	
Total		**$150,000**		

Source: RD 2111

There are several levee geometry standards and criteria that are recognized within the Delta. Dead Horse Island uses the Hazard Mitigation Plan (HMP) Criteria and the Bulletin 192-82 Standard. HMP level is the 100-year Base Flood Elevation plus an additional foot of freeboard for agricultural Districts. The goal is to reach the 192-82 level of flood protection, which is the 300-year surface elevation plus 1.5-ft freeboard for agricultural Districts.

The Level of Protection assessment below is based on the DWR 2017 Light Detection and Ranging (LiDAR) Survey. It should be noted that LiDAR survey data is generally suitable for high-level assessments and planning efforts such as this Plan, but it has limitations for more refined analyses due to accuracy thresholds, data gaps underneath vegetation and/or structure cover, and lack of identification of planimetric surface features.

The DWR 2017 LiDAR survey data indicates that the District's levee meets the following standards and criteria as shown in Table 13-5.

Table 13-5 Current Levee Assessment

Delta Agricultural Levee Standard/Criteria	Length of Levee that Meets Standard/Criteria	Percentage of Levee that Meets Standard/Criteria
Total Levee Length	13,642 feet	---
HMP Criteria	11,518 feet	84.4%
Bulletin 192-82	0 feet	0%

Source: RD 2111

Costs Due to a Levee Failure or Breach

A failure or breach of the District's levee system could result in flooding of the District to depths of approximately 14 feet on average. Projected costs associated with such an event have been calculated using actual costs from the 2004 Jones Tract flood event. All information used was gathered from the final FEMA Project Worksheets used to close out the claims for all of the public agencies involved in the disaster event (FEMA 1529-DR). Additional costs for work not claimed to FEMA included work performed by the United States Army Corps of Engineers; these costs were established from the invoiced amount provided by the Contractor.

In order to establish the unit costs for an anticipated flood cost model for Delta reclamation districts, the costs from the 2004 Jones Tract flood event were broken into component costs that can be applied to other districts using characteristic data for each district. The data used for the District includes the following:

- 211 acres of land
- 2.58 levee miles
- 14 feet average depth of District relative to BFE
- 7,800 linear feet of District maintained canals
- 3,000 acre-feet of floodwater to be evacuated from District

For the District, the estimated cost of a flood event resulting from a single levee failure would be approximately $19.9 million based on the costs from the 2004 Jones Tract flood event, with costs for distinct emergency and repair activities within the general cost magnitude shown. The cost analysis above does not include damage to privately owned property and improvements. The values of those properties exist elsewhere in this document. The actual financial impact to those properties and facilities would depend greatly on the replacement costs, the amount of insurance those properties might have, and where they are located relative to the location of the levee breach and depth of water at those locations. It should also be noted that a flood could potentially eliminate a cropping season.

Reclamation District Structures, Pumps, and Pipelines

Water for irrigation is supplied from Snodgrass Slough and the North Mokelumne River via siphons, and is routed through irrigation ditches located on the high end of the fields. Drainage of irrigation tail-water and subsurface seepage occurs through approximately 7,800 feet of earth-lined drainage canals through the farmed portion of the island, draining toward the terminal drainage pump station in the southwest portion of the District. The drainage canals are maintained regularly to remove accumulated debris and vegetation from the channels by both mechanical means and by use of approved herbicides. In some instances, the drainage canals are utilized to provide water to portable irrigation pumps used for temporary sprinkler type irrigation.

Excess water is removed from the irrigation and drainage systems by the main District pump station, which discharges into Snodgrass Slough at approximately Station 136+50. The pump station has one 25-hp pump and one 10-hp pump. Pump capacities for any pump with a given motor vary, depending on the total dynamic head, impeller size, and efficiency. Pump curves specific to the pumps and motors installed on the District are not available, but typical optimal flow rates for pumps with the same motor sizes as those installed on the District are approximately 3,000 gallons per minute (gpm) for a 25-hp pump, and 1,500 gpm for a 10-hp pump.

The flow rates listed above are based on pump performance during conditions at the time of the pump test. These conditions are assumed to be indicative of normal operations of the pump stations. Pump capacities for any pump with a given motor vary, depending on the total dynamic head, impeller size, and efficiency.

Both pumps are powered by electricity provided by the Sacramento Municipal Utilities District. If the power supply to the island is disrupted, there is no backup power supply immediately available to the pumps, and it would be necessary to bring in backup generators to operate the pumps.

General Infrastructure

According to the Delta Protection Commission's Economic Sustainability Plan for the Sacramento-San Joaquin Delta, there is a natural gas transmission pipeline that crosses Dead Horse Island, and the island is

situated in the middle of the West Thornton-Walnut Grove Gas Field. This gas field is part of a significant series of oil/gas fields that ranges from Sherman Island at its southwest-most point to Glanville Tract at its northeast-most point and includes the Rio Vista Gas Field, the largest natural gas field in California.

According to the State of California Department of Conservation Division of Oil, Gas & Geothermal Resources, three plugged and abandoned gas wells are located on Dead Horse Island. While the wells have been abandoned, the island retains value as a component of the State's gas production and transmission network through this portion of the Delta.

Electrical service to the island residents and District pump stations is provided by the Sacramento Municipal Utilities District. The transmission lines are fed from McCormack-Williamson Tract to a line that is located on and protected by the District's levee. Loss of this power supply would render the District drainage pumps useless, as well as cut power to the residences on the island.

The District is located just upstream of the bridge crossings of Walnut Grove Road, also called Sacramento County Road J11, across the North and South forks of the Mokelumne River. While there has not historically been a problem with access being impeded at these bridges directly due to flooding at Reclamation District No. 2111, this road is one of the major egress routes for the town of Walnut Grove, and provides access to Staten Island and Tyler Island specifically, and through much of the Delta in general. As can be seen in the photos included in the flood history in this report, boats have broken loose from local marinas and threatened to destroy bridges in this area in the past. Destruction of these egress routes could severely impede flood control operations for multiple reclamation districts in the area, as well as limit evacuation capabilities in the region.

Local Assets

The agricultural production located on Dead Horse Island provides an economic base from which the public benefits in the form of jobs, tax revenues, and other economic benefits. The District's levee protects 211 acres of farmland, two residences, several non-residential structures, and the high-value vegetable seed crops produced on the island. The DRMS Phase 1 report estimates the total assets within the District to be $910,000, and does not include the value of the land. The Public Policy Institute (PPIC) estimates the land value to be $862,581, and the asset value to be $998,000, for a total value of the land and assets of $1,860,581. Based on recent land sales of similar properties and soil types in the region indicate a land value of approximately $2,000,000. The estimated value of other assets including homes, buildings, a bridge, and appurtenant structures is approximately $3,000,000. The total value of land and assets is approximately $5,000,000. Given that this is a unique property in a very desirable location with many opportunities for other uses, the value could be in excess of the stated amount.

For the purposes of this report, no economic value has been placed on the environmental benefits provided by the interior lands within the island and protected by the levees. The costs of replacing these environmental benefits are likely substantial, and the costs to mitigate for environmental or habitat losses currently range from $65,000 to $145,000 per acre.

Natural Resources

The Reclamation District No. 2111 levee provides protection for valuable habitat essential for many threatened and endangered species. In general, Delta lands, including those protected by the District's levees, provide forage and cover for local and migratory populations of birds and terrestrial wildlife including many special status species. The levees also provide important waterside habitat and shoreline for various fisheries that includes several special status species. Flooding of Delta islands destroys habitat and kills most terrestrial species present.

Historic and Cultural Resources

Per the 2015 Five-Year Plan, there are not historic or cultural resources in the District.

Growth and Development Trends

According to the District in 2011, Dead Horse Island currently supports three permanent residences and several small structures which are generally not occupied. Three fulltime residents live on the Island. The permanent residences are above the required HMP levee crown elevation. The Planning Team for the District noted that future development is limited in the secondary zone of the Delta from the Delta Protection Plan.

Development since 2016

The District noted no new facilities. As such, no changes in vulnerability occurred due to development since the 2016 Plan Update.

Future Development

The District has the following future development plans.

Rock Slope Protection Project

The District's first priority is to ensure the protection of the existing levee by adding quarry stone riprap above the existing riprap to any portions of the waterside slope of the levee requiring additional rock slope protection. This will prevent erosion and reduce future erosion repairs. Prior to submitting a project proposal, a thorough riprap inventory of the District must be completed to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project. The quantities and costs provided in this Plan are planning level estimates based on input from the District and from the District's most recent survey.

The anticipated planning-level costs of the Rock Slope Protection Project consisting or additional riprap as needed is approximately $3.5 million. Quantities and costs are provided in this Plan as planning level estimates based on input from the District and from the District's most recent survey and inspection. A thorough riprap inventory of the District must be completed prior to submitting a project proposal to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project.

Overflow Weir Project

Due to historical inundations caused by flood surge caused by high flows generated from uncontrolled upstream levee breaches, the District plans to install a weir at the upstream levee on Dead Horse Cut. This will allow the District to fill the island with water to stabilize the levees against uncontrolled flooding. This should eliminate levee failures as the weight of the water on the island's interior will stabilize the levee against total levee failure. The District will likely sustain some damage and pumping costs, but the costs will be substantially than losing the entire levee section. Also, protecting against a failure of the entire levee section protects adjacent islands from failure due to rapid drawdown which can cause failure of adjacent levees. This project may be eligible for other funding sources because the adjacent levees protect a Delta Legacy Community as well as Federal Project Levees.

Bulletin 192-82 Levee Project

The District will then bring those portions of levee below the Bulletin 192-82 Standard to six inches above the Bulletin 192-82 Standard with a District minimum crown width of 24 feet to allow for future levee raises to address climate change and sea level rise. This work will likely be divided into several phases or projects, depending on the funding available. The Bulletin 192-82 Levee Project sites are proposed to be limited to the following locations as shown in Table 13-6.

Table 13-6 Bulletin 192-82 Levee Project Sites

Start Station	End Station	Length in Feet
0+00	136+42	13,642

These project sites may be addressed individually, or as a single project. The cost estimate provided in this report treats all Bulletin 192-82 Levee Project sites as a single project, and costs are reported accordingly.

The costs involved with constructing a minimum 16-foot wide crown in accordance with the Bulletin 192-82 Standard are approximately $11.5 million. Furthermore incremental costs involved with widening the crown to 24 feet to allow for future raises in freeboard to address climate change and sea level rise is approximately $5.5 million. Quantities and costs are provided in this Plan as planning level estimates based on input from the District and from the District's most recent survey and inspection. A design-level survey and inspection of the District must be completed prior to submitting a project proposal to determine more definitive quantities and costs required to complete the project.

Syphon Project

The District in the planning phase and plans to install 3 36-inch pipes to pre-flood the island. These pipes will be approximately 250 feet long. Fish screens will be used on the pipes to prevent fish from being sucked into the island. These pipes could also to relieve flooding within the District.

13.5.3. Vulnerability to Specific Hazards

This section provides the vulnerability assessment, including any quantifiable loss estimates, for those hazards identified above in Table 13-3 as high or medium significance hazards. Impacts of past events and

vulnerability of the District to specific hazards are further discussed below (see Section 4.1 Hazard Identification in the Base Plan for more detailed information about these hazards and their impacts on the Sacramento County Planning Area). Methodologies for evaluating vulnerabilities and calculating loss estimates are the same as those described in Section 4.3 of the Base Plan.

An estimate of the vulnerability of the District to each identified priority hazard, in addition to the estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low**—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low**—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High**—Very widespread with catastrophic impact.

Depending on the hazard and availability of data for analysis, this hazard specific vulnerability assessment also includes information on values at risk, critical facilities and infrastructure, populations at risk, and future development.

Power Outage/Power Failure

An impact of almost all hazards below relates to power outage and/or power failures. The US power grid crisscrosses the country, bringing electricity to homes, offices, factories, warehouses, farms, traffic lights and even campgrounds. According to statistics gathered by the Department of Energy, major blackouts are on the upswing. Incredibly, over the past two decades, blackouts impacting at least 50,000 customers have increased 124 percent. The electric power industry does not have a universal agreement for classifying disruptions. Nevertheless, it is important to recognize that different types of outages are possible so that plans may be made to handle them effectively. In addition to blackouts, brownouts can occur. A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency. Electric power disruptions can be generally grouped into two categories: intentional and unintentional. More information on types of power disruptions can be found in Section 4.3.2 of the Base Plan.

The District Planning Team noted that the pump stations and drainage conveyances are potentially at risk to power outages and/ or power failure. In the absence of power, localized flooding can occur because existing pump stations do not have backup power. In addition, if power outages occur near the end of the flood, it will be a challenge to dewater the districts.

Public Safety Power Shutoff (PSPS)

A new intentional disruption type of power outage/failure event has recently occurred in California. In recent years, several wildfires have started as a result of downed power lines or electrical equipment. This was the case for the Camp Fire in 2018. As a result, California's three largest energy companies (including PG&E), at the direction of the California Public Utilities Commission (CPUC), are coordinating to prepare all Californians for the threat of wildfires and power outages during times of extreme weather. To help protect customers and communities during extreme weather events, electric power may be shut off for public safety in an effort to prevent a wildfire. This is called a PSPS. More information on PSPS criteria can be found in Section 4.3.2 of the Base Plan.

Earthquake

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks, such as water, power, gas, communication, and transportation. Earthquakes may also cause collateral emergencies including dam and levee failures, seiches, hazmat incidents, fires, avalanches, and landslides. The degree of damage depends on many interrelated factors. Among these are: the magnitude, focal depth, distance from the causative fault, source mechanism, duration of shaking, high rock accelerations, type of surface deposits or bedrock, degree of consolidation of surface deposits, presence of high groundwater, topography, and the design, type, and quality of building construction.

Location and Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). Seismologists have developed several magnitude scales, as discussed in Section 4.3.9 of the Base Plan. Geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This magnitude figure is speculative based on an 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series

of faults has not been active in historic time. Potential earthquakes on the Hayward, Calaveras, and San Andreas fault could also affect the Delta area.

Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. Seismic shaking maps for the area show Sacramento County and the District fall within a low to moderate shake risk, with most of the moderate risk in the Delta area of the County.

Past Occurrences

There have be no past federal or state disaster declarations from this hazard. After the 2014 Napa Earthquake the District performed levee inspections and verified the continued operation of the pump stations around the island to check the levee integrity and ensure there was no damage to District assets as a result of the earthquake.

Vulnerability to and Impacts from Earthquake

The combination of plate tectonics and associated California coastal mountain range building geology generates earthquake as a result of the periodic release of tectonic stresses. Sacramento County lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future of the California north coastal mountain region.

Fault ruptures itself contributes very little to damage unless the structure or system element crosses the active fault; however, liquefaction can occur further from the source of the earthquake. In general, newer construction is more earthquake resistant than older construction due to enforcement of improved building codes. Manufactured buildings can be very susceptible to damage because their foundation systems are rarely braced for earthquake motions. Locally generated earthquake motions and associated liquefaction, even from very moderate events, tend to be more damaging to smaller buildings, especially those constructed of unreinforced masonry (URM) and soft story buildings.

The Uniform Building Code (UBC) identifies four seismic zones in the United States. The zones are numbered one through four, with Zone 4 representing the highest level of seismic hazard. The UBC establishes more stringent construction standards for areas within Zones 3 and 4. All of California lies within either Zone 3 or Zone 4. RD 2111 is within the less hazardous Zone 3.

Impacts from earthquake in the District will vary depending on the fault that the earthquake occurs on, the depth of the earthquake strike, and the intensity of shaking. Large events could cause damages to levees, infrastructure, critical facilities, residential and commercial properties, and possible injuries or loss of life. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees. All assets in the District are at risk to the effects of a damaging earthquake.

The District Planning Team noted that all natural resources could be affected by an earthquake causing damage to the levee structure should the island flood due to an earthquake.

Assets at Risk

The District Planning Team noted that the levees structures, pump stations and drainage conveyances are potentially at risk to an earthquake, though no evidence of damage has been observed to date.

Earthquake: Liquefaction

Likelihood of Future Occurrence–Low
Vulnerability–Medium

Hazard Profile and Problem Description

Liquefaction can be defined as the loss of soil strength or stiffness due to a buildup of pore-water pressure during a seismic event and is associated primarily with relatively loose, saturated fine- to medium-grained unconsolidated soils. Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. If this layer is at the surface, its effect is much like that of quicksand for any structure located on it. If the liquefied layer is in the subsurface, the material above it may slide laterally depending on the confinement of the unstable mass. Liquefaction is caused by a sudden temporary increase in pore-water pressure due to seismic densification or other displacement of submerged granular soils. Liquefiable soil conditions are not uncommon in alluvial deposits in moderate to large canyons and could also be present in other areas of alluvial soils where the groundwater level is shallow (i.e., 50 feet below the surface). Bedrock units, due to their dense nature, are unlikely to present a liquefaction hazard.

Location and Extent

There is no scientific scale for earthquake related liquefaction. The speed of onset is short, as is the duration. The effects from liquefaction can last for days, weeks, months or even years as areas of the County are rebuilt or leveed areas are dewatered, and the levees rebuilt. In Sacramento County, the Delta and areas of downtown Sacramento are at risk to liquefaction. The Delta sits atop a blind fault system on the western edge of the Central Valley. Moderate earthquakes in 1892 near Vacaville and in 1983 near Coalinga demonstrate the seismic potential of this structural belt. The increasing height of the levee system has prompted growing concern about the seismic stability of the levees. The concern is based on the proximity of faulting, the nature of the levee foundations, and the materials used to build the levees. Many levees consist of uncompacted weak local soils that may be unstable under seismic loading. The presence of sand and silt in the levees and their foundations indicates that liquefaction is also a possibility.

Past Occurrences

There have be no past federal or state disaster declarations from this hazard. The District noted no past occurrences of earthquake liquefaction or that affected the District in any meaningful way. The seismic events of 1989 and 2014 did not induce liquefaction on the Delta Levees. Delta levees are composed of material that contain pockets, rather than long continuous lenses, of sand. Though it has a low likelihood of future occurrence, liquefaction is a recognized potential risk.

Vulnerability to and Impacts from Liquefaction

Earthquake is discussed above, but is primarily focused on the vulnerability of buildings and people from earthquake shaking. This section deals with a secondary hazard associated with earthquake – the possible collapse of structural integrity of the ground underneath liquefaction prone areas. In Sacramento County, two of these areas have been identified: downtown Sacramento and the Delta area, which could lead to a possible collapse of delta levees and any above ground structures. While this levee failure differs from the levee failure discussion below which generally focuses on levee failure due to high water conditions or other types of structural failure, the resulting impacts would be similar and include those related to a large flood event. Potential earthquakes on the Hayward, Calaveras or San Andreas faults pose the highest risk to Delta Region levees. All assets in the District are at risk to the effects of liquefaction.

Assets at Risk

The District Planning Team noted that the levees structures, pump stations and drainage conveyances are potentially at risk to liquefaction resulting from seismic activity. Additionally, all-natural resources in the District would be at risk to liquefaction of the levee foundations and associated levee failures.

Flood: 1%/0.2% Annual Chance

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

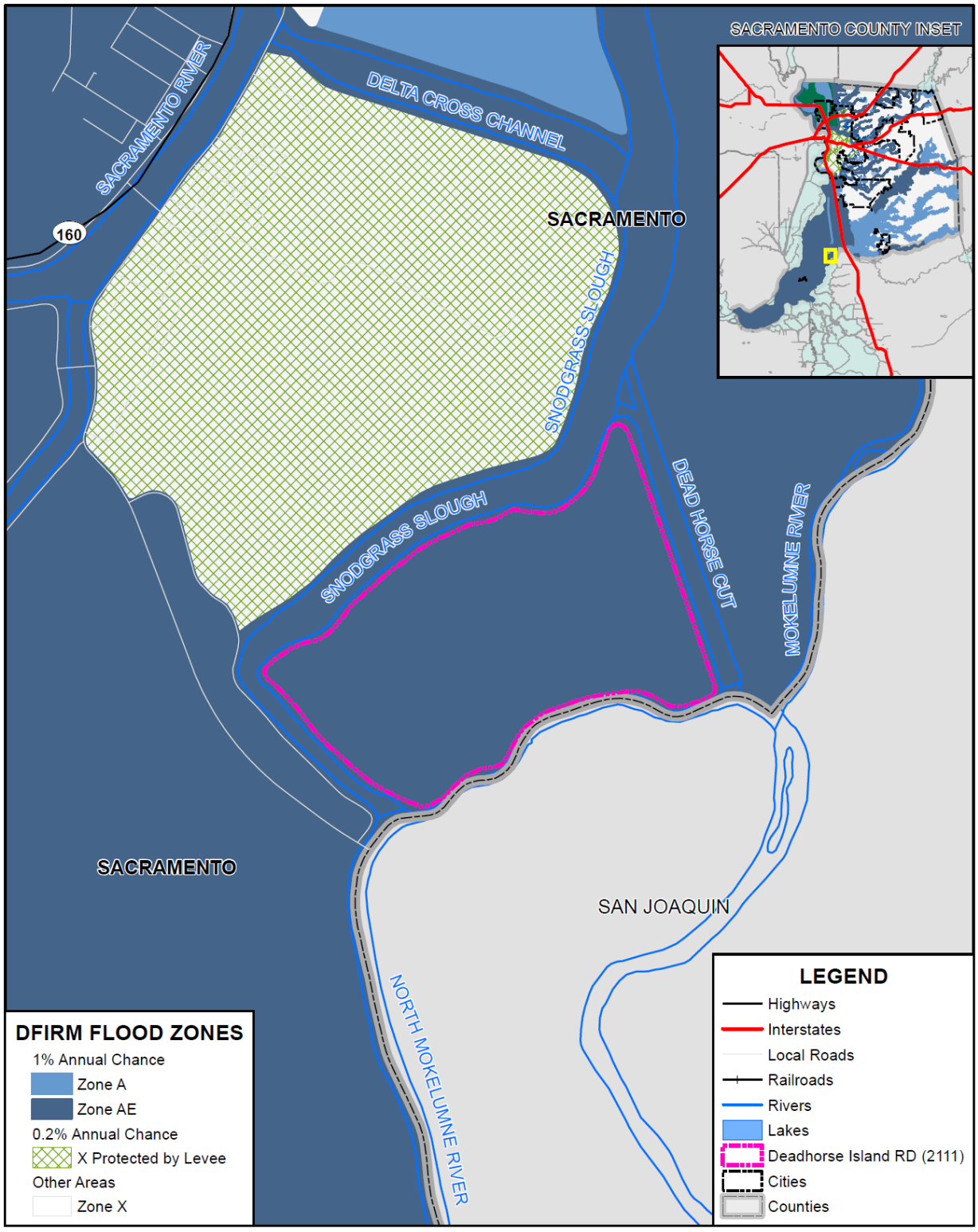
This hazard analyzes the FEMA DFIRM 1% and 0.2% annual chance floods. These tend to be the larger floods that can occur in the County or in the District, and have caused damages in the past. Flooding is a significant problem in Sacramento County and the District. Historically, the District has been at risk to flooding primarily during the winter and spring months when river systems in the County swell with heavy rainfall and snowmelt runoff. Normally, storm floodwaters are kept within defined limits by a variety of storm drainage and flood control measures. Occasionally, extended heavy rains result in floodwaters that exceed normal high-water boundaries and cause damage.

As previously described in Section 4.3.11 of the Base Plan, the Sacramento County Planning Area and RD 2111 have been subject to historical flooding. The Reclamation District No. 2111 levee is generally overtopped or the levee is breached during large flood events due to a confluence of several waterways in the vicinity of Dead Horse Island, which is located just downstream of where the Cosumnes and Mokelumne Rivers and Dry Creek merge with Snodgrass Slough. The island is separated from the Sacramento River by one reclamation district and the flood gates for the Delta Cross Channel. Flooding of the island occurs primarily because the island is located in a hydraulic choke point in the river system that is impacted by the timing of storms, the unrestricted flows from the Cosumnes River and Dry Creek as well as the management of reservoir releases on the Mokelumne River.

Location and Extent

RD 2111 has areas located in the 1% annual chance floodplain. This is seen in Figure 13-3.

Figure 13-3 RD 2111 – FEMA DFIRM Flood Zones



Data Source: FEMA NFHL 07/19/2018, Deadhorse Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Table 13-7 details the DFIRM mapped flood zones within the 1% annual chance flood zone as well as other flood zones located within the District.

Table 13-7 RD 2111– DFIRM Flood Hazard Zones

Flood Zone	Description	Flood Zone Present in the District
A	100-year Flood: No base flood elevations provided	
AE	100-year Flood: Base flood elevations provided	
AH	An area inundated by 1% annual chance flooding (usually an area of ponding), for which BFEs have been determined; flood depths range from 1 to 3 feet	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet	
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones	X
Shaded X	500-year flood the areas between the limits of the 1% annual chance flood and the 0.2-percent-annual-chance (or 500-year) flood	
X Protected by Levee	An area determined to be outside the 500-year flood and protected by levee from 100-year flood	

Source: FEMA

Additionally, flood extents can generally be measured in volume, velocity, and depths of flooding. Expected flood depths in the District vary, depending on the nature and extent of a flood event; specific depths are unknown. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Flooding in the District tends to have a shorter speed of onset, due to the amount of water that flows through the District. Flooding can occur with compound effects of a storm, high releases from upstream dams, snowmelt, and is influenced by tidal movement.

Past Occurrences

A list of state and federal disaster declarations for Sacramento County from flooding is shown on Table 13-8. These events also likely affected the District to some degree.

Table 13-8 Sacramento County – State and Federal Disaster Declarations from Flood 1950-2020

Disaster Type	Federal Declarations		State Declarations	
	Count	Years	Count	Years
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)

Source: Cal OES, FEMA

Past occurrences of flooding affecting RD 2111 are detailed in the levee failure section below.

Vulnerability to and Impacts from Flood

Floods have been a part of the District's historical past and will continue to be so in the future. During winter months, long periods of precipitation and the timing of that precipitation are critical in determining the threat of flood, and these characteristics further dictate the potential for widespread structural and property damages. Predominantly, the effects of flooding are generally confined to areas near the waterways of the County. As waterways grow in size from local drainages, so grows the threat of flood and dimensions of the threat. This threatens structures in the floodplain. Structures can also be damaged from trees falling as a result of water-saturated soils. Electrical power outages happen, and the interruption of power causes major problems. Loss of power is usually a precursor to closure of governmental offices and community businesses. Roads can be damaged and closed, causing safety and evacuation issues. People may be swept away in floodwaters, causing injuries or deaths.

Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities as well as life safety issues. Floods can be extremely dangerous, and even six inches of moving water can knock over a person given a strong current. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can also break utility lines and interrupt services. Standing water can cause damage to crops, roads, foundations, and electrical circuits. Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, loss of environmental resources, and economic impacts.

Dead Horse Island is located just downstream from the confluence of the Mokelumne and Cosumnes Rivers. The Cosumnes River is one of the few remaining rivers that does not have any dams, and flows are unrestricted upstream of Dead Horse Island. The Mokelumne River is controlled by several dams, with Camanche Dam being the principal flood control reservoir. McCormack Williamson Tract, located upstream to the northeast and adjacent to Dead Horse Island, has a restricted elevation levee on the upstream end of the tract that overtops and fills McCormack Williamson Tract when the Mokelumne and Cosumnes Rivers reach an elevation of 20.0 feet (NAVD 88 datum). The flood water that is contained within McCormack Williamson Tract builds up within the Tract until it overtops and breaches the levee on the downstream end of the Tract, adjacent to Dead Horse Island. When the McCormack Williamson Tract downstream levee fails, all of the water accumulated from upstream is released in a very short time, and given the narrow channels surrounding Dead Horse Island, causes an immediate short term rise in the water surface elevations in the channels surrounding Dead Horse Island. The majority of the recent flood events on Dead Horse Island can be attributed to this type of hydraulic event that commonly occurs during flood flows on the Mokelumne and Cosumnes Rivers.

Based on past history, the District Planning Team noted that the island's levees are sufficient to protect against a 100-year flood. A 200- or 500-year flood would likely overwhelm or overtop the levees. The

District Planning Team also noted that both marinas are unstable – they will break and block bridges during high water.

Assets at Risk

Should a flood breach the levees, the entirety of the assets of RD 2111 would be at risk. Levee failure is discussed later in this section. Flooding also causes erosion, which is discussed later in this Annex.

Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

There is only one building site in the District. It is above the floodplain.

Flood: Localized Stormwater Flooding

Likelihood of Future Occurrence–Occasional
Vulnerability–High

Hazard Profile and Problem Description

Flooding occurs in areas other than the FEMA mapped 1% and 0.2% annual chance floodplains. Flooding may be from drainages not studied by FEMA, lack of or inadequate drainage infrastructure, or inadequate maintenance. Localized, stormwater flooding occurs throughout the County during the rainy season from November through April. Prolonged heavy rainfall contributes to a large volume of runoff resulting in high

Location and Extent

RD 2221 is subject to localized flooding throughout the District. Flood extents are usually measured in areas affected, velocity of flooding, and depths of flooding. Expected flood depths in the District vary by location. Flood durations in the District tend to be short to medium term, or until either the storm drainage system can catch up or flood waters move downstream. Localized flooding in the District tends to have a shorter speed of onset, especially when antecedent rainfall has soaked the ground and reduced its capacity to absorb additional moisture.

Historically, RD 2221 has been at risk to flooding primarily during the spring months when river systems in the County swell with heavy rainfall. The District has a drainage system set up deal with localized flooding. A map of this system can be seen on Figure 13-4

Figure 13-4 RD 2221 Drainage System

Source: RD 2111

Past Occurrences

There have been no federal or state disaster declarations in the County due to localized flooding. The District has not identified past events.

Vulnerability to and Impacts from Localized Flooding

Primary concerns associated with stormwater flooding include impacts to agriculture and structures. Ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utility lines and interrupt services. Standing water can cause damage to crops, roads, and foundations. Other problems connected with flooding and stormwater runoff include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

Assets at Risk

The District Planning Team noted that all District assets are at risk to localized flooding; however, this flooding is likely to be a nuisance-type of flood and would not have lasting impacts on the District. Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Levee Failure

Likelihood of Future Occurrence–Occasional
Vulnerability–Extremely High

Hazard Profile and Problem Description

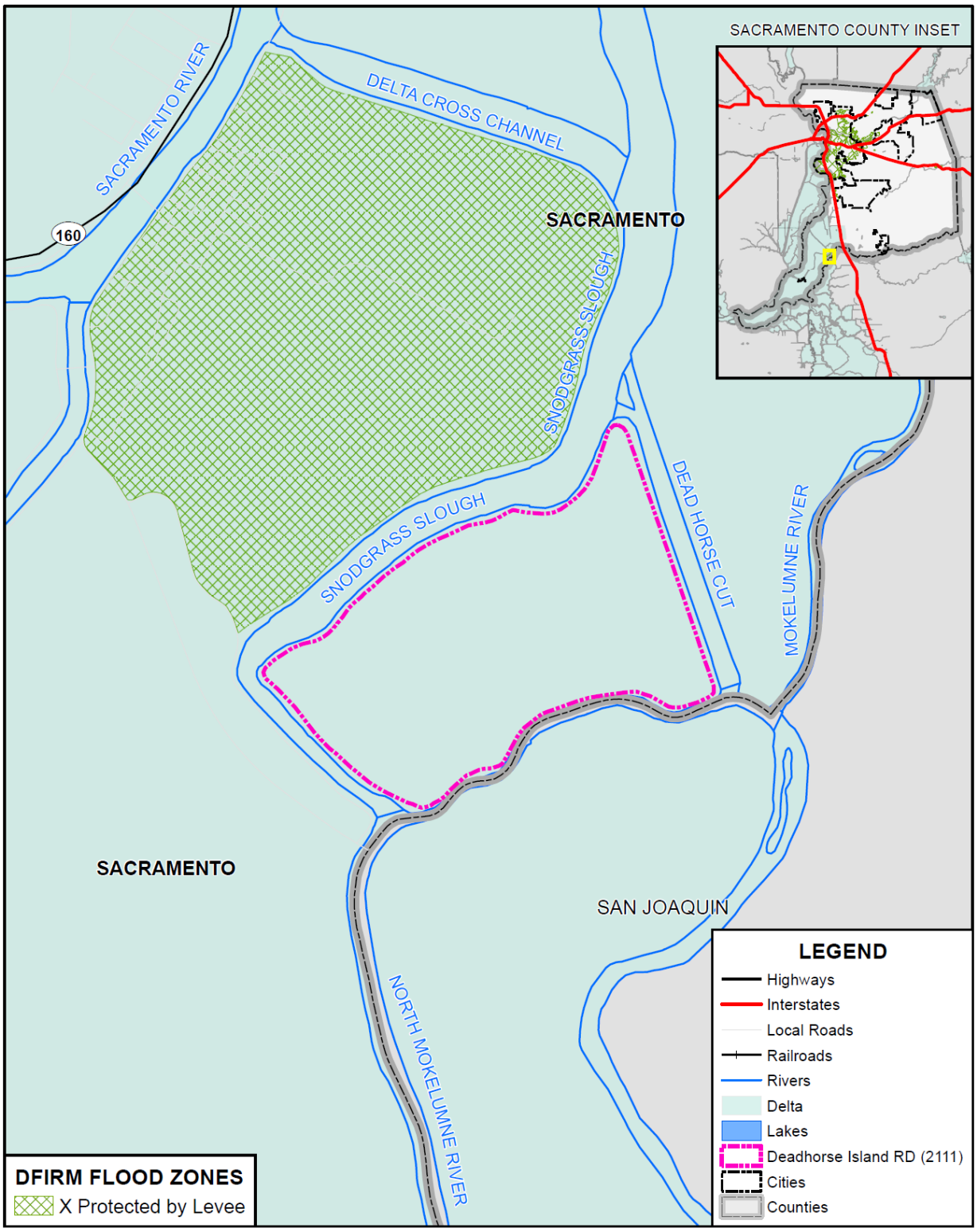
A levee is a raised area that runs along the banks of a stream or canal. Levees reinforce the banks and help prevent flooding by containing higher flow events to the main stream channel. By confining the flow to a narrower steam channel, levees can also increase the speed of the water. Levees can be natural or man-made.

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events or dam failure. For example, levees can be certified to provide protection against the 1% annual chance flood. Levees reduce, not eliminate, the risk to individuals and structures located behind them. A levee system failure or overtopping can create severe flooding and high water velocities. Levee failure can occur through overtopping or from seepage issues resulting from burrowing rodents, general erosion, excessive vegetation and root systems and other factors that compromise the integrity of the levee. No levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Location and Extent

There is not a scientific scale or measurement system in place for levee failure. Expected flood depths from a levee failure in the District vary by event and location. The speed of onset is slow as the river rises, but if a levee fails the warning times are generally short for those in the inundation area. The duration of levee failure risk times can be hours to weeks, depending on the river flows that the levee holds back. When northern California dams and reservoirs are nearing maximum capacity, they release water through the river systems, causing additional burdens on County levees. Levees in the District are shown on Figure 13-5.

Figure 13-5 RD 2111 – Levee Protected Areas



Data Source: FEMA NFHL 07/19/2018, Deadhorse Island Reclamation District, Sacramento County GIS, Cal-Atlas; Map Date: 09/2020.

Past Occurrences

The 2015 Five-Year Plan contained detail of past occurrences of levee failure and how it affected the District. Those details are here below:

- 1900 – Dead Horse Island was initially reclaimed. The levee on the east side of the Island was constructed by dredgers, which separated the Island from McCormack Williamson Tract.
- 1907 – A flood event breached the levee on nearby Tyler Island, and likely flooded Reclamation District No. 2111 as well.
- December 1955 – Rainfall on a deep Sierra snowpack caused flooding at Reclamation District No. 2111. Levee failed and the District was inundated.
- 1957 – A flood event caused inundation at Dead Horse Island. The levee failed and the District was inundated.
- 1980 – Levee failure at approximately Station 96+00 to 97+00. Due to hydraulic conditions in this portion of the Delta, the levee was overtopped by rising floodwaters causing the failure along Snodgrass Slough opposite the Walnut Grove Marina. Reclamation District No. 2111 was inundated. The levee was temporarily repaired so that the Island could be dewatered. Complete repair of the failed levee section occurred during the following summer months and the full levee section was restored. A FEMA claim was filed, and helped to defer the costs of the repair.
- February 1986 – The east end of the Island was overtopped. In the words of one of the District trustees, this flood event caused overtopping simultaneously "all over" the District. The location of the District at the confluence of the of the Mokelumne and Cosumnes Rivers caused a huge volume of water to overwhelm the District in a very short time, and the elevation of the levee was insufficient to protect the District against this rapid floodwater rise. The levee prism also failed as a result in the rapid pressure increase from the high water. In addition to the increased flow throughout the Delta, floodwaters around the District rose even further due to an unexpected flow restriction in the North Fork of the Mokelumne River at the New Hope Bridge, where several house boats had broken loose of their moorings and lodged against the bridge (see photo). The house boats had been docked at the New Hope Marina, located upstream of the split between the North Fork and South Fork of the Mokelumne River, near the western portion of the District levee. Note the marina blocking water that caused the RD 2111 levees to fail.

Figure 13-6 1986 Flooding

Source: 2015 Five-Year Plan for RD 2111

- January 1997 – The District levee failed at approximately Station 107+00 to 110+00 just as the levee was about to be overtopped. Consequences: A levee break occurred opposite the Walnut Grove Marina during a flood event. The District was fully inundated. Several boats and sections of the dock from the Walnut Grove Marina were pulled through the levee breach into the interior of the island. Other recreational boats, house boats, and sections of dock were also pulled into the Millers Ferry Bridge, including a two story floating home which particularly threatened to reduce flows down the North Fork of the Mokelumne River, increase the flood threat to adjacent islands, and possibly destroy the bridge, cutting off one of the few available emergency evacuation routes (see photo). The large houseboat was eventually destroyed and the debris was sucked under the bridge.

Figure 13-7 1997 Flooding

Source: 2015 Five-Year Plan for RD 2111

In earlier flood events, there are reports that the McCormack Williamson Tract levee was purposely breached on Dead Horse Cut prior to its overtopping, successfully attenuating the flood impacts previously anticipated to affect neighboring islands. These planned levee breaches also limited damage to the interior of the McCormack Williamson levees as the size and location of the planned breaches can be controlled, and the water surface elevation within the tract does not increase beyond the downstream high water surface elevations.

It should be noted that since 1986, significant portions of the levee system within the Legal Delta have been rehabilitated and improved, which has significantly reduced the number and frequency of levee breaches and failures during post-1986 Delta flood events.

In 2017, the District's levee performed well against high flows and high tides in February. Relief cuts made on McCormack-Williamson Tract upstream of the District in advance of peak flows helped alleviate extreme water surface elevations associated with past events due to water not building up behind those levees prior to them failing. Due to the relief cuts made upstream, no "surge" effect occurred and the District did not flood as in many prior events.

Vulnerability to and Impacts from Levee Failure

A levee failure can range from a small, uncontrolled release to a catastrophic failure. Levee failure flooding can occur as the result of prolonged rainfall and flooding. The primary danger associated with levee failure is the high velocity flooding of those properties outside and downstream of the breach.

Should a levee fail, some or all of the area protected by the levees would be at risk to flooding. Impacts from a levee failure include property damage, critical facility damage, and life safety issues. Business and economic losses could be large as facilities could be flooded and services interrupted. School and road closures could occur. Road closures would impede both evacuation routes and ability of first responders to quickly respond to calls for aid. Other problems connected with levee failure flooding include erosion, sedimentation, degradation of water quality, losses of environmental resources, and certain health hazards.

There are several standards that the levees in the Delta must meet in order to remain eligible for certain State and Federal disaster assistance programs. These include the Hazard Mitigation Plan (HMP) criteria and the Public Law 84-99 Flood Control and Coastal Emergency Act (PL 84-99) Standard for agricultural levees. The Level of Protection assessment below is based on the DWR 2017 Light Detection and Ranging (LiDAR) Survey. It should be noted that LiDAR survey data is generally suitable for high-level assessments and planning efforts such as this Plan, but it has limitations for more refined analyses due to accuracy thresholds, data gaps underneath vegetation and/or structure cover, and lack of identification of planimetric surface features.

The DWR 2017 LiDAR survey data indicates that the District's levee meets the following standards and criteria as shown in Table 13-9.

Table 13-9 RD 2111 Levee Standards of Protection

Delta Agricultural Levee Standard	Feet of Levee	Percentage of Levee
Total Levee Length	13,642 feet	–
Meets HMP Standard	11,581 feet	84.4%
Bulleting 192-82	0 feet	0.0%

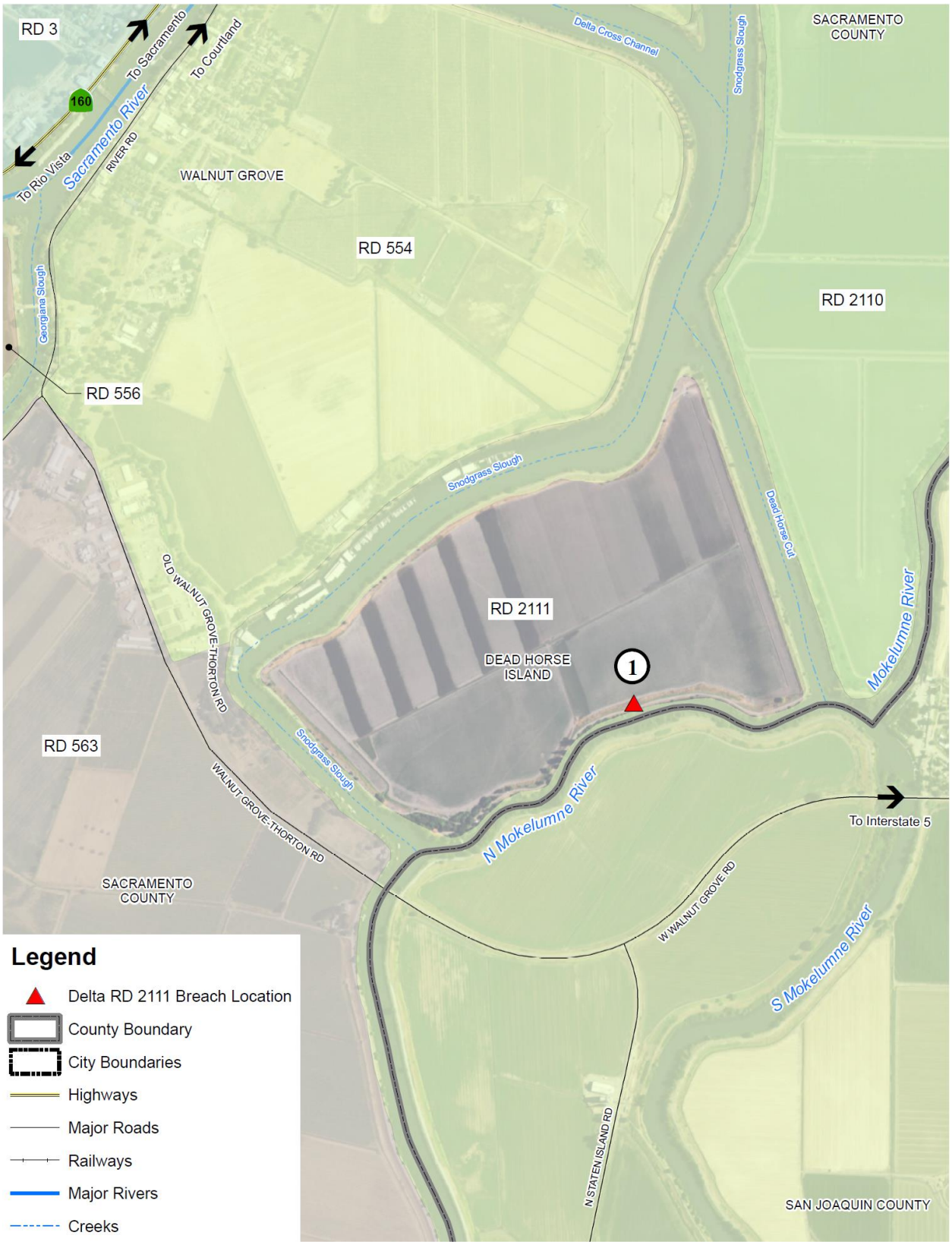
Source: 2020 Five Year Plan for RD 2111

StormReady Flood Scenarios and Evacuation Routes

The County of Sacramento and the City of Sacramento have prepared various detailed maps showing hypothetical levee breaks, inundation levels and the time it would take for waters to rise in affected neighborhoods, and rescue and evacuation zones. It is important to note that these maps deal with potential scenarios. These are to help Sacramento County citizens think of how to escape before an emergency occurs. It should be noted that it would be incorrect to assume that the evacuation routes shown on the maps will necessarily be citizens only way out in a flood. Escape routes could be affected by localized flooding, traffic accidents, and different flooding situations occurring at the time. Emergency officials will monitor roads and let the public know through radio stations and other media if alternate routes should be taken.

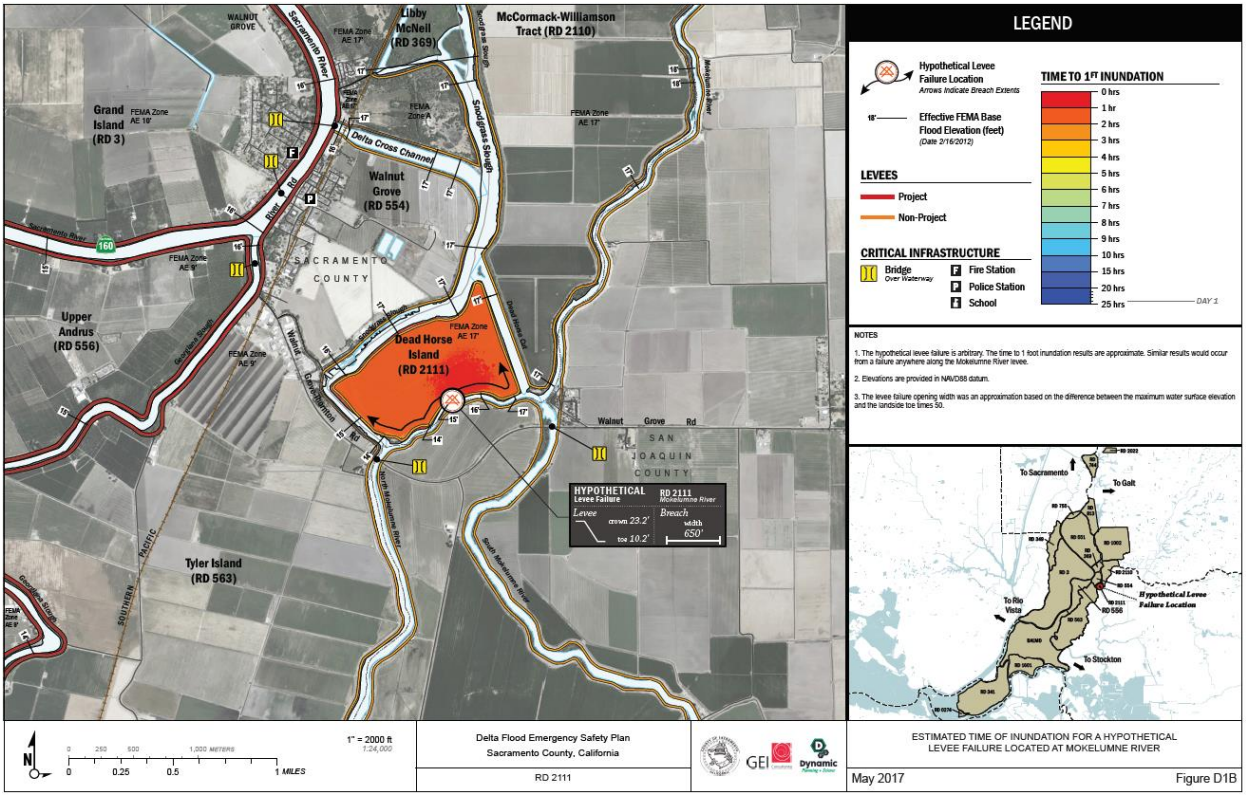
For RD 2111, Figure 13-8 details the locations in the Delta within Reclamation District 2111 where flooding could occur. The red triangle denotes a hypothetical potential levee breach location. Maps for this levee breach scenario regarding time to one foot inundation (Figure 13-9), estimated flood depths (Figure 13-10), and suggested evacuation routes (Figure 13-11) are displayed below.

Figure 13-8 RD 2111 – Potential Levee Breach Location



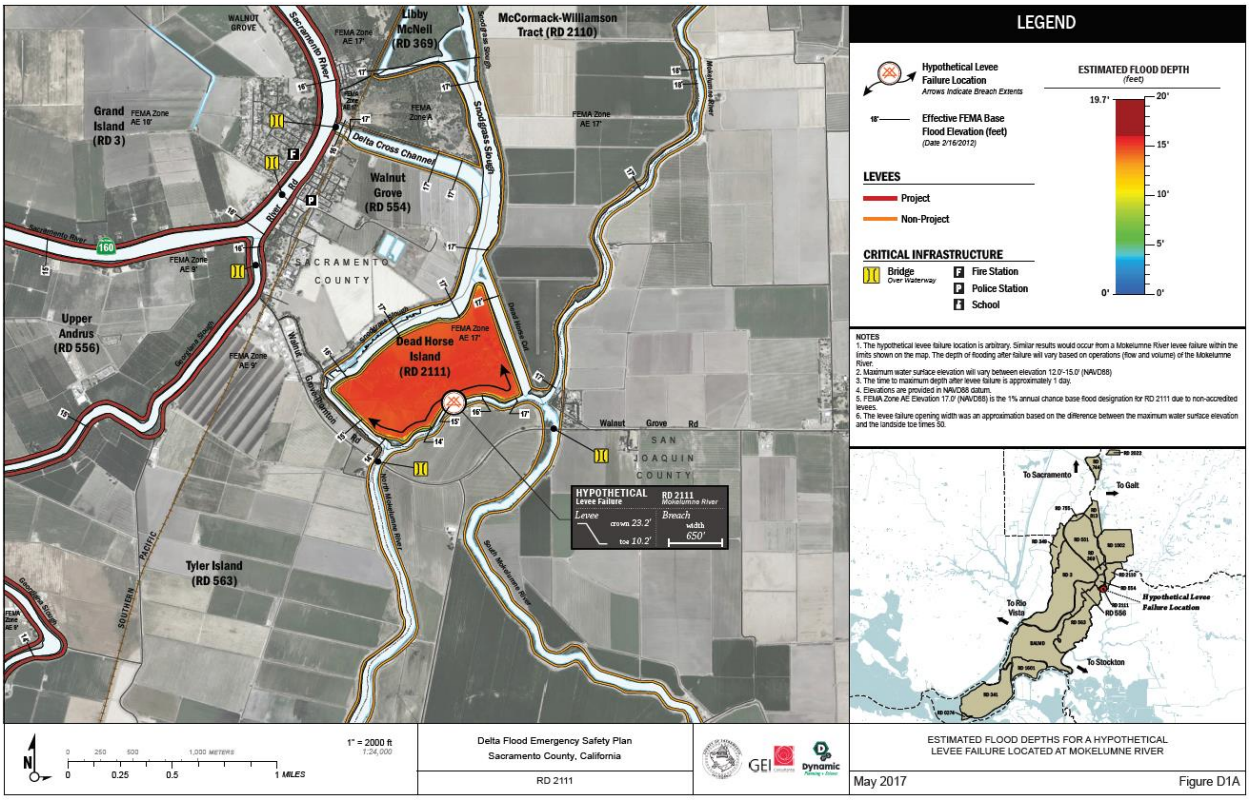
Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 13-9 RD 2111 – Time to One Foot Inundation after Levee Breach



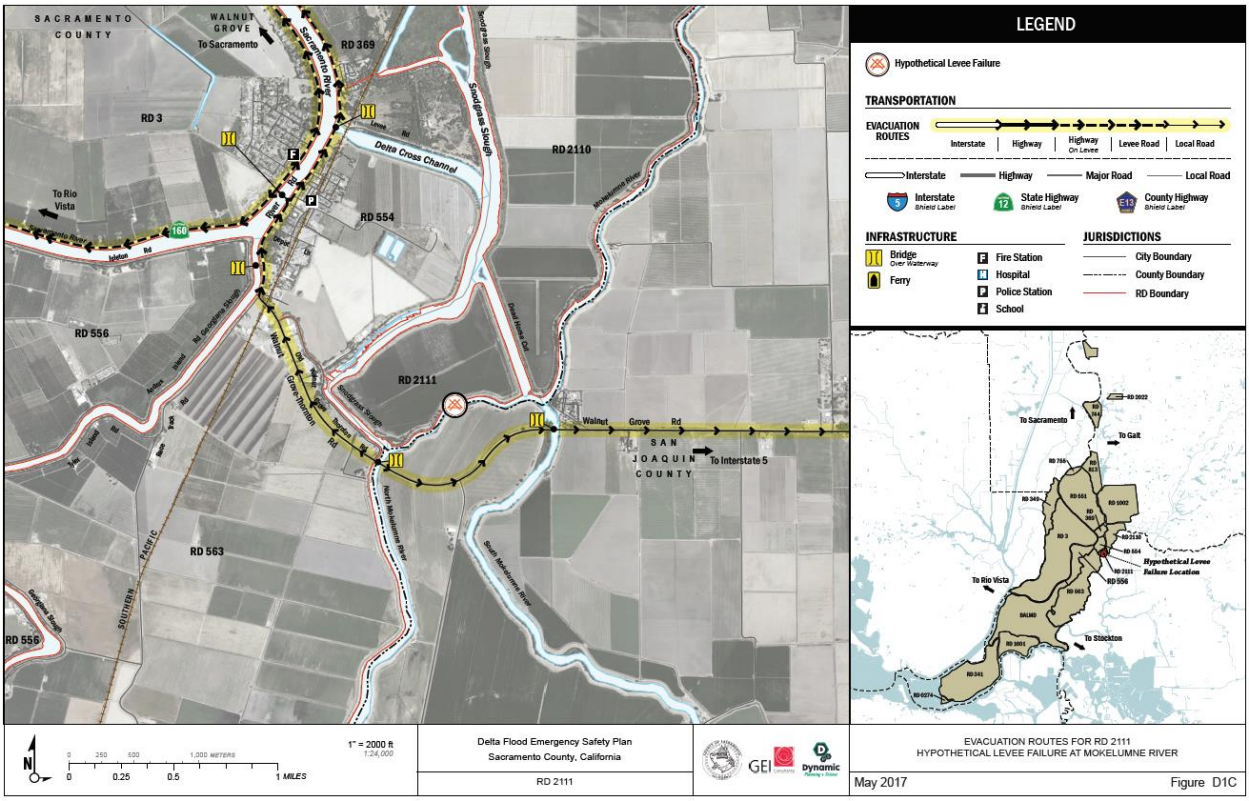
Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 13-10 RD 2111 – Estimated Flood Depth from Levee Breach Scenario



Source: Sacramento County Storm Ready – retrieved March 16, 2021

Figure 13-11 RD 2111 – Levee Breach Scenario Evacuation Routes



Source: Sacramento County Storm Ready – retrieved March 16, 2021

Assets at Risk

Should the levees fail, all District assets would be at risk. Flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Severe Weather: Heavy Rains and Storms (Hail, Lightning)

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

Storms in the District occur annually and are generally characterized by heavy rain often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. A thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. Heavy precipitation in the District falls mainly in the fall, winter, and spring months.

Location and Extent

Heavy rain events occur on a regional basis. Rains and storms can occur in any location of the District. All portions of the District are at risk to heavy rains. Most of the severe rains occur during the fall, winter, and spring months. There is no scale by which heavy rains and severe storms are measured. Magnitude of storms is measured often in rainfall and damages. The speed of onset of heavy rains can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of severe storms in California, Sacramento County, and the District can range from minutes to hours to days. Information on precipitation extremes can be found in Section 4.3.4 of the Base Plan.

Past Occurrences

There have been past disaster declarations from heavy rains and storms, which were discussed in Past Occurrences of the flood section above. According to historical hazard data, severe weather, including heavy rains and storms, is an annual occurrence in the District. This is the cause of many of the federal disaster declarations related to flooding.

The 5-year plan for RD 2111 included the following events of severe weather in the District.

- 1986 – Due to the extreme storm event, multiple days of heavy rain, strong winds from extreme low pressure gradients, high tides and runoff affecting the entire Sacramento-San Joaquin Delta, the District's levee failed. More information can be found in the Past Occurrences Section of Levee Failure above.
- 1997 – A series of large storms that produced heavy rain and high winds caused heavy runoff and high tide conditions that impacted the Districts levee, as well as the entire Sacramento – San Joaquin Delta region. More information can be found in the Past Occurrences Section of Levee Failure above.
- 2017 High Water Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency erosion repairs, rodent hole repairs, deployment of muscle wall and emergency response patrols and labor occurred during the event. Between Levee Station 403+00 and 450+00 the District levee experienced a significant landside slope failure due to under and through seepage. Emergency and temporary repair included placing a rock berm extending landward around the failure and then adding fill material to the damaged levee prism to fill the void. An engineered long-term repair strategy has been developed and submitted for assistance and remains in appeal for FEMA funding at the time of this report. The District had well organized floodfight response, and was able to immediately address the slope failure site which kept the island from flooding. Other than the slope failure site, the District's levees and sustained only minor damage and performed well.

Vulnerability to and Impacts from Heavy Rain and Storms

Heavy rain and severe storms are the most frequent type of severe weather occurrences in the District. These events can cause localized flooding. Elongated events, or events that occur during times where the ground is already saturated can cause 1% and 0.2% annual chance flooding. Wind often accompanies these storms and has caused damage in the past. Hail and lightning are rare in the District.

Actual damage associated with the effects of severe weather include impacts to property, critical facilities (such as utilities), and life safety. Heavy rains and storms often result in localized flooding creating

significant issues. Roads can become impassable and ground saturation can result in instability, collapse, or other damage to trees, structures, roadways and other critical infrastructure. Floodwaters and downed trees can break utilities and interrupt services.

During periods of heavy rains and storms, power outages can occur. These power outages can affect pumping stations and lift stations that help alleviate flooding. More information on power shortage and failure can be found in the Severe Weather: Extreme Heat Section above, as well as in Section 4.3.3 of the Base Plan.

However, it is the secondary effects of heavy rain and storms that are of concern to RD 2111. Heavy rains can cause flooding, levee failure, and stream bank erosion.

Assets at Risk

Flooding, levee failure, and stream bank erosion can cost RD 2111 million in damages. The District Planning Team noted that flooding of Delta islands destroys habitat, kills most species present, and can entrain and strand large populations of native and non-native fish species.

Severe Weather: High Winds and Tornadoes

Likelihood of Future Occurrence–Likely
Vulnerability–Medium

Hazard Profile and Problem Description

High winds, as defined by the NWS glossary, are sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. High winds can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. High winds can also cause PSPS events.

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are the most powerful storms that exist. Tornadoes, though rare, are another severe weather hazard that can affect areas of the Sacramento County Planning Area, primarily during the rainy season in the late fall, winter, and early spring.

Location and Extent

The entire District is subject to significant, non-tornadic (straight-line), winds. Each area of the County is at risk to high winds. Magnitude of winds is measured often in speed and damages. These events are often part of a heavy rain and storm event, but can occur outside of storms. The speed of onset of winds can be short, but accurate weather prediction mechanisms often let the public know of upcoming events. Duration of winds in California is often short, ranging from minutes to hours. The Beaufort scale is an empirical 12 category scale that relates wind speed to observed conditions at sea or on land. Its full name is the Beaufort Wind Force Scale. The Beaufort Scale was shown in Section 4.3.5 of the Base Plan.

Tornadoes, while rare, can occur at any location in the County and District. Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale (EF) provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. The F Scale and EF Scale are shown in Section 4.3.5 of the Base Plan.

Past Occurrences

There has been no federal or state disaster declarations in the County for winds and tornadoes. The District noted that since high winds is a regional phenomenon, events that affected the lower elevations of the County also affected the District. Those past occurrences were shown in the Base Plan in Section 4.3.5.

The 5-year plan for RD 2111 included the following events of winds and tornadoes in the District.

- 1986 – Due to the extreme storm event, multiple days of heavy rain, strong winds from extreme low-pressure gradients, high tides and runoff affecting the entire Sacramento-San Joaquin Delta, the District's levee failed. More information can be found in the Past Occurrences Section of Levee Failure above.
- 1997 Storms. A series of large storms that produced heavy rain on a heavy snowpack in the Sierras and high winds caused extraordinary heavy runoff and high tide conditions that impacted the District's levee, as well as the entire Sacramento – San Joaquin Delta region. The District claimed costs for flood event related erosion repairs, emergency response – floodfight, and engineering technical assistance. Due to the improvements to the District's levee since the 1986 flood event, and well organized floodfight response, the District's levees sustained only minor damage and performed well during this otherwise historical Flood Event.
- 2006 Flood Event. Rip rap was placed on waterside slopes to mitigate damage caused from high winds.
- 2017 High Water Event. A large series of storm events generating high winds and heavy rain caused rivers to rise above flood stage. Emergency erosion repairs, rodent hole repairs, deployment of muscle wall and emergency response patrols and labor occurred during the event. Between Levee Station 403+00 and 450+00 the District levee experienced a significant landside slope failure due to under and through seepage. Emergency and temporary repair included placing a rock berm extending landward around the failure and then adding fill material to the damaged levee prism to fill the void. An engineered long-term repair strategy has been developed and submitted for assistance and remains in appeal for FEMA funding at the time of this report. The District had well organized floodfight response, and was able to immediately address the slope failure site which kept the island from flooding. Other than the slope failure site, the District's levees and sustained only minor damage and performed well.

Vulnerability to and Impacts from Severe Weather: Wind and Tornado

High winds are common occurrences in the District throughout the entire year. Straight line winds are primarily a public safety and economic concern. Windstorm can cause damage to structures and power lines which in turn can create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered. High winds can impact critical facilities and infrastructure and can lead to power outages. Wind can also drive

wildfire flames, spreading wildfires quickly During periods of high winds and dry vegetation, wildfire risk increases. High winds that occur during periods of extreme heat can cause PSPS events to be declared in the County. More information on power shortage and failure can be found in the beginning of Section 13.5.3.

Impacts from high winds in the District will vary. Future losses from straight line winds include:

- Downed trees
- Power line impacts and economic losses from power outages
- Occasional structure damage
- Erosion of levees and other areas

When paired with highwater, heavy runoff, high tide, and high wind, impacts to District levees, as well as the entire Sacramento – San Joaquin Delta region, include serious levee erosion that could result in overtopping that possibly lead to failure.

Assets at Risk

The District Planning Team noted that the entire levee structures are at risk from wind. The District Planning Team noted that all-natural resources are at risk if wind caused levee failure in the District.

Subsidence

Likelihood of Future Occurrence–Occasional
Vulnerability–Medium

Hazard Profile and Problem Description

Subsidence is the gradual settling or sinking of the earth's surface over manmade or natural underground voids with little or no horizontal motion. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. Subsidence is worsened when groundwater drawdown exceeds the ability of the ground to naturally recharge. This is more common during periods of drought.

Location and Extent

There is no scientific scale to measure subsidence. Subsidence is measured in inches or feet of elevation change over time. Subsidence has a long speed of onset, as it occurs over many years. The duration of subsidence is long, as it is rare for subsidence to be reversed. In Sacramento County, the Delta in the southeast portion of the County is highly at risk to subsidence. In the Delta, subsidence affects the islands as well as the levees.

Past Occurrences

There have been no state or federal disasters in the County related to subsidence.

- In addition, there has been no other identified incidents of subsidence related specifically to RD 2111 to note.

Vulnerability to and Impacts from Subsidence

Historically, the County has been at risk from subsidence. Vulnerability in the County from subsidence comes from several different causes:

- Compaction of Unconsolidated Soils by Earthquake Shaking (Liquefaction)
- Compaction by Heavy Structures
- The Erosion of Peat Soils
- Fluid Withdrawal

These were discussed in detail in Section 4.3.16 of the Base Plan.

Since reclamation of the island began, elevations have fallen to as much as 20 feet below sea level, requiring protection by over 1,125 miles of man-made levees throughout the Delta. Drainage is provided by a network of ditches that collect and transport shallow groundwater, irrigation runoff, and levee seepage to pump stations that discharge back into the Delta waterways. These ditches create an unsaturated root zone for crops, and provide a more stable levee foundation.

Assets at Risk

All levee structures in RD 2111 are at risk to subsidence. The District Planning Team noted that all natural resources are at risk from subsidence.

13.6 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation education, outreach, and partnerships, and other mitigation efforts.

13.6.1. Regulatory Mitigation Capabilities

Table 13-10 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in RD 2111.

Table 13-10 RD 2111 Regulatory Mitigation Capabilities

Plans	Y/N Year	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan/General Plan	Y 2020	5 Year Plan identifies hazards that may affect RD 1601. Some mitigation strategies are proposed. Yes, the plan can be used to implement mitigation actions.
Capital Improvements Plan	N	
Economic Development Plan	N	

Local Emergency Operations Plan	Y	The District completed a Flood Safety Plan consisting of an Emergency Operations Plan and Annex A – Flood (the Flood Contingency map) in 2019 for RD2221.
Continuity of Operations Plan	N	
Transportation Plan	N	
Stormwater Management Plan/Program	N	
Engineering Studies for Streams	N	
Community Wildfire Protection Plan	N	
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	RD 2111 Five Year Plan completed in 2020.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	Version/Year:
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	Score:
Fire department ISO rating:	N	Rating:
Site plan review requirements	N	
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
Zoning ordinance	N	
Subdivision ordinance	N	
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
The Emergency Operations Plan development process alone helps to increase the capabilities of the District to respond to emergencies and disasters. Continued funding available to maintain these plans would be helpful.		

Source: RD 2111

13.6.2. Administrative/Technical Mitigation Capabilities

Table 13-11 identifies the District department(s) responsible for activities related to mitigation and loss prevention in RD 2111.

Table 13-11 RD 2111's Administrative and Technical Mitigation Capabilities

Administration	Y/N	Describe capability Is coordination effective?
Planning Commission	N	
Mitigation Planning Committee	Y	RD 2111 together with KSN (engineering firm) staff support this committee.
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	
Mutual aid agreements	Y	
Other		
Staff	**Y/N FT/PT**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official	N	
Floodplain Administrator	N	
Emergency Manager	Y	KSN, Inc.
Community Planner	N	
Civil Engineer	Y	KSN, Inc.
GIS Coordinator	Y	KSN, Inc.
Other		
Technical		
Warning systems/services (Reverse 911, outdoor warning signals)	Y	Sacramento County has an alert and warning system that covers the District.
Hazard data and information	Y	
Grant writing	Y	
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Pursuant to Sacramento County General Plan Safety Element Policies, SA-18a&b, written approval must be obtained from the applicable Reclamation District to build any structure or grade any soil within 300 feet of the land side toe of levee. This applies to anyone who wants to fill, excavate, or construct a structure within 50 feet of the toe of a Sacramento County river levee and anyone who wants to develop land within 300 feet of the toe. To ensure this requirement is met, every parcel located near a levee is tagged in the building department database. These capabilities in the table above can be expanded by utilization of additional funding opportunities to pay for the services provided by KSN, Inc. so the District can use the General Fund dollars to fund additional District priorities.		

Source: RD 2111

13.6.3. Fiscal Mitigation Capabilities

Table 13-12 identifies financial tools or resources that the District could potentially use to help fund mitigation activities.

Table 13-12 RD 2111's Fiscal Mitigation Capabilities

Funding Resource	Access/ Eligibility (Y/N)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	N	
Authority to levy taxes for specific purposes	N	
Fees for water, sewer, gas, or electric services	N	
Impact fees for new development	N	
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	RD taxes
Incur debt through private activities	N	
Community Development Block Grant	N	
Other federal funding programs	Y	HMGP, FEMA Post-Disaster Assistance
State funding programs	Y	DWR Delta Levee Maintenance Subventions and Special Projects Program
Other		
How can these capabilities be expanded and improved to reduce risk?		
Continued funding from the Delta Levees Program is crucial. Federal funding programs are difficult to pursue because of the local cost share; if state or other partners could help the local cost share then small, rural communities it would gain more access to federal grants.		

Source: RD 2111

13.6.4. Mitigation Education, Outreach, and Partnerships

Table 13-13 identifies education and outreach programs and methods already in place that could be/or are used to implement mitigation activities and communicate hazard-related information.

Table 13-13 RD 2111's Mitigation Education, Outreach, and Partnerships

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	N	
Natural disaster or safety related school programs	N	
StormReady certification	N	
Firewise Communities certification	N	

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Public-private partnership initiatives addressing disaster-related issues	N	
Other	Y	DWR Flood Methods Course and Just In Time Training Program. Training Policy is outlined in Attachment 1 of RD1601's Emergency Operations Plan (EOP), which includes SEMS/NIMS courses (SEMS 100, 200, 700; or can be covered through G0402).
How can these capabilities be expanded and improved to reduce risk?		
Additional Funding to provide these types of programs. The District will seek to find funding from Cal OES, CA DWR, and FEMA to increase mitigation capability.		

Source: RD 2111

13.6.5. Other Mitigation Efforts

The District Planning Team noted no other mitigation efforts.

13.7 Mitigation Strategy

13.7.1. Mitigation Goals and Objectives

RD 2111 adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

13.7.2. Mitigation Actions

The planning team for RD 2111 identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. The following hazards were considered a priority for purposes of mitigation action planning:

- Floods: 1%/0.2% annual chance
- Levee Failure

It should be noted that many of the projects submitted by each jurisdiction in Table 5-4 in the Base Plan benefit all jurisdictions whether or not they are the lead agency. Further, many of these mitigation efforts are collaborative efforts among multiple local, state, and federal agencies. In addition, the countywide public outreach action, as well as many of the emergency services actions, apply to all hazards regardless of hazard priority. Collectively, this multi-jurisdictional mitigation strategy includes only those actions and projects which reflect the actual priorities and capacity of each jurisdiction to implement over the next 5-years covered by this plan. It should further be noted, that although a jurisdiction may not have specific projects identified for each priority hazard for the five year coverage of this planning process, each jurisdiction has focused on identifying those projects which are realistic and reasonable for them to

implement and would like to preserve their hazard priorities should future projects be identified where the implementing jurisdiction has the future capacity to implement.

Multi-Hazard Actions

Action 1. Rock Slope Protection Project

Hazards Addressed: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to provide additional protection to the levee by installing additional riprap.

Project Description: The District plans to ensure the protection of the existing levee by adding quarry stone riprap above the existing riprap to any portions of the waterside slope of the levee requiring additional rock slope protection. This will prevent erosion and reduce future erosion repairs. Prior to submitting a project proposal, a thorough riprap inventory of the District must be completed to determine where additional riprap may be necessary and determine more definitive quantities and costs required to complete the project.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District 5-Year Plan and Delta Levees Program

Responsible Office/Partners: RD 2111

Project Priority: High

Cost Estimate: $3.5 million

Benefits (Losses Avoided): Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners

Timeline: 1-10 years depending on regulatory process and funding

Action 2. Levee Improvement Projects

Hazards Addressed: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to improve the Dead Horse Island levees over the next five years to a level of protection that meets, or exceeds, the Bulletin 192-82 standard.

Project Description: The District will then bring those portions of levee below the Bulletin 192-82 Standard to six inches above the Bulletin 192-82 Standard with a District minimum crown width of 24 feet using 2:1 landside side slopes to allow for future levee raises to address climate change and sea level rise. If sufficient funding is available, the segments of levee improved during this phase will include portions of the levee that meet the HMP Criteria, but do not meet the design template for this project, due to the many relatively short stretches of levee that do not meet the Bulletin 192-82 Standard in close proximity to longer stretches of levee that do not meet the HMP Standard. After the entire levee meets or exceeds the HMP Criteria, the District will bring any remaining portions of levee below the Bulletin 192-82 Standard to six inches above the Bulletin 192-82 Standard.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District Five-year Plan

Responsible Office/Partners: RD 2111

Project Priority: High

Cost Estimate: $16,000,000

Benefits (Losses Avoided): Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners.

Timeline: 1-10 years depending on regulatory process and funding

Action 3. Overflow Weir Project

Hazards Addressed: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to provide infrastructure that will allow the District to fill the island with water to stabilize the levees against uncontrolled flooding.

Project Description: Due to historical inundations caused by flood surge caused by high flows generated from uncontrolled upstream levee breaches, the District plans to install a weir at the upstream levee on Dead Horse Cut. This will allow the District to fill the island with water to stabilize the levees against uncontrolled flooding. This should eliminate levee failures as the weight of the water on the island's interior will stabilize the levee against total levee failure. The District will likely sustain some damage and pumping costs, but the costs will be substantially than losing the entire levee section. Also, protecting against a failure of the entire levee section protects adjacent islands from failure due to rapid drawdown which can cause failure of adjacent levees. This project may be eligible for other funding sources because the adjacent levees protect a Delta Legacy Community as well as Federal Project Levees.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District Five-year Plan

Responsible Office/Partners: RD 2111

Project Priority: High

Cost Estimate: $5,000,000

Benefits (Losses Avoided): Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners.

Timeline: 1-10 years depending on regulatory process and funding

Action 4. Syphon Project

Hazards Addressed: Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to provide infrastructure that will allow the District to fill the island with water to stabilize the levees against uncontrolled flooding.

Project Description: Due to historical inundations caused by flood surge caused by high flows generated from uncontrolled upstream levee breaches, the District plans to install The District will be installing 3 36-inch pipes to pre-flood the island. Fish screens will be used on the pipes to prevent fish from being sucked into the island. This will allow the District to fill the island with water to stabilize the levees against

uncontrolled flooding. This should eliminate levee failures as the weight of the water on the island's interior will stabilize the levee against total levee failure. The District will likely sustain some damage and pumping costs, but the costs will be substantially than losing the entire levee section. Also, protecting against a failure of the entire levee section protects adjacent islands from failure due to rapid drawdown which can cause failure of adjacent levees. This project may be eligible for other funding sources because the adjacent levees protect a Delta Legacy Community as well as Federal Project Levees.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District Five-year Plan

Responsible Office/Partners: RD 2111

Project Priority: High

Cost Estimate: $1,000,000

Benefits (Losses Avoided): Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: Delta Levee Subventions, Delta Levee Special Projects, HMGP Grant Programs, State Funding Opportunities, seeking cost sharing partners.

Timeline: 1-10 years depending on regulatory process and funding

Action 5. Backup Power Project

Hazards Addressed: Climate Change, Earthquake; Earthquake: Liquefaction; Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is to provide backup power to Reclamation District 2111 facilities when power goes out.

Project Description: The District would like to ensure continued operation of District infrastructure during a Public Safety Power Shutoff through obtaining backup power generators, quick connects, and associated electrical improvements. The project would design and install main disconnect systems to allow for safe use of generators as needed during a power shutoff or power failure. The project would include one generator per district and improvements for a disconnect systems for each pump station.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: District Five-year Plan

Responsible Office/Partners: RD 2111

Project Priority: High

Cost Estimate: $200,000

Benefits (Losses Avoided): Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: State – Delta Flood Emergency Response Grant Program, HMGP Grant Programs

Timeline: 1-10 years depending on regulatory process

Action 6. Flood Safety Plan Updates, Training, and Exercises

Hazards Addressed: Flood: 100/200/500-year, Localized Stormwater Flooding, Levee Failure; Severe Weather: Heavy Rains and Storms, Wind and Tornadoes; and Subsidence

Goals Addressed: 1, 2, 3, 4, 5

Issue/Background: The goal of this Mitigation Action is update RD 563's Flood Safety Plan, participate in training, and to exercise the flood safety plan to ensure it can successfully be implemented. This is especially important to mitigate against the effects of staff turnover.

Project Description: The District would like to ensure continued training of staff, board members, and agents with response functions with regards to flood fighting and associated activities. Updating RD2111 Flood Safety Plan is essential to continue to protect infrastructure protected by the district's levees. The Emergency Operations Plan provides guidance on how the District will organize, coordinate with outside partners, flood fight, dewater, recover, and serves as a planning document for future flood fight operations.

Other Alternatives: none

Existing Planning Mechanism(s) through which Action Will Be Implemented: California Water Code Section 9650-51 (AB156), Central Valley Flood Protection Plan's emergency preparedness priority, the District's Five-year Plan, and Districts Flood Safety Plan

Responsible Office/Partners: RD 2111

Project Priority: High

Cost Estimate: $100,000

Benefits (Losses Avoided): Preservation of 2111 levee structures, Ecosystem Restoration and Habitat Enhancement Component, Reversing Land Subsidence, Ensuring Adequate and Effective Emergency Response Plans, Benefitting Water Quality, Improving Water Supply Reliability

Potential Funding: State – Delta Flood Emergency Response Grant Program, HMGP Grant Programs

Timeline: 1-10 years depending on regulatory process

Appendix A Planning Process

A.1 Sacramento County Step 1: Organize to Prepare a Plan

(a). Involvement of Community Land Use and Comprehensive Planning

In addition to attending meetings, providing draft text for inclusion in the plan, reviewing plan documents, and coordinating input from other departments and stakeholders, Sacramento County and City of Sacramento planners also provided information on development since the last plan, mapping and details on future development areas, input on current mitigation capabilities, coordination with other planning mechanisms, and input on capabilities including in-progress modifications to various County plans, ordinances, and associated documents specific to Sacramento County's floodplain management program.

Sacramento County Planners

- Sacramento County Office of Planning and Environmental Review (John Lundgren, Senior Planner and Todd Taylor, Associate Planner)
- City of Sacramento Community Development Department, Planning Division (Remi Mendoza, Associated Planner)

Other planners to the process included Jeanine Foster and Chris Morrison, professional planners with Foster Morrison, the consultant for this LHMP Update, as well as other planners and staff from the incorporated communities and other participating jurisdictions involved in future land use development decisions for the Sacramento County Planning Area.

(b). Staff of County Departments on HMPC with Expertise on CRS Step 7 Activities

In order to promote the integration of CRS into this planning process, the representatives from the Sacramento County and the City of Sacramento were selected based on their areas of expertise relative to the CRS mitigation categories as detailed in Table A-1.

Table A-1 Sacramento County Planning Area Staff Capability with Six Mitigation Categories

Jurisdiction/Departments	Prevention	Property Protection	Natural Resource Protection	Emergency Services	Structural Flood Control Projects	Public Information	Other
Sacramento County							
Department of Water Resources/Flood Management and Engineering, George Booth	X	X	X		X	X	X
Emergency Services, Mary Jo Flynn-Nevins, Interim Chief of Emergency Services	X	X	X	X	X	X	X

Jurisdiction/Departments	Prevention	Property Protection	Natural Resource Protection	Emergency Services	Structural Flood Control Projects	Public Information	Other
Office of Planning and Environmental Review, John Lundgren, Senior Planner	X	X	X	X		X	X
City of Sacramento							
Department of Utilities, Rosa Millino, Senior Engineer	X	X	X		X	X	X
City, Office of Emergency Management, Daniel Bowers	X	X	X	X	X	X	X
Community Development Department Planning Division, Remi Mendoza, Associate Planner	X	X	X		X	X	X

List of Hazard Mitigation Planning Committee Invitees

Jurisdiction	Name	Email	Name	Email	Name	Email
Cities						
City of Citrus Heights	Dirk Medema	dmedema@citrusheights.net		CityClerk@citrusheights.net		citymanager@citrusheights.net
	Eric Singer	esinger@citrusheights.net				
City of Elk Grove	Jeff Werner	jwerner@elkgrovecity.org	Amittoj Thandi	athandi@elkgrovecity.org		
City of Isleton	Charles Bergson	cbergson@cityofisleton.com	Yvonne Zepeda	yvonne.zepeda@cityofisleton.com	Joe Fonbuena	publicworks@cityofisleton.com
City of Rancho Cordova	Dalia Fadl	dfadl@cityofranchocordova.org	Albert Stricker	astricker@cityofranchocordova.org	Cyrus Abhar	cabhar@cityofranchocordova.org
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	Lisa DeKlinski	ldeklinski@cityofsacramento.org	Yanelis Rios	yrios@cityofsacramento.org	Richard Coombs	rec1146@aol.com
			Jeanelle Gottlob	jgottlob@cityofsacramento.org	Greta Soos	GSoos@cityofsacramento.org
	Daniel Bowers	DBowers@cityofsacramento.org	Lauren Groves	lgroves@cityofsacramento.org	Julie Lim	jlim@cityofsacramento.org
	Matt Hertl	mhertel@cityofsacramento.org	Roshini Das	rdas@cityofsacramento.org		
City of Folsom	Ryan Neves	rneves@folsom.ca.us	Bryan Holm	bholm@folsom.ca.us	Steve Krahn	skrahn@folsom.ca.us
	Dave Nugen	dnugen@folsom.ca.us	Ken Cusano	kcusano@folsom.ca.us		
City of Galt	Trung Trinh	ttrinh@ ityofgalt.org	Mark Clarkson	mclarkson@cityofgalt.org	William Forrest	bforrest@cityofgalt.org
	Michael Selling	mselling@cityofgalt.org	Jason Behrmann	jbehrmann@cityofgalt.org		
County of Sacramento						
Sac County DWR	George Booth	boothg@saccounty.net	Shayan Rehman	rehmans@saccounty.net	Dave Bolen	bolend@saccounty.net
	Dawn Pimentel	pimenteld@saccounty.net	Rod Goss	gossr@saccounty.net	Archie Wright	wrighta@saccounty.net

Jurisdiction	Name	Email	Name	Email	Name	Email
	Heidi Huber	huberh@saccounty.net	Mike Johnson	johnsonm@saccounty.net	Todd Peterson	petersont@saccounty.net
	Dana Booth	boothd@saccounty.net	Dave Tamayo	tamayod@saccounty.net		
Sac County Building Dept	Nancy Springer	nspringer@saccounty.net				
SCWA Water	Kerry Schmitz	schmitzk@saccounty.net	John Kern	kernj@saccounty.net	Tom Pasterski	pasterskit@saccounty.net
	Forrest Williams	williamsf@saccounty.net	Darryl Eck	eckd@saccounty.net		
Sac OES	Mary Jo Flynn	flynnm@saccounty.net	Matthew Hawkins			
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	Vyomi Upadhyay	upadhyayv@sacsewer.com	Piper Crawford	crawfordp@sacsewer.com	Michael Redfern	redfernm@sacsewer.com
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RD 1000	Kevin King	kking@rd1000.org				
RD 369 Locke	Clarence Chu	776-1661				
RD 813	Thomas Herzog					
RD 349	Frederick Wheeler	775-1516				
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RD 746	Hood					
CA DWR MA9						
Water Districts						
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City of Sacramento Water						
Fruitridge Vista Water		916-443-2607	Danilo Sanchez	des@cpuc.ca.gov		
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Sac Suburban Water	Mike Huot	mhuot@sswd.org	916-972-7171			
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Carmichael Water	Chris Nelson	chris@carmichaelwd.org	Laura Strand	laura@carmichaelwd.org		
Fair Oaks Water		customerservice@fowd.com	Michael Misenboym	mmisenboym@fowd.com		
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SCWA (see above County)						
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Regional Water Authority						
School Districts						
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San Juan USD		www.sanjuan.edu				
Sacramento City USD		www.scusd.edu		miamah-reed@scusd.edu		Victoria-Flores@scusd.edu
Arcohe USD		www.arcohe.net	Lori Salfen	salfen@arcohe.net		
Elk Grove USD		www.egusd.net				
Elverta USD		www.ejesd.net	Elizabeth Golchert			
Folsom Cordova USD		www.fcusd.org				

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Galt Joint Elementary SD		http://gjusesd-ca.schoolloop.com				
Galt Join HS SD		www.ghsd.us				
Natomas USD		www.natomasunified.org				
Rio Delta USD		http://rdusd-ca.schoollop.com				
Robla School District		www.robla.k12.ca.us				
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Park Districts – only if they need a grant						
Fair Oaks Park		www.forpd.org	Kris Borders	kborders@fairoakspark.org		
Rio Linda Park		www.rleparks.com				
Orangevale Park						
Mission Oaks Park		www.morpd.com				
Southgate Park		www.southgaterecandpark.net			Juanita Cano	jcano@southgaterecandpark.net
Arcade Creek Rec and Park			Stephen Fraher	sfraher@acrpd.com		
Fire Districts - only if they need a grant https://www.srfecc.ca.gov/SCFCA/departments.htm						
Courtland FD		www.courtlandfire.com				
Delta FD		www.riverdeltafire.com				
Wilton FD		www.wilton-fire.org				
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Isleton FD		City of Isleton				

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Folsom FD						
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Arden Bluffs						
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Saira Nisha		Public
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Shayan Rehmans		Sacramento County DWR
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Shelly Jiang	Climate Change Coordinator	Sacramento Metropolitans Air Quality Management District
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Spencer Eberle		Resident Old North Sacramento/ ARFC District Board of Directors
Steve Nebozuk		Sacramento Regional County Sanitation District/ Sacramento Area Sewer District
Steve White		Sacramento County Department of Transportation
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Travis Franklin		Elk Grove Water District
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Ty Bailey	Battalion Chief	Sacramento Metro Fire District
Valeri Mihanovich	Director	Public/The Regional Center for Volunteerism-Hanson Sacramento AND Sacramento Region Voluntary Organizations Active in Disaster
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Wendi Wilkinson	Senior Ag Env. Scientist	Home Owner Franklin Pond Area Elk Grove/ California Department of Agriculture

Kickoff Meeting

Kickoff Meeting Invite to Planning Team, Stakeholders, and Public

From: Jeanine Foster
Sent: Tuesday, August 25, 2020 11:14 AM
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Subject: Sacramento County LHMP Update: HMPC Kickoff Meeting

When: Tuesday, September 15, 2020 1:30 PM-4:00 PM (UTC-08:00) Pacific Time (US & Canada).
Where: Virtual Zoom Meeting

All,

On behalf of Sacramento County, you are being invited to a Zoom Meeting of the Hazard Mitigation Planning Committee (HMPC) to kick off the Sacramento County 2021 Local Hazard Mitigation Plan (LHMP) Update project. See project details in attached invite. Zoom meeting information is provided below.

Topic: Sacramento County LHMP Update: Kickoff Meeting
Time: Sep 15, 2020 01:30 PM Pacific Time (US and Canada)

Join Zoom Meeting
https://us02web.zoom.us/j/83207958742?pwd=TVJoRHNuU2hkWis5SHhNZDZnK25Udz09

Meeting ID: 832 0795 8742
Passcode: 695737
One tap mobile
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Dial by your location
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+1 253 215 8782 US (Tacoma)
+1 346 248 7799 US (Houston)
+1 929 205 6099 US (New York)
+1 301 715 8592 US (Germantown)
+1 312 626 6799 US (Chicago)
Meeting ID: 832 0795 8742
Passcode: 695737
Find your local number: https://us02web.zoom.us/u/kd6EqhYYUM

Kickoff Meeting Agenda

PLACER COUNTY
LOCAL HAZARD MITIGATION PLAN (LHMP) UPDATE
HMPC (KICKOFF) MEETING #1
September 15, 2020

1. Introductions
2. Hazard Mitigation & the Disaster Mitigation Act Planning Requirements
3. The National Flood Insurance Program (NFIP) Community Rating System (CRS)
4. The Role of the Hazard Mitigation Planning Committee (HMPC)
5. Planning for Public Input
6. Coordinating with other Agencies
7. Hazard Identification
8. Schedule
9. Data Needs
10. Questions and Answers

Kickoff Meeting Sign-in Sheets

Name/Title	Title	Department/Agency/ Affiliation
George Booth		Sacramento County DWR/Sacramento Water Agency
Amittoj Thandi	Engineering Services Support Manager	City of Elk Grove
Gilbert Cosio	Principal Engineer	MBK Engineers for RD 3 (North Delta RDs)
Daniel Bowers	Director of Emergency Management	City of Sacramento OEM
Jeanelle Gottlob	Emergency Manager	City of Sacramento
Vyoini Upadhyay	Associate Civil Engineer	Regional Sanitation District/ SASD Part of Sanitation Districts Agency
Scott Fujikawa	Senior Civil Engineer	Sacramento County Department of Airports
Todd Taylor	Associate Planner	Sacramento County Planning
Megan Floyd	Environmental Specialist	Sacramento County EMD
Dana Booth	Stormwater Quality Program Manager	Sacramento County
Silvia Reynoso	Water Resources Engineer	Cal DWR
Rod Rodriguez	Emergency Services Coordinator	Placer County OES
Dalia Fadl	Sr. Civil Engineer	City of Rancho Cordova
June Cowles		City of Rancho Cordova Planning Department
Ryan Neves	Senior Engineer	City of Folsom
Julie Lim	Sr. Staff Assistant	City of Sacramento Department of Utilities
John Lundgren	Sr. Planner	Sacramento County Planning Department
Ty Bailey	Battalion Chief	Sacramento Metro Fire District
Mike Snelling	Director of Public Works	City of Galt
Lauren Groves		City of Sacramento OEM
Tom Pasterski		SCWA
Paul Kent	Emergency Manager	City of Elk Grove
Lisa Deklinski		City of Sacramento Department of Utilities
Forrest Williams		SCWA
Travis Franklin		Elk Grove Water District
Jim Gillum		Resident/Gillum Consulting, Inc.
Heidi Hampton		Sacramento Sheriff's Office RMAC
Neal Joyce		City of Sacramento
Remi Mendoza		City of Sacramento Community Development Department
M.T. Lorenzo-Lee		Sacramento County Resident
Greta Soos	Assistant Planner	City of Sacramento Planning Department

Name/Title	Title	Department/Agency/ Affiliation
Mary Jo Flynn-Nevins		Sacramento County OES
Michael Redfern		Sacramento Area Sewer District
Shayan Rehmans		Sacramento County DWR
Jeff Werner		City of Elk Grove
Alan Haynes		NOAA/NWS/California Nevada River Forecast Center
Paul Siebensohn	Director of Field Operations	Rancho Murieta CSD
Emily Pappalardo		MBK Engineers
David Bolen		Sacramento County DWR
Shelly Jiang	Climate Change Coordinator	Sacramento Metropolitans Air Quality Management District
Lupe Rodriguez		Sacramento County Department of Transportation
Matt Hertel	Action Long Range Planning Manager	City of Sacramento
Liz Ramos		Kjeldsen, Sinnock & Neudeck, Inc
Mark Barcellos		Sacramento County Environmental Management Department
Piper Crawford		Regional Sanitation District
Tom Trexler		MBK Engineers
Steve White		Sacramento County Department of Transportation
Wendi Wilkinson	Senior Ag Env. Scientist	Home Owner Franklin Pond Area Elk Grove/ California Department of Agriculture
Gilbert Mendes		Home Owner Franklin Pond Area Elk Grove
Brenda Bongiorno		Sacramento County Public Works
Valeri Mihanovich	Director	Public/The Regional Center for Volunteerism-Hanson Sacramento AND Sacramento Region Voluntary Organizations Active in Disaster
Melanie Saucier		SAFCA
Heidi Huber		Sacramento County DWR
Melissa Wright	Senior Civil Engineer	Sacramento County Department of Transportation
Steve Nebozuk		Sacramento Regional County Sanitation District/ Sacramento Area Sewer District
Tina Anderson	Project Manager	MBK Engineers
Tim Kerr		American River Flood Control District
Brian Walker	Sr Engineer/Floodplain Manager	City of Roseville
Brian McCord	Director Operational Risk Management	California American Water

Name/Title	Title	Department/Agency/ Affiliation
Matthew Renfro	CivicSpark Fellow	Sacramento Metropolitan Air Quality Management District
Dawn Pimentel		Sacramento County DWR
Debbie Turner		Los Rios Community College District
Bill Forrest		City of Galt Public Works
Juanita Cano		Southgate Recreation and Park District
Kerry Schmitz		Sacramento County Water Agency
Rosa Millino	Senior Engineer	City of Sacramento
Keith Leech		Sacramento County DGS Fleet Service
Julia Coleman	Risk Management Specialist	Risk Management Los Rios College
Hunter Merritt	Public Involvement Specialist	USACE SPK Sacramento District
Bill Darsie		KSN Engineers, RD 2111,1601, 563
Glen Rickelton		Sacramento County Department of Airports
Connie Perkins	Senior Engineer	Central Valley Flood Protection Board and City of Sacramento Resident
Clair Davis	Floodplain and CRS Administrator	City of Fort Worth TX
Alexander Barba		Sacramento County DWR
Jeanine Foster	Project Manager	Foster Morrison Consulting
Chris Morrison	Lead Planner	Foster Morrison Consulting
Alan Vail	Managing Partner	Resident/VCS Consulting
Troy Bair	Deputy Fire Chief - Operations	Consumnes CSD Fire Department
Matt Demarco	Administrative Battalion Chief	Consumnes CSD Fire Department
Spencer Eberle		Resident Old North Sacramento/ ARFC District Board of Directors
Patrick Erwin		RDs 341 & 800/ Wagner & Bonsignore, Consulting Civil Engineers

Risk Assessment Meeting

Risk Assessment Meeting Invite to Planning Team, Stakeholders, and Public

From: Jeanine Foster <jeanine.foster@fostermorrison.com>
Sent: Monday, February 1, 2021 9:29 AM
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Subject: Sacramento County LHMP: Risk Assessment Meeting
When: Wednesday, February 17, 2021 2:30 PM-5:00 PM (UTC-07:00) Mountain Time (US & Canada).
Where: https://us02web.zoom.us/j/81464669827?pwd=OVZQNmtGcCtReTBFUVhHZDlEcktSUT09

Sacramento County Hazard Mitigation Planning Committee:

You are invited to the HMPC Risk Assessment Meeting, our second planning committee meeting for the development of Sacramento County's Local Hazard Mitigation Plan (LHMP) Update. Many of you attended the planning committee kickoff meeting in September of 2020 which initiated the LHMP Update effort. Since then, the Foster Morrison team has been working to collect data to develop Chapter 4 of our LHMP, the Risk Assessment Chapter, and for development of the Jurisdictional Annexes to the LHMP.

This Risk Assessment Meeting will be held via Zoom on Wednesday, February 17 from 1:30 – 4:00 pm Pacific Time. During this meeting, we will be reviewing the risk assessment data developed to date and will be looking for your feedback in refining and adding to this in-process Risk Assessment Chapter. We will also be discussing jurisdictional participation and data still needed to inform the risk assessment for the Sacramento County LHMP Update.

Your ongoing participation is critical to the success of this project. Please let me know if you have any questions. See below for the Zoom meeting invite.

Thank you,

Jeanine Foster
Foster Morrison Consulting
(303) 717-7171

Join Zoom Meeting
https://us02web.zoom.us/j/81464669827?pwd=OVZQNmtGcCtReTBFUVhHZDlEcktSUT09

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Risk Assessment Meeting Agenda

Sacramento County
Local Hazard Mitigation Plan (LHMP) Update
Risk Assessment Meeting: February 17, 2021

1. Introductions
2. Status of the DMA Planning Process
3. Review of Risk Assessment
4. Critical Facility Data Overview (Sacramento County OES)
5. Open Discussion and Input on the Risk Assessment (Handout)
6. Questions

Risk Assessment Meeting Sign in Sheets

Name/Title	Title	Department/Agency/ Affiliation
George Booth		Sacramento County DWR/ Sac County Water Agency
Amittoj Thandi	Engineering Services Support Manager	City of Elk Grove
Gilbert Cosio	Principal Engineer	MBK Engineers for RD 3 (North Delta RDs)
Jeanelle Gottlob	Emergency Manager	Jenelle Gottlob
Vyomini Upadhyay	Associate Civil Engineer	Regional Sanitation District/ SASD Part of Sanitation Districts Agency
Todd Taylor	Associate Planner	Sacramento County Planning
Dalia Fadl	Sr. Civil Engineer	City of Rancho Cordova
June Cowles		City of Rancho Cordova Planning Department
Ryan Neves	Senior Engineer	City of Folsom
John Lundgren	Sr. Planner	Sacramento County Planning Department
Ty Bailey	Battalion Chief	Sacramento Metro Fire District
Tom Pasterski		SCWA
Jim Gillum		Resident/Gillum Consulting, Inc.
Neal Joyce	DOU Supervising Engineer	City of Sacramento Department of Utilities
Remi Mendoza		City of Sacramento Community Development Department
Greta Soos	Assistant Planner	City of Sacramento Planning Department
Michael Redfern		Sacramento Area Sewer District
Jeff Werner		City of Elk Grove
Emily Pappalardo		MBK Engineers
David Bolen		Sacramento County DWR
Shelly Jiang	Climate Change Coordinator	Sacramento Metropolitans Air Quality Management District
Liz Ramos		Kjeldsen, Sinnock & Neudeck, Inc
Piper Crawford		Regional Sanitation District
Steve White		Sacramento County Department of Transportation
Wendi Wilkinson	Senior Ag Env. Scientist	Home Owner Franklin Pond Area Elk Grove/ California Department of Agriculture
Heidi Huber		Sacramento County DWR
Tina Anderson	Project Manager	MBK Engineers
Tim Kerr		American River Flood Control District
Brian McCord	Director Operational Risk Management	California American Water

Name/Title	Title	Department/Agency/ Affiliation
Dawn Pimentel		Sacramento County DWR
Bill Forrest		City of Galt Public Works
Juanita Cano		Southgate Recreation and Park District
Kerry Schmitz		Sacramento County Water Agency
Rosa Millino	Senior Engineer	City of Sacramento
Keith Leech		Sacramento County DGS Fleet Service
Julia Coleman	Risk Management Specialist	Risk Management Los Rios College
Hunter Merritt	Public Involvement Specialist	USACE SPK Sacramento District
Bill Darsie		KSN Engineers, RD 2111,1601, 563
Glen Rickelton		Sacramento County Department of Airports
Connie Perkins	Senior Engineer	City of Sacramento Resident/ State CRS Coordinator
Clair Davis	Floodplain and CRS Administrator	City of Fort Worth TX
Jeanine Foster	Project Manager	Foster Morrison Consulting
Chris Morrison	Lead Planner	Foster Morrison Consulting
Matt Demarco	Administrative Battalion Chief	Consumnes CSD Fire Department
Spencer Eberle		Resident Old North Sacramento/ ARFC District Board of Directors
Patrick Erwin		RDs 341 & 800/ Wagner & Bonsignore, Consulting Civil Engineers
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Saira Nisha		Public
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Nestor Michelena		California Highway Patrol
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Anitra Pawley	Program Manager	In-Delta Investments, Division of Multibenefits CA DWR; ??
Brian Hensley		Citrus Heights Water District; bhensley@chwd.org

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Michael Moncrief	Principal	MBK Engineers; moncrief@mbkengineers.com
Michael Doane		Sacramento Regional Parks; doane@saccounty.net
David Bolland		Bolland and Associates; Dave_bolland@outlook.com

Mitigation Strategy Meetings

Mitigation Strategy Meetings Invite to Planning Team, Stakeholders, and Public

From: Jeanine Foster <jeanine.foster@fostermorrison.com>
Sent: Tuesday, March 9, 2021 4:51 PM
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Cc: Chris Morrison; Brenna Howell; Warr, Levi@DWR; Jennifer Holden; Jim Gillum; Flynn. MaryJo; Jamie McKinley; Gary; Jennifer Larkin; SAFCA. MAIL
Subject: Sacramento County LHMP Update: Mitigation Strategy Goals Meeting
When: Wednesday, March 24, 2021 2:30 PM-4:30 PM (UTC-07:00) Mountain Time (US & Canada).
Where: https://us02web.zoom.us/j/87806660168?pwd=RVYrYlVTT1lWdjNORk1MSFBTN2djUT09

All,

You are invited to the Mitigation Strategy Meetings (HMPC #3 & #4) for the 2021 Sacramento County LHMP Update:

Mitigation Strategy Meeting: Goals - March 24 (Wednesday) 1:30-3:30 Pacific Time. *During this first meeting, we will be updating the 2016 LHMP Goals and Objectives.*
Mitigation Strategy Meeting: Actions/Projects – March 30 (Tuesday) 1:30-4:00 Pacific Time. *During this second meeting, we will be identifying potential mitigation actions and projects for reducing Sacramento County's and all Participating Jurisdiction's risk and vulnerability to priority hazards and disasters.*

These are the two most important meetings for this LHMP Update Project!

Zoom Meeting Information for the March 24th Meeting is included below. A separate invite will be sent for the meeting on March 30th. A handout for the meetings will be provided via email prior to our first meeting.

Let me know if anyone has questions.
Thanks,

Jeanine Foster
Foster Morrison Consulting
(303) 717-7171

Join Zoom Meeting for March 24th Meeting:
https://us02web.zoom.us/j/87806660168?pwd=RVYrYlVTT1lWdjNORk1MSFBTN2djUT09

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+1 312 626 6799 US (Chicago)
+1 929 205 6099 US (New York)
+1 301 715 8592 US (Washington DC)
Meeting ID: 878 0666 0168
Passcode: 012399
Find your local number: https://us02web.zoom.us/u/ksXF09LAB

Mitigation Strategy Meeting Agenda

Sacramento County
Local Hazard Mitigation Plan (LHMP) Update
Mitigation Strategy Meetings
March 24th and March 30th, 2021

HMPC Meeting #2:

7. Introductions
8. LHMP Project Status and Next Steps/Timeline
9. Priority Hazards Review
10. Develop Plan Goals and Objectives
11. Introduction to HMPC Meeting #4: Mitigation Alternatives/Actions/Projects

HMPC Meeting #3:

12. Introductions
13. Review Mitigation Categories and Selection Criteria
14. Brainstorming of Mitigation Alternatives/Actions/Projects by Hazard
15. Review of Voting Process for Prioritization of Mitigation Projects
16. Questions

Mitigation Strategy Meeting Sign in Sheets – March 24th

Name/Title	Title	Department/Agency/ Affiliation
George Booth		Sacramento County DWR/ Sac County Water Agency
Amittoj Thandi	Engineering Services Support Manager	City of Elk Grove
Gilbert Cosio	Principal Engineer	MBK Engineers for RD 3 (North Delta RDs)
Jeanelle Gottlob	Emergency Manager	Jenelle Gottlob
Vyomini Upadhyay	Associate Civil Engineer	Regional Sanitation District/ SASD Part of Sanitation Districts Agency
Todd Taylor	Associate Planner	Sacramento County Planning
Dalia Fadl	Sr. Civil Engineer	City of Rancho Cordova
June Cowles		City of Rancho Cordova Planning Department
Ryan Neves	Senior Engineer	City of Folsom
John Lundgren	Sr. Planner	Sacramento County Planning Department
Ty Bailey	Battalion Chief	Sacramento Metro Fire District
Jim Gillum		Public/Gillum Consulting, Inc.
Remi Mendoza		City of Sacramento Community Development Department
M.T. Lorenzo-Lee		Sacramento County Resident
Greta Soos	Assistant Planner	City of Sacramento Planning Department
Michael Redfern		Sacramento Area Sewer District
Emily Pappalardo		MBK Engineers
David Bolen		Sacramento County DWR
Liz Ramos		Kjeldsen, Sinnock & Neudeck, Inc
Piper Crawford		Regional Sanitation District
Steve White		Sacramento County Department of Transportation
Wendi Wilkinson	Senior Ag Env. Scientist	Home Owner Franklin Pond Area Elk Grove/ California Department of Agriculture
Gilbert Mendes		Home Owner Franklin Pond Area Elk Grove
Valeri Mihanovich	Director	Public/The Regional Center for Volunteerism-Hanson Sacramento AND Sacramento Region Voluntary Organizations Active in Disaster
Melanie Saucier		SAFCA
Heidi Huber		Sacramento County DWR
Tim Kerr		American River Flood Control District
Brian McCord	Director Operational Risk Management	California American Water

Name/Title	Title	Department/Agency/ Affiliation
Dawn Pimentel		Sacramento County DWR
Chris Neudeck		KSN Engineering/ cneudeck@ksninc.com
Brenna Howell		Howell Consulting
Debbie Turner		Los Rios Community College District
Bill Forrest		City of Galt Public Works
Juanita Cano		Southgate Recreation and Park District
Rosa Millino	Senior Engineer	City of Sacramento
Keith Leech		Sacramento County DGS Fleet Service
Julia Coleman	Risk Management Specialist	Risk Management Los Rios College
Glen Rickelton		Sacramento County Department of Airports
Jeanine Foster	Project Manager	Foster Morrison Consulting
Chris Morrison	Lead Planner	Foster Morrison Consulting
Matt DeMarco	Administrative Battalion Chief	Consumnes CSD Fire Department
Spencer Eberle		Resident Old North Sacramento/ ARFC District Board of Directors
Patrick Erwin		RDs 341 & 800/ Wagner & Bonsignore, Consulting Civil Engineers
Charles Bergstrom		City of Isleton; cbergson@cityofisleton.com
Jamie Hudson		City of Elk Grove Emergency Management jhudson@elkgrovepd.org
Linda Ford		Resident/Metro Fire CERT ;metrofirecert@gmail.com
Holly Brown		Resident/SacRegion VOAD HandsOn Sacramento; hbrown@communitylinkcr.org
Rebecca Scott		Citrus Heights Water District; rscott@chwd.org
Matt Hawkins	Emergency Manager	Sacramento County OES; hawkinsm@sacoes.org
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Mika Guevarra	Emergency Volunteer	Resident/Sacramento Region BOAD HandsOn Sacramento; mguevarra@communitylinkcr.org
Levi Warr		CA DWR; levi.warr@water.ca.gov
Tom Monahan		Public; tmonahan1947@yahoo.com
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Michael Doane		Sacramento Regional Parks; doane@saccounty.net
Victoria LaMar-Haas		Cal OES, Program Manager, Local Hazard Mitigation Planning
Ben Ashby		CHP East Sacramento Area
Jason D'Alessio		Sacramento County OES
Megan Walton		Cal OES Recovery

Name/Title	Title	Department/Agency/ Affiliation
Angelina Wu		City of Sacramento
Toni Hoang		SMUD
Jamie McKinley		City of Sacramento; jmckinley@cityofsacramento.org

Mitigation Strategy Meeting Sign in Sheets – March 30th

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George Booth		Sacramento County DWR/ Sac County Water Agency
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Gilbert Cosio	Principal Engineer	MBK Engineers for RD 3 (North Delta RDs)
Jeanelle Gottlob	Emergency Manager	Jenelle Gottlob
Vyomini Upadhyay	Associate Civil Engineer	Regional Sanitation District/ SASD Part of Sanitation Districts Agency
Todd Taylor	Associate Planner	Sacramento County Planning
Dalia Fadl	Sr. Civil Engineer	City of Rancho Cordova
June Cowles		City of Rancho Cordova Planning Department
John Lundgren	Sr. Planner	Sacramento County Planning Department
Ty Bailey	Battalion Chief	Sacramento Metro Fire District
Remi Mendoza		City of Sacramento Community Development Department
M.T. Lorenzo-Lee		Sacramento County Resident
Greta Soos	Assistant Planner	City of Sacramento Planning Department
Michael Redfern		Sacramento Area Sewer District
Emily Pappalardo		MBK Engineers
Liz Ramos		Kjeldsen, Sinnock & Neudeck, Inc
Piper Crawford		Regional Sanitation District
Steve White		Sacramento County Department of Transportation
Wendi Wilkinson	Senior Ag Env. Scientist	Home Owner Franklin Pond Area Elk Grove/ California Department of Agriculture
Gilbert Mendes		Home Owner Franklin Pond Area Elk Grove
Valeri Mihanovich	Director	Public/The Regional Center for Volunteerism-Hanson Sacramento AND Sacramento Region Voluntary Organizations Active in Disaster
Melanie Saucier		SAFCA
Heidi Huber		Sacramento County DWR

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Eric Singer		City of Citrus Heights Planning Division
Debbie Turner		Los Rios Community College District
Bill Forrest		City of Galt Public Works
Juanita Cano		Southgate Recreation and Park District
Rosa Millino	Senior Engineer	City of Sacramento
Keith Leech		Sacramento County DGS Fleet Service
Julia Coleman	Risk Management Specialist	Risk Management Los Rios College
Connie Perkins	Senior Engineer	City of Sacramento Resident/ State CRS Coordinator
Jeanine Foster	Project Manager	Foster Morrison Consulting
Chris Morrison	Lead Planner	Foster Morrison Consulting
Spencer Eberle		Resident Old North Sacramento/ ARFC District Board of Directors
Patrick Erwin		RDs 341 & 800/ Wagner & Bonsignore, Consulting Civil Engineers
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Toni Hoang		SMUD
Jamie McKinley		City of Sacramento; jmckinley@cityofsacramento.org

Final HMPC Meeting

Final Team Meeting Invite to Planning Team, Stakeholders, and Public

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Sent: Tuesday, July 13, 2021 3:49 PM
To: Jeanine Foster; dmedema@citrusheights.net; CityClerk@citrusheights.net; citymanager@citrusheights.net; jwerner@elkgrovecity.org; athandi@elkgrovecity.org; jhudson@elkgrovepd.org; cbergson@cityofisleton.com; yvonne.zepeda@cityofisleton.com; publicworks@cityofisleton.com; dfadl@cityofranchocordova.org; astricker@cityofranchocordova.org; cabhar@cityofranchocordova.org; jcowles@cityofranchocordova.org; RMillino@cityofsacramento.org; njoyce@cityofsacramento.org; KSherfey@cityofsacramento.org; rmendoza@cityofsacramento.org; JMcCabe@cityofsacramento.org; KLai@cityofsacramento.org; ldeklinski@cityofsacramento.org; yrios@cityofsacramento.org; rec1146@aol.com; jgottlob@cityofsacramento.org; GSoos@cityofsacramento.org; DBowers@cityofsacramento.org; lgroves@cityofsacramento.org; rneves@folsom.ca.us; bholm@folsom.ca.us; skrahn@folsom.ca.us; dnugen@folsom.ca.us; frodriguez@folsom.ca.us; ttrinh@cityofgalt.org; mclarkson@cityofgalt.org; mselling@cityofgalt.org; bforrest@cityofgalt.org; boothg@saccounty.net; rehmans@saccounty.net; bolend@saccounty.net; pimenteld@saccounty.net; gossr@saccounty.net; wrighta@saccounty.net; huberh@saccounty.net; johnsonm@saccounty.net; petersont@saccounty.net; boothd@saccounty.net; tamayod@saccounty.net; nspringer@saccount.net; schmitzk@saccounty.net; kernj@saccounty.net; pasterskit@saccounty.net; williamsf@saccounty.net; eckd@saccounty.net; flynnm@saccounty.net; ozorake@saccounty.net; carlsonr@saccounty.net; GomezLu@saccounty.net; mieled@saccounty.net; frazierk@sacsewer.com; moorest@sacsewer.com; nebozuks@sacsewer.com; upadhyayv@sacsewer.com; crawfordp@sacsewer.com; fujikawas@saccounty.net; willisc@saccounty.net; RickeltonG@saccounty.net; vicarir@saccounty.net; hinesk@saccounty.net; lil@saccounty.net; whitest@saccounty.net; wrightme@SacCounty.NET; bellase@saccounty.net; doanem@saccounty.net; lundgrenj@saccounty.net; smithtodd@saccounty.net; MOFFITTL@saccounty.net; taylorto@saccounty.net; rainsm@saccounty.net; goetzs@saccounty.net; SJiang@airquality.org; mrenfro@airquality.org; robinsonju@airquality.org; jarno@airquality.org; jchan@airquality.org; ghelfip@saccounty.net; johnsonr@saccounty.net; BardiniG@saccounty.net; Wilcoxp@saccounty.net; acostad@saccounty.net; OlsonK@SacCounty.net; leechk@saccounty.net; johnsonp@saccounty.net; AalborgH@saccounty.net; CossioC@saccounty.net; FloydM@saccounty.net; MccoyK@saccounty.net; barcellosm@saccounty.net; KaridisD@saccounty.net; bongiornob@saccounty.net; SandovalA@saccounty.net; pwervin@wbecorp.com; rcwagner@wbecorp.com; cneudeck@ksninc.com; ssinnock@ksninc.com; GLabrie@dccengineering.net; daniel@kaydix.com; cosio@mbkengineers.com; tkerr@arfcd.org; kking@rd1000.org; MMadison@egwd.org; Brian.McCord@amwater.com; des@cpuc.ca.gov; karla.tejada@gswater.com; brandyn.hancocks@gswater.com; mhuot@sswd.org; debrasedwick@sbcglobal.net; chris@carmichaelwd.org; laura@carmichaelwd.org; customerservice@fowd.com; mmisenboym@fowd.com; rscott@chwd.org; jduran@orangevalewater.com; nwadmin@natomaswater.com; psiebensohn@ranchomurietacsd.com; kborders@fairoakspark.org; jcano@southgaterecandpark.net; sfraher@acrpd.com; teague.michael@metrofire.ca.gov; Johnson.maurice@metrofire.ca.gov; Bruce.robert@metrofire.ca.gov; Hein.Randall@metrofire.ca.gov; troybair@csdfire.com; mattdemarco@csdfire.com; michelle.mead@noaa.gov; alan.haynes@noaa.gov; megan.walton@caloes.ca.gov; Victoria.LaMar-Haas@CalOES.ca.gov; Lindsey.stanley@caloes.ca.gov; yrodrigu@placer.ca.gov; kathleen.ave@smud.org; sarah.staley@smud.org; Patrick.Durham@smud.org; sami.nall@water.ca.gov; kelly.soule@water.ca.gov; Anitra.Pawley@water.ca.gov; mlorenzo@water.ca.gov; emma.reed@fema.dhs.gov; xing.liu@fema.dhs.gov; Edith.Lohmann@fema.dhs.gov; zhamill@co.sutter.ca.us; WalkerBrian@Roseville.ca.us; Bruno.Costa@dot.ca.gov; Will.Schilling@dot.ca.gov; Hunter.Merritt@usace.army.mil; Constance.PerkinsGutowsky@cvflood.ca.gov; melinda@floodassociation.net; vtgonis@chp.ca.gov;

dfdewaal@fbi.gov; gwgoodman@fightthebite.net; douglas.brim@yolocounty.org; klove@sacsheriff.com; sheriff@sacsheriff.com; gsaelee@SacSheriff.com; ccotten@SacSheriff.com; ewhite@elkgrovepd.org; jkearsing@elkgrovepd.org; rooney@pd.cityofsacramento.org; linda@chaplaw.us; walterjhoppe@gmail.com; modfromhood@yahoo.com; alstonjoan@comcast.net; ginny@greeneandhemly.com; pappalardo@mbkengineers.com; msvls@cwo.com; portabellainteriordesign@yahoo.com; saberin@frontiernet.net; peterwesleystone@gmail.com; giranch@frontiernet.net; virvitch@aol.com; tim@timhodgson.us; spammyrussell@gmail.com; michelle_franusich@yahoo.com; Hkhapp@aol.com; bob33berger@gmail.com; hardhead131@yahoo.com; deyoungliving@gmail.com; office@woodsidehoa.com; kimberlyedwards00@comcast.net; seebogierun@aol.com; javed.siddiqui@jtsengineering.com; Charhorseranch@aol.com; Brian.Heiland@water.ca.gov; Dhenderson@esri.com; derek@larsenwurzel.com; wolmsted@comcast.net; ivan.gennis@gmail.com; jim@gillumco.com; gbwhitney@gmail.com; arvail@sbcglobal.net; mace.ucdavis@gmail.com; curtis.alling@ascentenvironmental.com; ezapata@cityofsacrmento.org; Rob.Mead@comcast.net; cferrari@geiconsultants.com; lance.egcitizen@gmail.com; meg.arnold@valleyvision.org; jkim@lgc.org; amanda@ejcw.org; colin@ejcw.org; wendi.wilkinson@cdfa.ca.gov; dianekirk@frontiernet.net; awe@areawesteng.com; psphangureh@gmail.com; alain@allstate.com; vihong@hotmail.com; doncald@hotmail.com; Sandy.Holsopple@pcbs-services.com; apsturm@ucdavis.edu; Clair.Davis@fortworthtexas.gov; rsetliff@cityofnapa.org; 93cobrarims@gmail.com; ruby.cornejo@ymail.com; mzsueq81@aol.com; dave@olsonconstructioninc.com; EdDavis@mbk.com; americasplumbing@msn.com; Bhale3@gmail.com; loreenee@msn.com; Violetta.Corral@safecu.org; casey@teamsia.com; gheisinger@financeofamerica.com; kimberly@fairwaynapa.com; RonPeden@pedenproperties.com; john@greyscale.llc; npavlit@hotmail.com; message1189@gmail.com; mhamon@mrhamon.com; mmareka@gmail.com; Christopher.X.Teng@kp.org; alex.martynovskiy@gmail.com; kevin@cmsplumbers.com; ddtay38lor@gmail.com; cadams@ebiconsulting.com; ngan.stanley@gmail.com; angiely314@yahoo.com; dianne@themarkinfamily.com; Jacobocito25@gmail.com; ruk239@aol.com; houseb101@gmail.com; csaechao06@gmail.com; kat.marcil@gmail.com; vmihanovich@communitylinkcr.org; rodriguezl@saccounty.net; Silvia.reynoso@water.ca.gov; Bailey.ty@metrofire.ca.gov; tfranklin@egwd.org; hhampton@sacsheriff.com; mhertel@cityofsacramento.org; eramos@ksninc.com; anderson@mbkengineers.com; flweiland@yahoo.com; colemaj2@losrios.edu; toni.hoang@smud.org; kohl@cwo.com; spencer@spencereberle.com; steberle1@hotmail.com; redfernm@sacsewer.com; saccreeks@gmail.com; metrofirecert@gmail.com; tmonahan1947@yahoo.com; esinger@citrusheights.net; florescj@saccounty.net; kcusano@folsom.ca.us; feliperodriguez@csdfire.com; hbrown@communitylinkcr.org; mguevarra@communitylinkcr.org; HawkinsM@SacOES.Org; bsessa1064@aol.com; BMaynard@chp.ca.gov; rdas@cityofsacramento.org
Cc: Chris Morrison; Brenna Howell; Cave, Regina; Flynn. MaryJo; Saucier. Melanie; Jennifer Larkin
Subject: Sacramento County LHMP Update: Final HMPC Meeting
When: Wednesday, August 4, 2021 10:00 AM-12:00 PM (UTC-07:00) Mountain Time (US & Canada).
Where: https://us02web.zoom.us/j/81491279503?pwd=SE8yR2ZBMmFnWUU5Z0xNdi9FYVB2UT09

Jeanine Foster is inviting you to a scheduled Zoom meeting.

FINAL HMPC ZOOM MEETING INFO:
Topic: Sacramento County LHMP Update: Final HMPC Meeting
Time: Aug 4, 2021 9:00 – 11:00 AM Pacific Time (US and Canada)

Join Zoom Meeting
https://us02web.zoom.us/j/81491279503?pwd=SE8yR2ZBMmFnWUU5Z0xNdi9FYVB2UT09

Meeting ID: 814 9127 9503
Passcode: 529795
One tap mobile
+16699006833,,81491279503#,,,,*529795# US (San Jose)
+12532158782,,81491279503#,,,,*529795# US (Tacoma)

Dial by your location
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+1 253 215 8782 US (Tacoma)
+1 346 248 7799 US (Houston)
+1 929 205 6099 US (New York)
+1 301 715 8592 US (Washington DC)
+1 312 626 6799 US (Chicago)
Meeting ID: 814 9127 9503
Passcode: 529795
Find your local number: https://us02web.zoom.us/u/kchs9hJLKa

AGENDA
Sacramento County Local Hazard Mitigation Plan (LHMP) Update
Final Meeting
August 4, 2021

1. Introductions
2. Status of the LHMP Update Process
3. Addressing Public Comments
4. Summary of Changes in Sacramento County Planning Area Vulnerabilities/ Mitigation Priorities
5. Final Input: Data/Projects
6. Next Steps

Final Team Meeting Sign in Sheet

Name/Title	Title	Department/Agency/ Affiliation
George Booth		Sacramento County DWR/ Sac County Water Agency
Gilbert Cosio	Principal Engineer	MBK Engineers for RD 3 (North Delta RDs)
Lauren Groves		City of Sac OEM (for Jeanelle Gottlob) lgroves@cityofsacramento.org
Lisa Barsdale		Sac Metro Fire, (Barsdale.lisa@metrofire.ca.gov
Orlando Olivas		Sacramento County Dept. of Airports (for Glen Rickelton
Todd Taylor	Associate Planner	Sacramento County Planning
Dalia Fadl	Sr. Civil Engineer	City of Rancho Cordova
Ryan Neves	Senior Engineer	City of Folsom
John Lundgren	Sr. Planner	Sacramento County Planning Department
Ty Bailey	Battalion Chief	Sacramento Metro Fire District
Jim Gillum		Public/Gillum Consulting, Inc.
Daniel Bowers	Sac OEM Director	dbowers@cityofsacramento.org
Remi Mendoza		City of Sacramento Community Development Department
Rosa Millino	Senior Engineer	City of Sacramento
Greta Soos	Assistant Planner	City of Sacramento Planning Department
Michael Redfern		Sacramento Area Sewer District
Emily Pappalardo		MBK Engineers
David Bolen		Sacramento County DWR
Liz Ramos	Kjeldsen, Sinnock & Neudeck, Inc	(Representing Deadhorse, Tyler and Twitchell
Piper Crawford		Regional Sanitation District
Barb McGowan	DCC Engineering	BALMD (RDs 317, 407, 2607) BMcGowan@dcceng.net
Steve White		Sacramento County Department of Transportation
Wendi Wilkinson	Senior Ag Env. Scientist	Home Owner Franklin Pond Area Elk Grove/ California Department of Agriculture
Gilbert Mendes		Home Owner Franklin Pond Area Elk Grove
Heidi Huber		Sacramento County DWR
Tim Kerr		American River Flood Control District
Dawn Pimentel		Sacramento County DWR
Ken Cusano	Fire Chief	Folsom Fire Department
Bill Forrest		City of Galt Public Works

Name/Title	Title	Department/Agency/ Affiliation
Hunter Merritt	Social Scientist	USACE Institute for Water Resources hunter.merritt@usace.army.mil
Julia Coleman	Risk Management Specialist	Risk Management Los Rios College
Jeanine Foster	Project Manager	Foster Morrison Consulting
Chris Morrison	Lead Planner	Foster Morrison Consulting
Matt DeMarco	Administrative Battalion Chief	Consumnes CSD Fire Department
Spencer Eberle		Resident Old North Sacramento/ ARFC District Board of Directors
Patrick Erwin		RDs 341 & 800/ Wagner & Bonsignore, Consulting Civil Engineers
Regina Cave		City of Citrus Heights rcave@citrusheights.net
Jamie Hudson		City of Elk Grove Emergency Management jhudson@elkgrovepd.org
Rebecca Scott		Citrus Heights Water District; rscott@chwd.org
Sylvia Reynoso	DOU Supervising Engineer	City of Sacramento
Michael Doane		Sacramento Regional Parks; doane@saccounty.net
Mary Jo Nevins		Sacramento County OES
Brandon Mitchell		Sacramento County Water Resources mitchellbr@saccounty.net

A.2 Sacramento County Step 2: Involve the Public

Multiple efforts were made to engage the public during the creation of this plan, including direct outreach efforts such as phone calls, emails, direct mailings, and face-to-face meetings, in addition to the broader outreach efforts such as e-newsletters, website postings, newspaper advertisements and articles, and leveraging other community events to communicate and invite participation in the LHMP Update project. A key element of public participation is including members of the public and other public-type stakeholders (at 50% participation) on the Hazard Mitigation Planning Committee.

a) List of Hazard Mitigation Planning Committee (HMPC) Members and Public Members to the HMPC

The HMPC, comprising key county, city, special district, and other government and stakeholder representatives and the public, developed the plan with leadership from the County OES and facilitation by Foster Morrison. This list of HMPC members is shown in Section A.1.c of this Appendix.

In addition to the HMPC, a Steering Committee to the HMPC was established to help guide LHMP development, including the CRS components of floodplain management planning and the overall development of the LHMP. The Steering Committee is comprised of key representatives from the County and the City of Sacramento as the two CRS communities and includes non-local government and public representatives. The non-local government members of the Steering Committee (citizens and other outside stakeholders) represent more than 50% representation of the committee for the Steering Committee.

Table A-2 Sacramento County LHMP Steering Committee to the Hazard Mitigation Planning Committee

Community/ Representative	Department/Organization	County/ City	Public/ Resident	Stakeholder	# Meetings
Sacramento County					
George Booth	Sacramento County Department of Water Resources	X			5
John Lundgren	Sacramento County Office of Planning and Environmental Review	X			5
City of Sacramento					
Rosa Millino	Community Development Department Planning Division,	X			5
Remi Mendoza	Development Services Department/ Regulatory Compliance	X			5
Public Representatives					
Wendy Wilkinson	Home Owner Franklin Pond Area, Elk Grove		X	X	5
Gilbert Mendes	Home Owner Franklin Pond Area, Elk Grove		X		4
Spencer Eberle	Resident – Old North Sacramento		X		5

Community/ Representative	Department/Organization	County/ City	Public/ Resident	Stakeholder	# Meetings
Holly Brown	Resident/Hands On Sacramento		X	X	3
Jim Gillum	Resident/Gillum Consulting		X		4
Connie Perkins	City of Sacramento Resident		X	X	3
Maria Lorenzo-Lee	Resident Pocket Area		X	X	3
Mike Guevarra	Resident/Hands On Sacramento		X	X	3
Tom Monahan	Public		X		3
Derek Lawson	Public		X		3
Valerie Mihanovich	Public/Hands On Sacramento		X	X	3
Linda Ford	Resident/ Metro Fire Cert				3

b) and c) Public Meetings

In addition to a paid advertisement in the local newspaper, the Sacramento Gazette, for public participation, notices of meetings were sent directly to all persons on the HMPC contact list and also to other agency and key stakeholders with an interest in the Sacramento County Planning Area, as well as through other social media outreach efforts. The majority of these people reside in Sacramento County or in surrounding communities. The formal public meetings for this project are summarized in the following table.

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Early Public Meeting	1) Intro to DMA, CRS and mitigation planning 2) 2021 LHMP Update Process	September 15, 2020	Zoom Meeting
Final Public Meeting	1)Presentation of Draft LHMP and solicitation of public and stakeholder comments	August 3, 2021	Zoom Meeting

Paid Ad for Early Meeting

THE SACRAMENTO
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770 L St., Suite 950
Sacramento, CA 95814-3361
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FILING STAMP

SAC COUNTY WATER RESOURCES
ATTN: MATT ROBINSON
827 7TH ST., ROOM 301
SACRAMENTO CA 95814

SEE ATTACHED COPY OF PUBLISHED NOTICE ▶

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(C.C.P. §2015.5)

State of California)
County of Sacramento)

BE AWARE, BE PREPARED

(92167)

I am a citizen of the United States; I am over the age of 18 years. I am the principal clerk of THE SACRAMENTO GAZETTE, a community newspaper printed and published in the English language, and adjudged to be a Newspaper of General Circulation for the City and County of Sacramento by the Sacramento County Superior Court on August 12, 1997. That the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of THE SACRAMENTO GAZETTE and not in any supplement thereof on the following date(s), to wit:

09-11-20

Executed on: 09-11-2020
at Sacramento, California

I certify under penalty of perjury that the foregoing is true and correct:

Signature

THE SACRAMENTO GAZETTE
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ATTN: MATT ROBINSON
827 7TH ST., ROOM 301
SACRAMENTO CA 95814

Sacramento County 2021 Local Hazard Mitigation Plan Update

HELP YOUR COMMUNITY BE HAZARD-READY!

Sacramento County with its cities and numerous special districts will be updating the Local Hazard Mitigation Plan (LHMP) looking at the risk of floods, drought, wildfires, severe weather, and other natural hazards of concern to the County. While hazards such as these cannot be prevented, a Hazard Mitigation Plan forms the foundation for a community's long-term strategy to reduce disaster losses. A FEMA-approved Hazard Mitigation Plan allows agencies to apply for pre- and post-disaster mitigation grant funding. In addition, this LHMP Update provides for lower costs of flood insurance premiums, through the National Flood Insurance Program's (NFIP) Community Rating System (CRS), to residents of Sacramento County and City of Sacramento, as the two CRS communities.

You are invited. Sacramento County is seeking members of the public to participate on our Hazard Mitigation Planning Committee (HMPC) for this LHMP Update. No background or expertise is required. We encourage attendance and participation from the general public at our upcoming Planning Committee and Public Meetings to kick off the project; please select the time and location that works best for you:

Planning Committee Virtual Meeting
September 15, 2020 (Tuesday)
1:30 - 4:00 pm

Public Information Virtual Meeting
September 15, 2020 (Tuesday)
6:00 – 7:30 pm

For more information and to obtain the Zoom link for the meetings, please visit our LHMP webpage at www.StormReady.org

Early Public Meeting Agenda

SACRAMENTO COUNTY
LOCAL HAZARD MITIGATION PLAN (LHMP)
PUBLIC MEETING #1
SEPTEMBER 15, 2020

1. Introductions
2. Hazard Mitigation & the Disaster Mitigation Act Planning Requirements
3. Hazard Identification and Profiles
4. Schedule
5. Questions and Answers

Early Public Meeting –Sign-in Sheet

Name/Title	Title	Department/Agency/ Affiliation
George Booth		Sacramento County DWR
Wendi Wilkinson	Senior Ag Env. Scientist	Homeowner Franklin Pond Area Elk Grove/ California Department of Agriculture
Gilbert Mendes		Homeowner Franklin Pond Area
Dirk Medema		City of Citrus Heights
Linda Ford		Metro Fire CERT
M. T Lorenzo-Lee		Resident Pocket Area
Spencer Eberle		Resident of Old North Sacramento
Jillian Powell		Resident
Jeanine Foster	Project Manager	Foster Morrison Consulting
Chris Morrison	Lead Planner	Foster Morrison Consulting

Paid Ad for Final Public Meeting

SUBSCRIBE TODAY!
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SACRAMENTO COUNTY

Sacramento County Invites Comments on their 2021 Local Hazard Mitigation Plan Update!

HELP YOUR COMMUNITY BE HAZARD-READY!

Sacramento County with its cities and numerous special districts is updating the Local Hazard Mitigation Plan (LHMP) looking at the risk of floods, drought, wildfires, severe weather, and other natural hazards of concern to the County. While hazards such as these cannot be prevented, a Hazard Mitigation Plan forms the foundation for a community's long-term strategy to reduce disaster losses. A FEMA-approved Hazard Mitigation Plan allows agencies to apply for pre- and post-disaster mitigation grant funding. In addition, this LHMP Update provides for lower costs of flood insurance premiums, through the National Flood Insurance Program's (NFIP) Community Rating System (CRS), to residents of Sacramento County and City of Sacramento, as the two CRS communities.

Public Review Draft: A Public Review Draft of the 2021 LHMP Update is available online (pdf format) at: www.stormready.org. It is also available (in printed copy) at the following locations Arcade Library, 2443 Marconi Avenue, Sacramento CA 95821, Hours: Tues – Sat 10 am to 6 pm (closed Sun and Mon).

Email comments by August 13th to: Jeanine.foster@fostermorrison.com

Public and Planning Committee Meetings: We encourage attendance and participation from the public at our upcoming virtual (Zoom) public and planning committee meetings on the Draft LHMP. Please select the time and location that works best for you:

August 3, 2021 (Tuesday)
Public Meeting 5:30 - 7:00 pm

August 4, 2021 (Wednesday)
Planning Committee Meeting 9:00 - 11:00 am

For Zoom Call in information:
Please visit our LHMP webpage at www.StormReady.org.

For more information:
Contact George Booth at boothg@sacounty.net or call (916) 874-6484.

Ad#: 95228 — Pub: 07-23-21 07-30-21

Final Public Meeting – Public Agenda

AGENDA
Sacramento County
Local Hazard Mitigation Plan (LHMP) Update
Final Public Meeting
August 3, 2021

1. Introductions
2. Status of the LHMP Update Process
3. Addressing Public Comments
4. Summary of Changes in Sacramento County Planning Area Vulnerabilities/ Mitigation Priorities
5. Public: Data/Projects
6. Next Steps

Final Public Meeting Sign in Sheet

Name/Title	Department/Agency/Affiliation
George Booth	Sacramento County DWR
Spencer Eberle	Resident of Old North Sacramento
Chris Morrison	Foster Morrison Consulting
Jeanine Foster	Foster Morrison Consulting

(d) Other Public Outreach Efforts

Effort	Description
Sacramento County LHMP Update Website	Information on the Plan update process and location of documents, and final HMPC and public meeting locations were posted on the County website. This website also included a link to the Survey. See StormReady.com
Public Outreach Flyer for Kickoff Meeting	An initial public outreach flyer was developed for the initial public and planning team kick off meetings and to use throughout the project as outreach materials.
September 1, 2020 Sacramento County Social Media Posts	Social media message on Twitter and Facebook advertising the LHMP Project Kickoff. They all link back to the StormReady webpage where more information on the LHMP Update project can be found.
September 4, 2020 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project Kickoff. They all link back to the StormReady webpage where more information on the LHMP Update project can be found.
September 8, 2020 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project Kickoff. They all link back to the StormReady webpage where more information on the LHMP Update project can be found.
September 13, 2020 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project Kickoff. They all link back to the StormReady webpage where more information on the LHMP Update project can be found.
September 15, 2020 Sacramento County online Ad	Online (Sacramento County website) Ad posted the day of the LHMP Kickoff Meetings advertising the LHMP Project and the Public and HMPC Kickoff Meetings.
October 2020 – September 2021 LHMP Hazard Survey	A public survey was posted on the County's website inviting the public to comment on how prepared both the County and individuals are for a possible natural disaster, including flood events.
December 1, 2020 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Hazard Survey. They all link back to the Survey as posted on the StormReady County webpage
February 16, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Hazard Survey. They all link back to the Survey as posted on the StormReady County webpage
February 17, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Hazard Survey. They all link back to the Survey as posted on the StormReady County webpage

Effort	Description
November 2020 – August 2021 Digital Ads for Survey promotion	Digital ads were developed that ran through the County's Entercom radio contract. The messages appear once a week as it's mixed in with County Storm Ready ads. The link goes to the survey. These digital ads are geo-located and target various areas of the County at different times. The ads ran once a week.
December 20-27, 2020 Comcast Commercial for Survey promotion	A commercial was developed in both English and Spanish that ran on numerous channels throughout Sacramento County advertising the LHMP Update Survey and directing them to the StormReady.com website. The commercial appeared on 30 different channels, in 8 different areas/zones in the County and ran 840 times.
Public Outreach Flyer for the Final Public and HMPC meetings and how to submit comments on the Draft Plan	A Public Outreach Flyer was developed to advertise the final Public and HMPC Meetings and to solicit input on the Draft LHMP prior to finalization and submittal to Cal OES and FEMA.
July 28, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project final Public and HMPC meetings and how to review and provide comment on the Draft LHMP. They all link back to the StormReady webpage where the Public Review Draft Plan and more information on the LHMP Update project can be found.
August 2, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project final Public and HMPC meetings and how to review and provide comment on the Draft LHMP. They all link back to the StormReady webpage where the Public Review Draft Plan and more information on the LHMP Update project can be found.
August 3, 2021 Sacramento County Social Media Posts	Social media messages were posted on Twitter and Facebook advertising the LHMP Project final Public and HMPC meetings and how to review and provide comment on the Draft LHMP. They all link back to the StormReady webpage where the Public Review Draft Plan and more information on the LHMP Update project can be found.
Public Outreach at Sacramento County Public Library, Downtown (Arcade) Location	The County placed the draft plan in the reference section at the Sacramento County Public Library, Downtown (Arcade) location. Invitations were placed on social media, the County website, and as part of the advertisements for public meetings to let the public know that the documents were there for review and input as well as in electronic format on the LHMP website.

Sacramento County LHMP Update Website

Date captured: 9/18/2020

Date captured 9/16/2020

Public Outreach Flyer for Kickoff Meeting - September 1, 2020

SACRAMENTO COUNTY

Help Reduce Disaster Losses in Your Community by Participating in the Sacramento County Local Hazard Mitigation Plan Update

Sacramento County is developing a Local Hazard Mitigation Plan (LHMP) Update to their 2016 plan. The purpose of this LHMP Update is to assess risk to natural hazards, implement actions to reduce future losses, and maintain eligibility for federal mitigation funds in accordance with the Disaster Mitigation Act of 2000. Partners in this planning effort include the incorporated communities of the City of Sacramento, Citrus Heights, Elk Grove, Folsom, Galt, Isleton, and Rancho Cordova and many special districts throughout the County.

What is Hazard Mitigation?

Hazard mitigation means any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards.

Why is Natural Hazard Mitigation Important?

Most people who live or work in Sacramento County have been affected by natural hazards in one way or another. Sacramento County and its residents are vulnerable to a variety of hazards including **floods, levee failure, drought, wildfire, and other severe weather events.**

The rising costs associated with disaster response and recovery have focused the attention of federal, state, and local governments on addressing natural hazards before they occur. Obviously, torrential rains and floods cannot always be prevented from occurring. Planning for natural hazards and implementing mitigation measures, however, can reduce the impact of such events when they do occur. Emergency response and recovery costs; property damage; personal injury and loss of life; and the overall economic and social impact on the community can all be reduced, and in some instances eliminated through natural hazard mitigation.

Hazard Mitigation Plan and Plan Update Process

After securing Federal Emergency Management Agency (FEMA) mitigation grant funding, Sacramento County is using the funds to support an update of the 2016 LHMP. This LHMP Update is being developed by a Hazard Mitigation Planning Committee (HMPC) comprised of representatives from various County and City departments; neighboring jurisdictions; key federal, state, and local agency stakeholders; and the public.

The plan will address an updated list of hazards, will assess the likely impacts of these hazards to the people and assets of the Sacramento County planning area, and will also establish updated goals and prioritize projects to reduce the impacts of future disasters on people and property as well as to critical facilities and infrastructure.

Another benefit of mitigation planning is that it can also help lessen the cost of flood insurance to the residents of Sacramento County and the City of Sacramento through FEMA's National Flood Insurance Program's (NFIP) Community Rating System.

National Flood Insurance Program's Community Rating System

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions in meeting the goals of the CRS Program. The reduction in flood insurance premium rates is provided according to a community's CRS classification. Sacramento County and the City of Sacramento are currently both a CRS Class 2, which provides up to a 40 percent discount on flood insurance premiums for those located within the special flood hazard area (SFHA). Participation by these communities in CRS results in over $2.8 million in annual savings to area residents on the cost of their flood insurance premiums.

Opportunities for Input

Members of the community have a very important role in this process. Planning Committee and Public Meetings will be held throughout the plan development process starting fall 2020 through summer of 2021. All interested stakeholders and members of the public are welcome to attend either of these meetings.

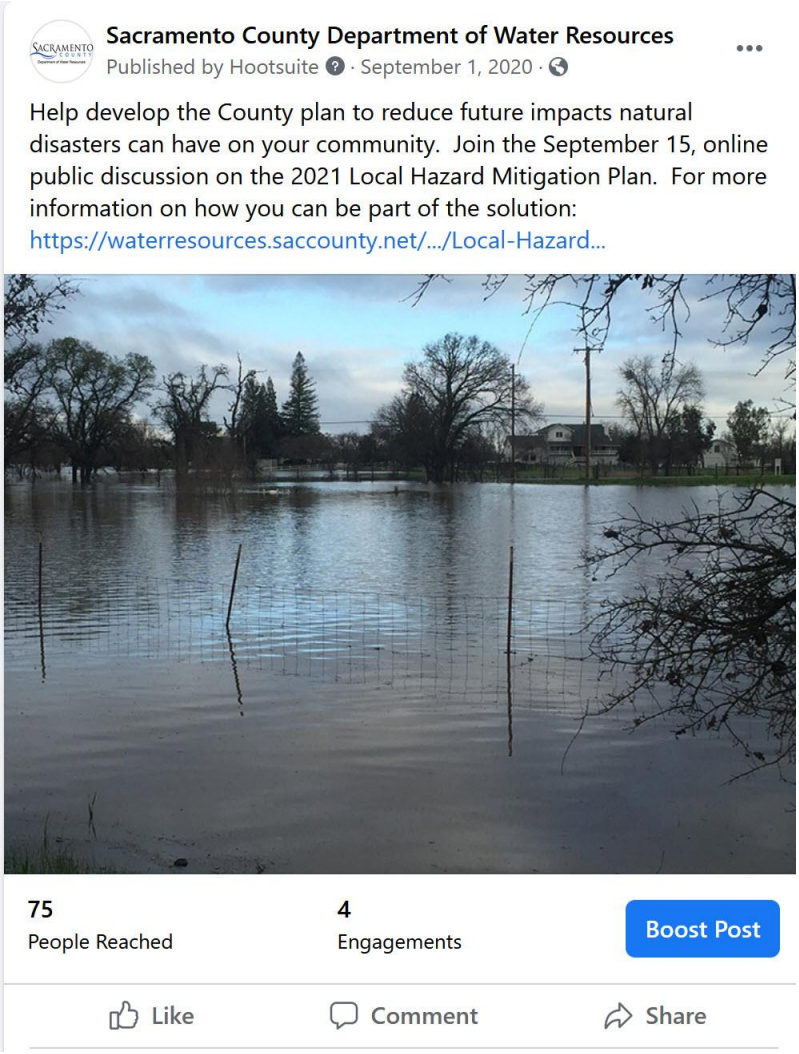
A draft of the LHMP Update will also be available late spring 2021 for review and comment by the public and all interested stakeholders on the County website and in select public libraries.

For more information on this project and how you can get involved, go to www.**StormReady.org** or click here: https://waterresources.saccounty.net/stormready/Pages/Local-Hazard-Mitigation-Plan-2017-Update.aspx

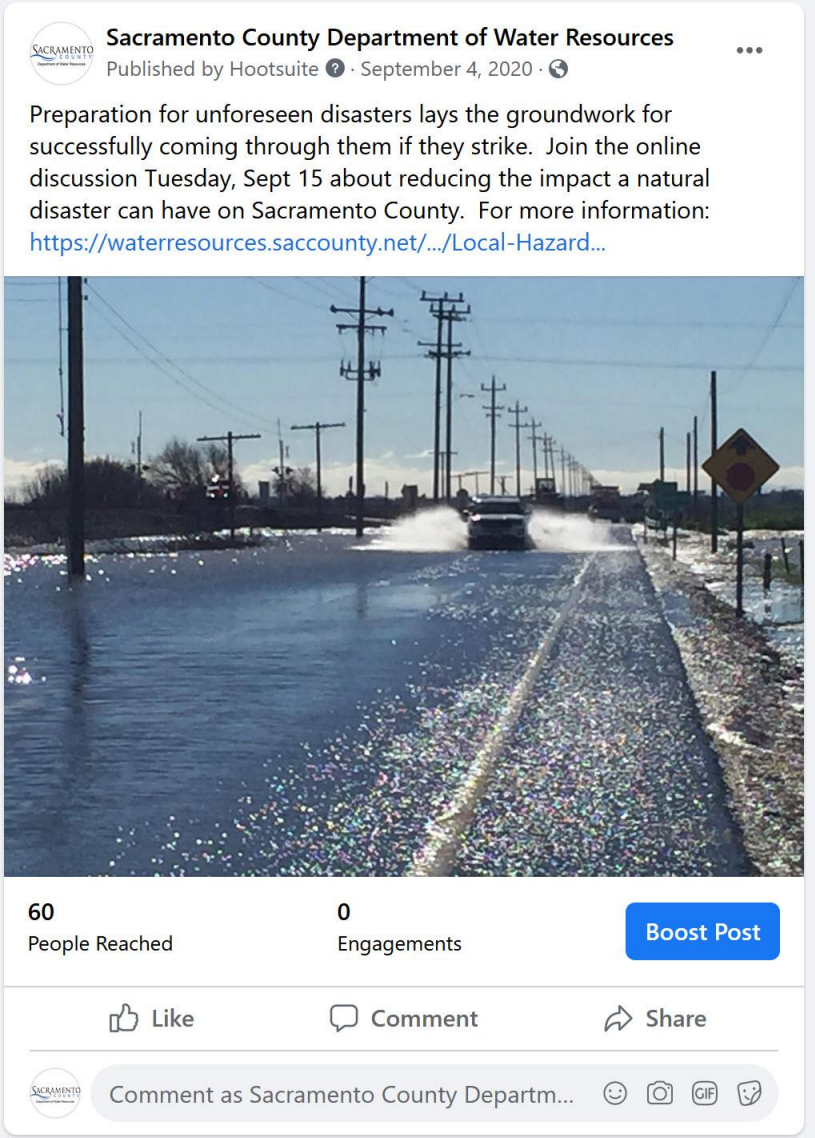
If you have questions or for additional information, please contact the following individuals:

George Booth	**Jeanine Foster**
Sacramento County Department of Water Resources	Foster Morrison Consulting Ltd.
Boothg@saccounty.net	jeanine.foster@fostermorrison.com

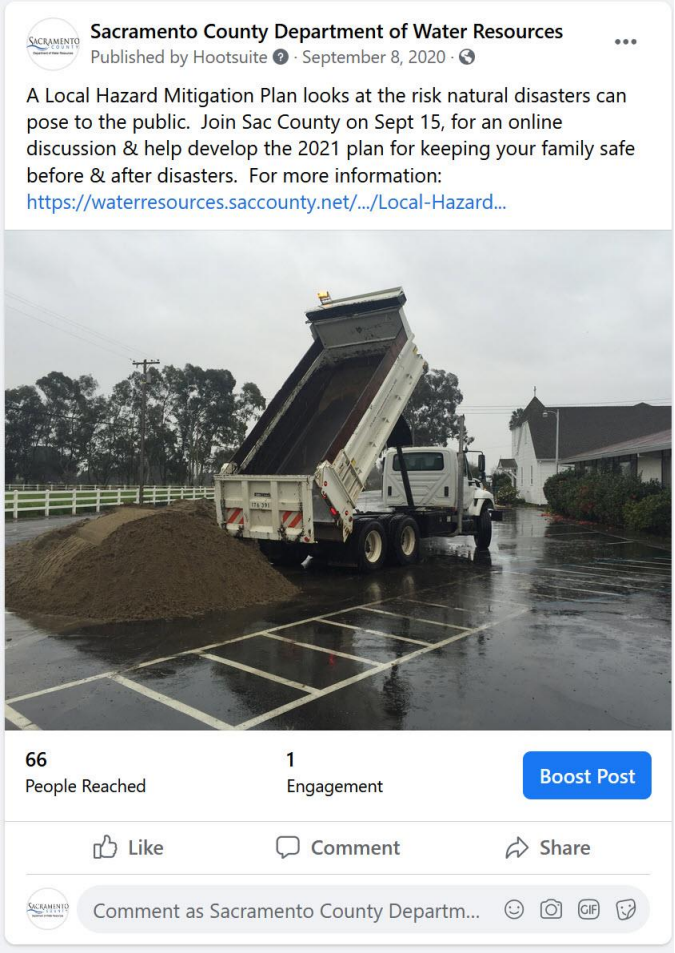
Sacramento County Social Media Posts - September 1, 2020



Sacramento County Social Media Posts - September 4, 2020

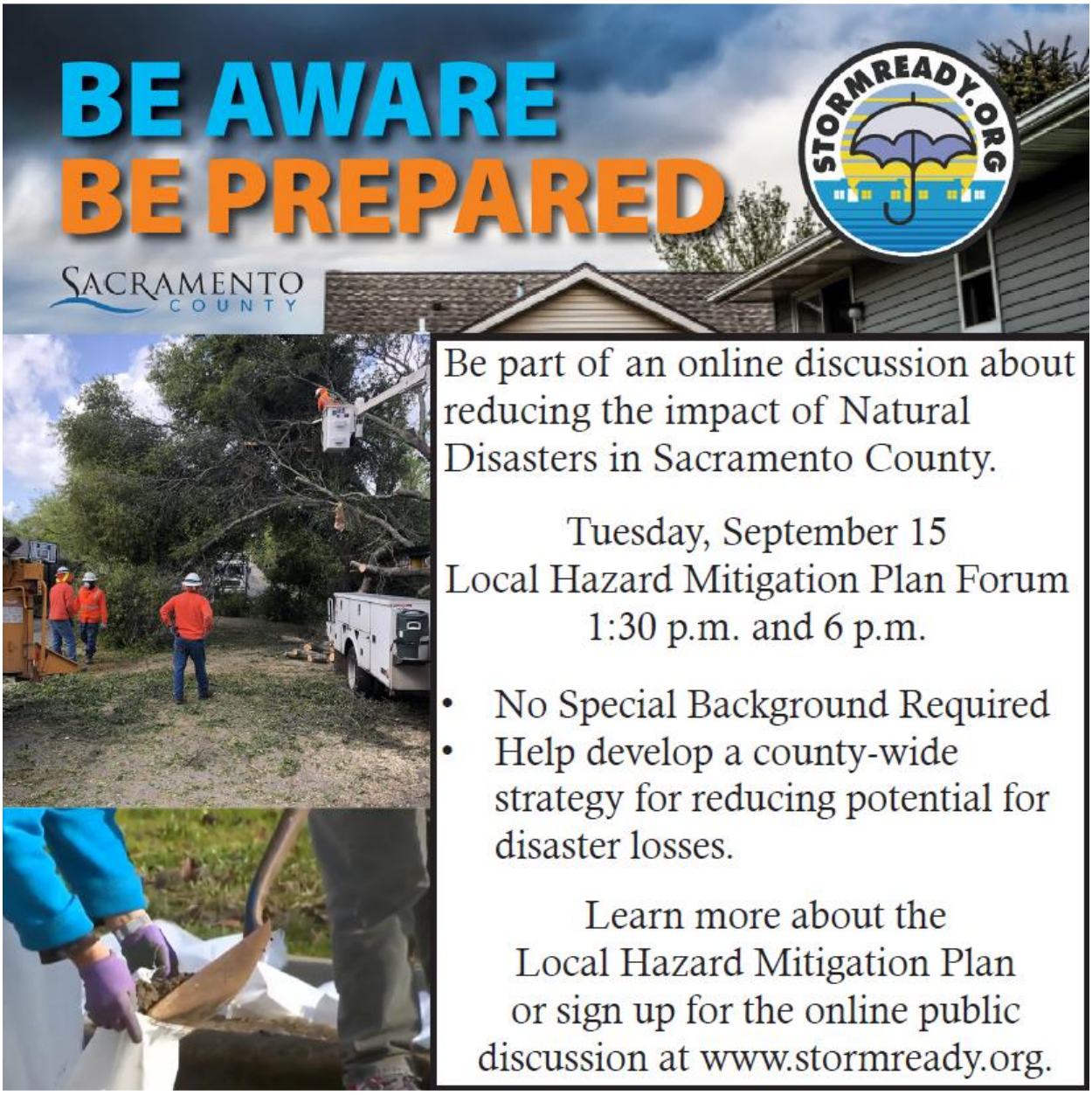


Sacramento County Social Media Posts - September 8, 2020

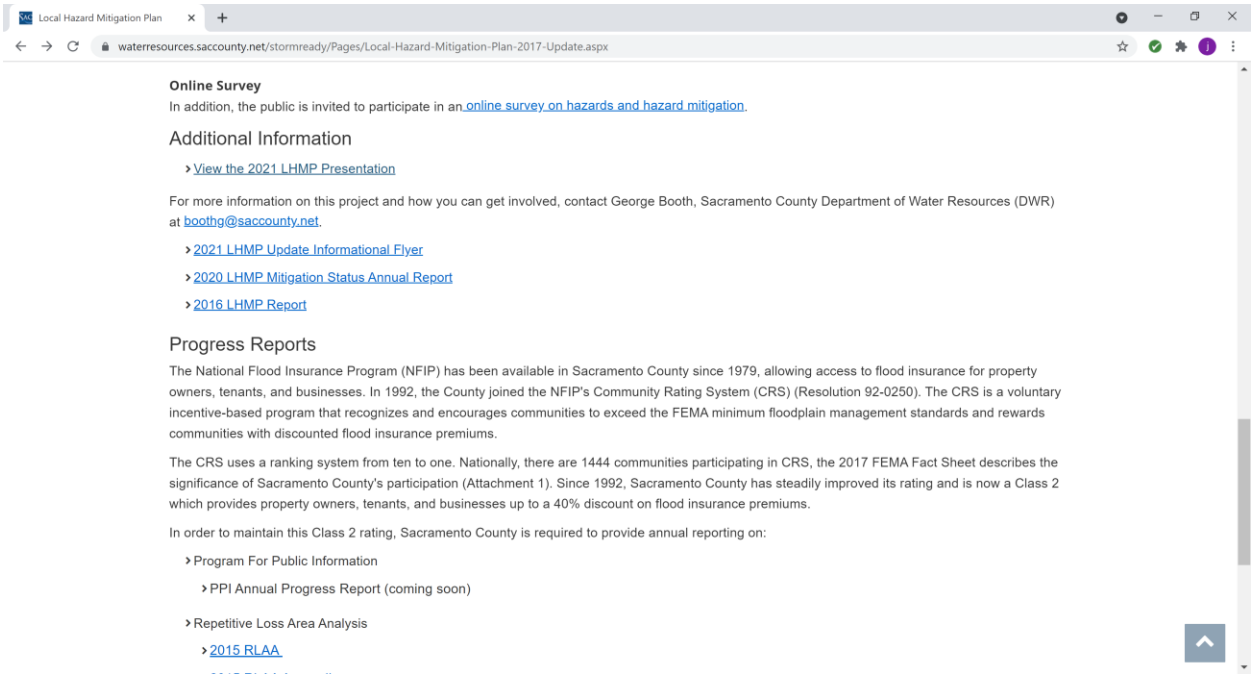


Sacramento County Social Media Posts - September 13, 2020

Sacramento County online Ad - September 15, 2021

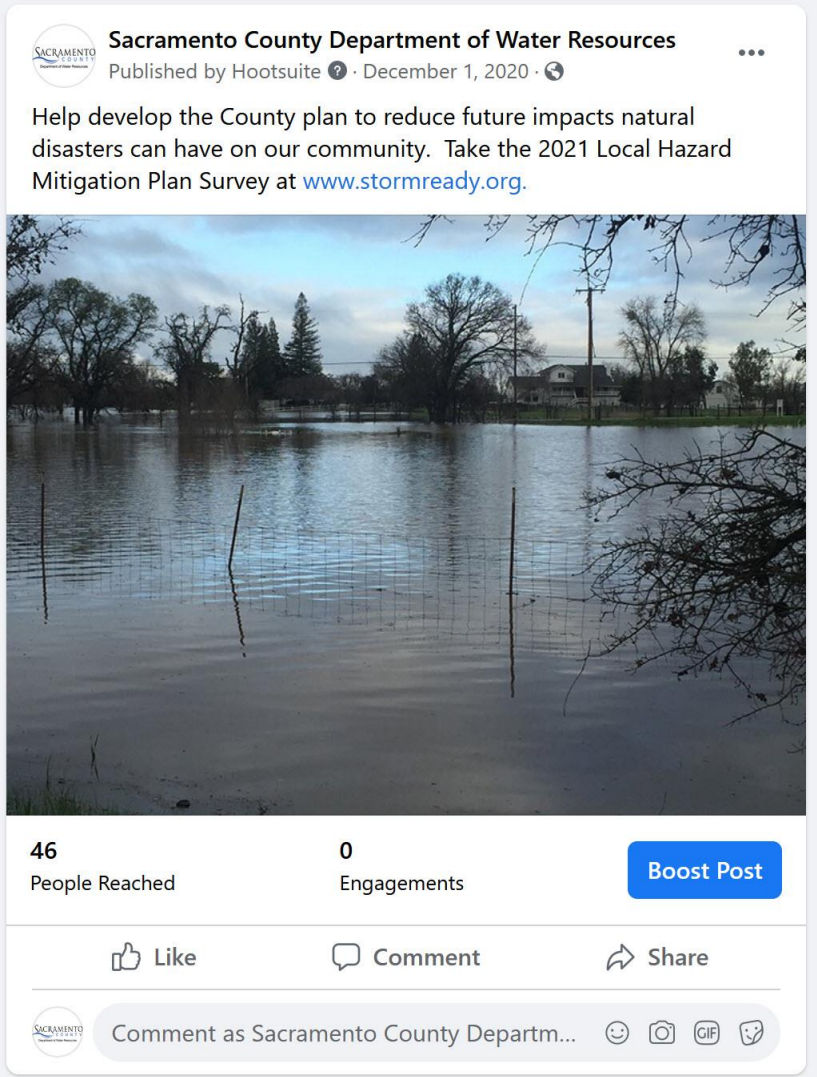


Sacramento County LHMP Survey – Posted from October 2020 – September 2021

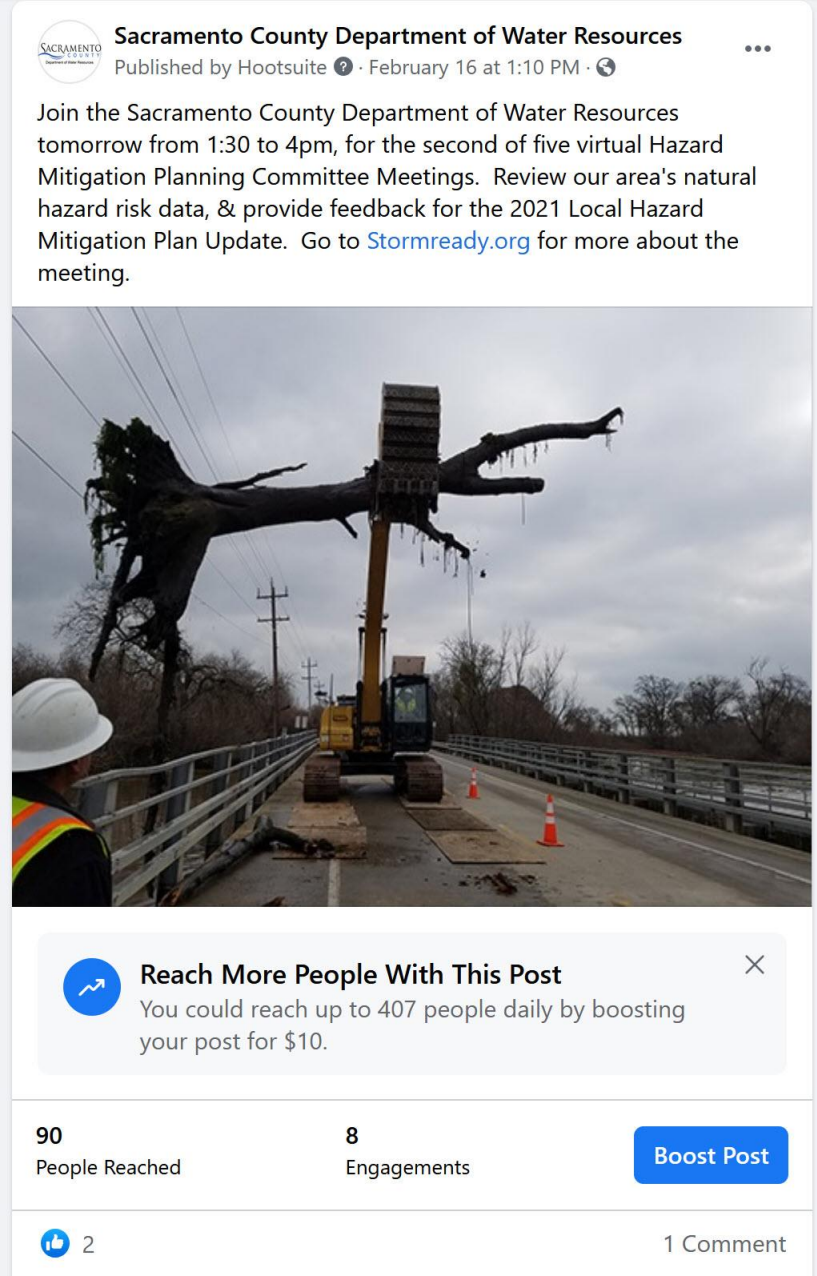


Date captured: 9/29/2021

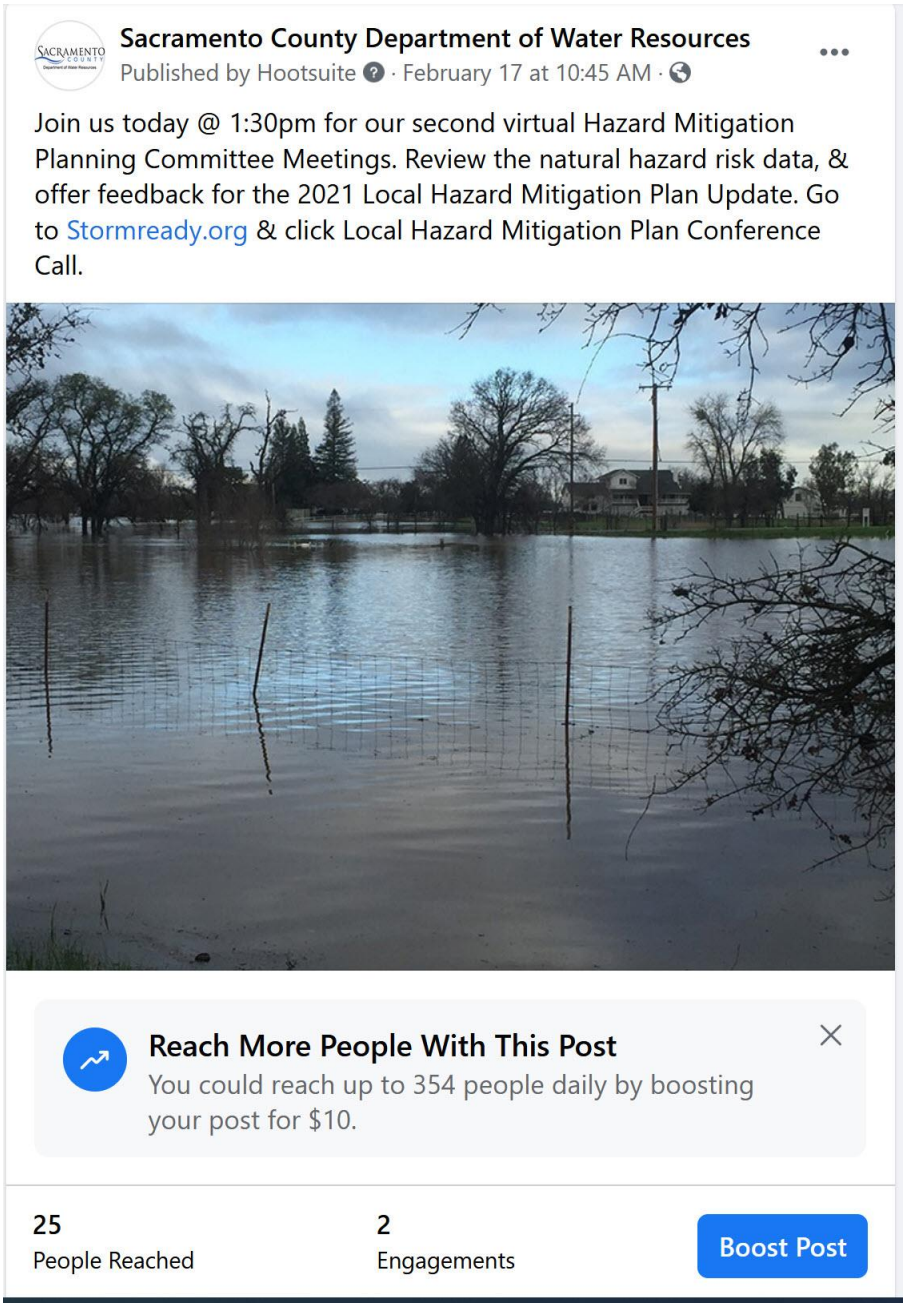
LHMP Hazard Survey Social Media Outreach - December 1, 2020



Sacramento County Social Media Posts - February 16, 2021

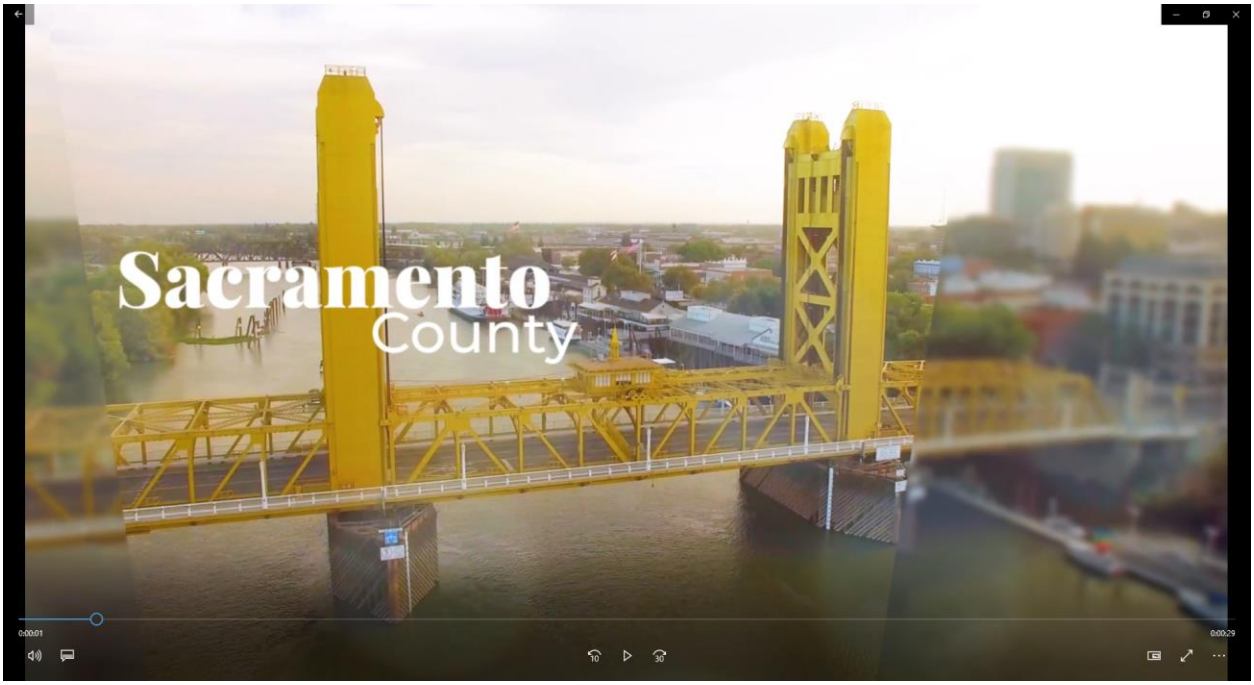


Sacramento County Social Media Posts - February 17, 2021



Sacramento County Digital Ads for Survey Promotion - November 2020 – August 2021

Comcast Commercial for Survey promotion December 20-27, 2020



effectv
A COMCAST COMPANY

INVOICE NO.	INVOICE DATE
WC823273	12/27/2020
BILL CYCLE	**INVOICE DUE DATE**
202012	1/31/2021

AFFIDAVIT

Product:

Comcast Order No: WC11555219

Market: Sacramnto-Stkton-Modesto

Estimate No:

TIM Est No: 3182870

Contract Type: Single

Campaign No:

AE Name: Ray Tucker

Commercial Summary

Spot ID	Title	Zone	Networks	Spots	Cost
NE1992470	SacCounty_LHMP2021	Citrus Heights Uverse/4215, Citrus Heights/6066, Downtown Sac Uverse/4218, Downtown Sacramento/6065, Elk Grove Uverse/4220, Folsom Uverse/4222, Folsom/6067, South Sacramento/6068	OXYG, FRFM, HALL, NFLN, TLC, LIF, TRU, CNBC, NBCS, CNN, GSN, BET, CMT, NSCA, HLN, FOOD, DISC, ENT, TVL, TRAV, ESP2, FXNC, TNT, ESPN, FBN, OWN, MNBC, FX, SYFY, NSBA	840	$941.00

Public Outreach Flyer for the Final Public and HMPC meetings and how to submit comments on the Draft Plan - July 28, 2021

SACRAMENTO COUNTY

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Opportunities for Input

Members of the community have a very important role in this process. A draft of the LHMP Update is available for review and comment by the public and all interested stakeholders on the County website at: https://waterresources.saccounty.net/stormready/Pages/Local-Hazard-Mitigation-Plan-2017-Update.aspx. It is also available (in printed copy) at the following location:

Arcade Library
2443 Marconi Avenue, Sacramento CA 95821
Hours: Tues – Sat 10am to 6pm (closed Sun and Mon)

A public meeting on the Draft Plan is scheduled for Tuesday August 3, 2021 from 5:30 – 7:00 pm (via Zoom) and final planning committee meeting will be held Wednesday August 4, 2021 from 9:00 – 11:00 am (also via Zoom). All interested stakeholders and members of the public are welcome to attend either of these meetings.

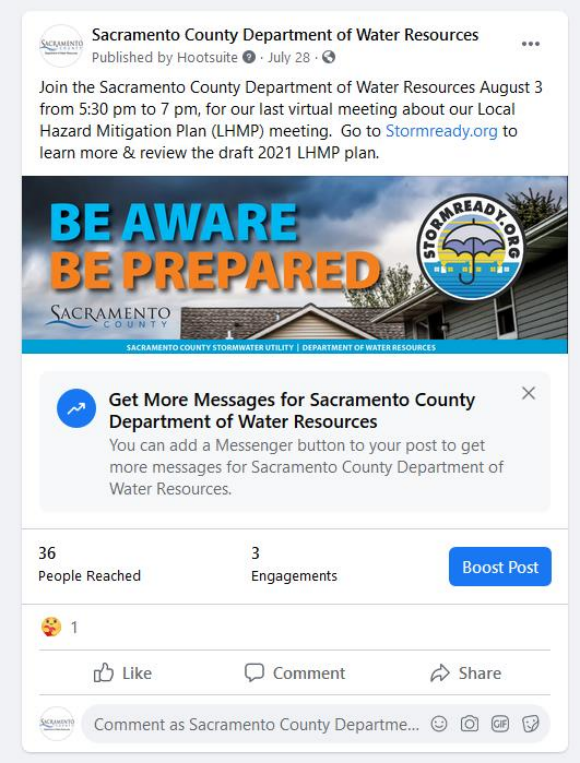
Online Survey

In addition, the public is invited to participate in an online survey on hazards and hazard mitigation in Sacramento County at StormReady.org and follow the link to Local Hazard Mitigation Plan, 2021.

For more information on this project and Zoom information for the upcoming meetings, go to the LHMP webpage at www.**StormReady.org** or click here:
https://waterresources.saccounty.net/stormready/Pages/Local-Hazard-Mitigation-Plan-2017-Update.aspx.
If you have questions or for additional information, please contact the following individuals:

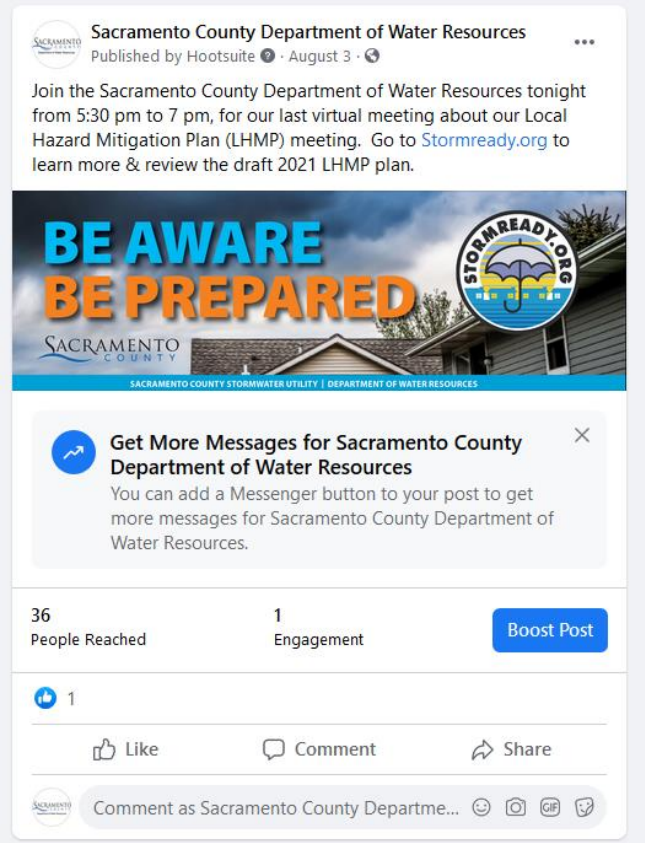
George Booth	Jeanine Foster
Sacramento County Department of Water Resources	Foster Morrison Consulting Ltd.
Boothg@saccounty.net	jeanine.foster@fostermorrison.com

Sacramento County Social Media Post - July 28, 2021

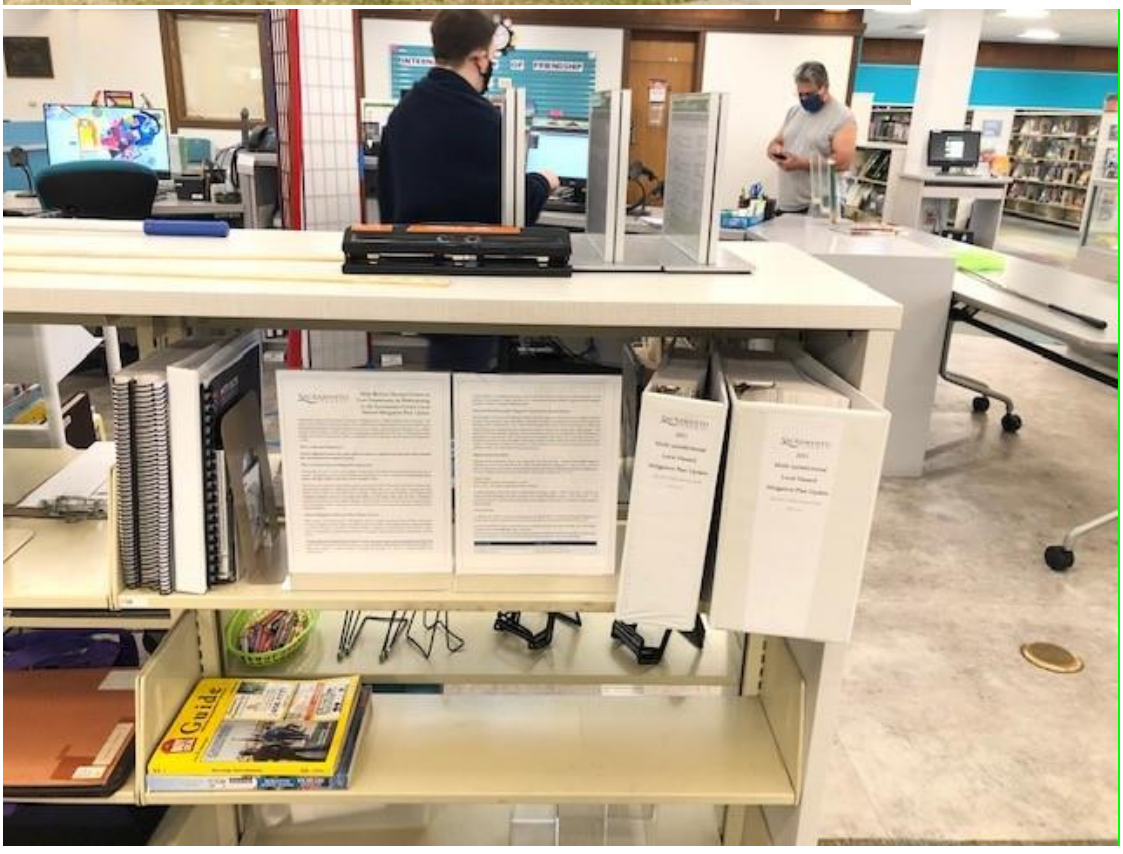


Sacramento County Social Media Post – August 2, 2021

Sacramento County Social Media Posts - August 3, 2021



Public Outreach at Sacramento County Public Library, Downtown (Arcade) Location



LHMP Survey

An integral element in hazard mitigation planning is broad public participation. Information provided by residents fosters a better understanding of local hazard concerns and can spawn innovative ideas to reduce impacts of future hazard events. A public opinion survey was accomplished to gather information from Sacramento County Planning Area residents concerning local hazards. The survey was located on the County's LHMP website and survey participation was promoted through public meetings, program websites, press releases, social media, digital ads, and a Comcast commercial. as previously described. Following is a summary of survey results.

- 190 individuals took the survey.
- 51 out of the 190 people who responded were extremely concerned about the possibility of the community being affected by a disaster.
- Wildfire, drought, flood, and levee failure were hazards of greatest concern.
- 52 out of 183 respondents noted that their house was in a floodplain, 50 out of 183 didn't know if their home was in a floodplain.
- 85 out of 182 respondents noted that their house was protected by a levee, 31 out of 183 didn't know if their home was protected by a levee.
- 87 out of 181 respondents had experienced a natural disaster.
- TV, email, direct mailings, and social media were the best choices to reach the public regarding disaster information and making homes more disaster resistant.

Public Comments Received and How Addressed

Comment Date	Person Commenting	Method Received			Comments	How addressed?
		Email	Phone	Written		
6/23/2021	Tom Monahan	X			Hi Jeanie, You may recall my concerns about Sacramento disaster planning for urban fires. Attached is a copy of a front page article in today's Sacramento Bee about how homeless camp fires could readily spread to neighborhoods. The paper also includes an opinion piece (not attached) called 'American River Parkway lost to indifference' by Marcos Breton. I fear that with the extensive drought, the indifference to potential fires goes way beyond just the Parkway. Thanks again for all of your efforts to try to plan for all the disasters we may face. Tom Monahan	Items sent were incorporated into the Risk Assessment for wildfire as well as in the Mitigation Strategy. .

5/25/2021	Ann Kohl	X			Jeanine, This extensive and impressive report appears to be the draft for Mitigation Strategy Development for the City of Citrus Heights. I may have missed the draft for the Arden Arcade and Carmichael areas. Please send me the 2016 drop box base information, as well as any updates now available for Mitigation Strategy Development and risk assessment for the Arden Arcade Carmichael Communities. I would also appreciate it if you would identify under Subject, the specific communities involved, so we can easily identify the information provided. Questions: Is there coordination now with the County and cities on their Climate Action Plans? Unfortunately I have lost track of where we are in the LHMP Update process. Is there a revised calendar for when your firm will be releasing drafts of specific Local Hazard Mitigation Plans, and receive back comments? When do you anticipate that the draft for the overall Sacramento area will be available and open to receive public comments? Is there an revised estimate as to when the draft LHMP Update will go to the BOS? Thanks for keeping me in the loop. Ann	Hi Ann, Sorry for the delay in my response. I have had your email up since last week. You are correct, this is a large report. A couple of items to note: It is actually individual jurisdictions that are participants to the LHMP based on FEMA requirements as to who is eligible. They must be an independent jurisdiction, with their own governing board. Thus the County, all the cities, and many special Districts are participants to this LHMP for a total of 32 participating jurisdictions. The list is provided at the end of this email. So, "areas" are not eligible to "participate" under this LHMP, but would fall within the jurisdiction where they are located. That said, the flood issues within the Arden Creek and Carmichael areas are mostly captured within the unincorporated County. The Hazard Risk Assessment for the County and the Sacramento County Planning Area are included in Chapter 4 of the Base Plan. With respect to information on your areas of interest, there is information on past occurrences/flood issues based on input received. I would also suspect, that there are other areas within the flood risk assessment of the LHMP that address the areas without naming them specifically, based on data received from different sources. For example, in Chapter 4, issues specific to Arden Creek and Carmichael areas is mostly found in the Past Occurrences sections of Chapter 4. I saw reference to past issues on pages 4-92, 4-216, 4-77 and 4-276. This LHMP is really a big picture document reflecting the totality of the hazards in each participating jurisdiction; it should not be thought of as a detailed study of any one area, which are generally done through other planning and design mechanisms. The dropbox link to access all of these 2021 documents is in the below email. There is not an active dropbox location for the 2016 LHMP, although you can still access it on the County's Storm Ready website: This project is currently in the internal Planning Committee Draft review stage, which is why you received this email. A public review draft will be going out in July; there will be a public and final planning committee meeting in August and the 2021 LHMP Update is on schedule to go to Cal OES and FEMA for review and approval in September. As far as you question on the Climate Action Plan Coordination between the County and cities, I am not in the loop on that. I do know that in February, the County provided a draft of their updated Climate Action Plan. This LHMP project is done with the primary focus of providing FEMA eligibility for mitigation grant funding as well as developing information on the Risk and Vulnerability of the Sacramento County Planning Area and its participating jurisdictions to various natural hazards. Again, that said, it is intended to be a high level document to meeting FEMA requirements for an approved LHMP, and doesn't drill down to all the individual issues; although, possible mitigation measures can certainly focus on more detailed areas. Thanks for reaching out. Hope that helps.

Comment Date	Person Commenting	Method Received			Comments	How addressed?
		Email	Phone	Written		
4/13/2021	Wendy Wilkinson	X			Hi Jeanine and George, I'm going over the voting and have two questions. Is my house included in this category: Implement Delta Small Communities (flood risk reduction plan for the communities of Hood, Courtland, Locke, Walnut Grove East, and Walnut Grove West/Ryde) Do you have a description of what this is? Also, what does RD stand for? In the category: Delta RDs – address internal drainage issues Thank you, Wendi	Hi Wendi, I will answer the second question. RD stands for Reclamation Districts – we have many RDs participating in this LHMP. As far as your first question, I will defer to George. I am not entirely sure where your house is and he is the one running the Delta Small Communities projects. In general, the Delta Small Communities project is being done for the five communities listed below. One of the goals is to identify various flood control options for the protection of those communities. I hope that helps. Again thanks for being part of the LHMP process and let me know if you have additional questions. Jeanine Foster

2/22/2021	Ann Kohl	X			Jeanine, Appreciate your getting back to me regarding my question as to the omission of the 1960 season flood records. See attached pictures from 1960's flood. These attached pictures were taken inside the Roxburgh home (2719 Laurel Dr.) in 1960. Al is standing in the water. I remember vividly that flood, since we had just moved into our new home along the Sierra Branch of the Strong Ranch Slough and were the Roxburgh's neighbors. Al Roxburgh provided extensive historical records of flooding both before and after Folsom Dam. His family was one of the original residents living along the Sierra Branch of the Strong Ranch Slough, and Al wrote a history of the neighborhood. I have his correspondence and records. Their home with its extensive flood plain and water retention area has just sold. The pictures were were on display, along with the attached County Study Map of the Sierra Branch, at the SOV neighborhood's fall annual meeting. They should be in the County DWR records. There was severe general flooding that 1960-1961 winter season. Even with the Folsom Dam I recall that levees went down in the Delta, the agricultural open space at H Street bridge was flooded, our neighborhood roads flooded and we couldn't get out. Fair Oaks Blvd. at Monroe wasn't passable, and	Pictures and documents were used to discuss that section of river, as well as past occurrences of flooding.

					the flood water over our yard was well over 2 feet, within 1 foot of our living room. The Sierra Branch was over its banks. Its flood plain and water retention areas were inadequate to handle the drainage or the severity of the storm and volume of rain water. Backflow came into the neighborhood as the American River was at capacity and the pumps at the levee were turned off. Also attached is the Roland Brady consultant's geology report, which discusses the Sierra Branch and has recommendations. There is also a lot of information on the concerns of individual residents with the impacts from new construction flooding lower neighbors. This is due to the increase in impervious surface area, builders scraping vegetation and grading lots prior to construction and elimination of water retention areas. This heightens FEMA risks for flooding. Is it possible for mitigation to require Title Companies, at point of sale, to reveal the risk of flooding for the parcel being sold, so new buyers know their specific hazard for future flooding. FEMA flood insurance might be required at point of sale and expand those with flood insurance, perhaps reducing the cost for all those carrying the insurance. Two requests: Please send the power point that you presented at the zoom meeting. The	

Comment Date	Person Commenting	Method Received			Comments	How addressed?
		Email	Phone	Written		
					information was impressive and I wanted to share it with park districts, the SOVNA Board members and others. Also can you provide a link to the grants by FEMA and others that you cited? Sending my best wishes and looking forward to receiving materials for the March meeting. Ann Kohl, Arden Arcade Sierra Branch Network	

2/19/2021	Tom Monahan	X			Thank you for notifying me about your February 17, 2021 LHMP Risk Assessment Update (Zoom) Meeting, which I found to be informative about the status of current Sacramento County disaster planning. I am writing as a member of the general public, residing in the City of Sacramento, in response to your plea in that meeting for comment on the planning to date. My main disaster planning concern is in regard to the prospect of urban wildfires, such as have occurred in recent times in Northern California. More specifically, I am concerned that possibly climate driven increases in the number and severity of wind events could lead to more devastating wildfires in the canopy of trees common in many densely populated areas – such as the City of Sacramento, which is known as the 'City of Trees.' In the material presented in your Risk Assessment meeting, I briefly noted the wildfire map for the county, which identified almost all of the perceived risk (in yellow) to be in the more non-urban eastern portions of the county – with, if I saw correctly, a tiny sliver of yellow along the American River. There did not appear to be any indication of risk to any of the cities in the county. That could be a significant oversight. During the heat, winds and fires of last August through October, I	Hi Tom, As I am working on sending a follow up to the Mitigation Strategy for the Sacramento County LHMP. I wanted to thank you for your input. I believe most of your items were addressed either in the wildfire risk assessment that you will see included in the updated LHMP as well as in the proposed mitigation action items. Specifically, based on your annotated input, the following is addressed: WF-1 - Map and Assess Vulnerability to Wildfire: Wildfire hazard areas are identified in the updated Chapter 4 Risk Assessment for the entire Sacramento County Planning Area and specific to each participating jurisdiction. While it is not a scenario based assessment, potential loss estimates, key impacts and vulnerabilities are included in the wildfire risk assessment. WF-2 – Incorporate Wildfire Mitigation Into the Comprehensive Plan: Key wildfire risk assessment data, policies, and recommendations for addressing wildfire risk are integrated into the County and City General Plans and to some extent in the County and City Emergency Operation Plans. Cal Fire requires incorporation into the General Plan for any community that has areas located within the Very High Fire Hazard Severity Zone. WF-6 – Structure and Infrastructure Projects: You are correct that retrofitting at-risk structures with ignition resistant materials is generally cost prohibitive in an urban area. There is a proposed action to consider this approach for critical facilities and other at-risk structures, but it likely will be difficult to implement on a larger scale WF-7 – Create Defensible Space around Structures and Infrastructures: This is also an important strategy. The County and Cities all have some type of vegetation management and defensible space ordinance that is intended to address these issues. Enforcement of these requirements have always been the issue. This will continue as a mitigation strategy in this LHMP. WF-8 – Conduct Maintenance to Reduce Risk. Your idea of: Routinely inspect and repress the use of open fires among homeless encampments – particularly during periods of high winds during dry seasons. This is a great idea, and one that is implemented on a more informal basis. It is recognized that homeless camps contribute to ignitions. WF-9 – Implement a Fuels Management Program: Yes, this is being implemented by fire districts throughout Sacramento County at an urban scale. It is also part of the mitigation strategy for this LHMP. WF-10 – Education and Awareness Programs/FireWise Communities: This mitigation strategy is most often found in areas with a significant Wildland Urban Interface (WUI) areas. The concept of forming neighborhood groups to conduct education and mitigation in specific neighborhoods is a good one, but not likely to gain much traction in

					recall several or more days of winds in Sacramento gusting to 40mph, or more, through treetops and across leaf piles, dry grass and other potentially combustible materials. At times, it appeared to me that even an ill-timed spark from a BBQ, an electrical wire or any other source could potentially spread and grow rapidly – possibly reaching the tree canopy above, and intensifying. In that same time period, I have also bicycled along the American River pathway. The area is populated with numerous homeless camps scattered among the trees and dry brush. The number of people and the large and continual food preparation that takes place in those areas would appear to be a significant potential wildfire threat. I have seen open fires throughout that area and, in a strong wind, a wildfire could seemingly easily spread to the canopy of trees – and even cross the river. When these concerns first came to my attention, I attempted to contact the City of Sacramento through its 311 service system (inquiry #200910-208660) – from which I was subsequently referred to the City Urban Forestry Department, and later to the Fire Department. In neither case was I able to find anyone who could speak knowledgeably to me about planning or preparations to contend with urban	Sacramento County, unless there is an area or two where neighborhood groups are willing to take on the effort. I don't see this being viable in Sacramento County. WF-11 & WF-12– Increase Wildfire Risk Awareness/Educate Property Owners: This is always an effective approach to wildfire mitigation in all areas. It will be part of the Public Outreach efforts countywide and for all jurisdictions. Again, thank you for taking the time to provide input. I do believe that given the regional wildfires in California over the last several years, the urban wildfire issue is becoming a greater concern and will be reflected as such in the updated LHMP. Jeanine Foster

Comment Date	Person Commenting	Method Received			Comments	How addressed?
		Email	Phone	Written		
					wildfires. It was not until I contacted my City Counsilman, Jay Schenirer's office directly, that I was referred to your disaster planning process. From your Risk Assessment meeting, I understand that the City of Sacramento, as with all jurisdictions, would need to have mitigation action plans in order to be included in the planning process, and to be recognized by FEMA. I also understood that the responsibility for the creation of such plans is local responsibility which, I presume, means at the discretion of each individual jurisdiction. Yet, having already made several calls and other contacts in regard to potential urban wildfire planning, my comments here represent my latest and best effort to direct attention to the need for planning in that regard. My hope is that, by offering these comments about your risk planning efforts, more thorough attention will be directed to risks and potential mitigations for urban wildfires in the County, the City of Sacramento (and its other urban jurisdictions) – thereby helping to prevent some future urban wildfire(s.) Again, thank you for the opportunity to present these concerns.	

2/17/2021	Ann Kohl, Chris Tooker, Steve Fishbein, Anne Del Core	X			All, Jeanine is the consultant on the County's (FEMA required) Update of its Risk Assessment Plan. The third meeting is today at 1 PM. See below for the notification and invite to attend today's meeting and submit your comments. The Arden Arcade Sierra Branch Committee submitted a safety request at the second meeting as we are alarmed that the Sierra Branch of the Strong Ranch Slough is not now included in the County's ALERT system for flooding. Therefore residents living along the two tributaries of the Sierra Branch do not receive advance warning of flash floods. We have requested that the Sierra Branch be monitored and included in the ALERT system. Also we have requested a civil defense plan be developed to notify residents with lots, streets, streams and creeks subject to flooding where to go when we need to move to higher ground. Roads (Morse, Fulton at Monroe, Joseph, Jonas, Northrop, Sierra Blvd., Laurel Dr., Crocker, Adams, etc.) historically have not been passable when we have had approximately 2" of rain in 12 hours and with general flooding. Climate Change projections are that the Sacramento area will have more years of drought and then short periods of intense rain storms. The American and Sacramento Rivers	Meeting was attended by some of these residents.

Comment Date	Person Commenting	Method Received			Comments	How addressed?
		Email	Phone	Written		
					may in the future be at capacity and local drainage pumps turned off causing back flow into our neighborhoods. SOV resident experienced significant flooding in 1960, 1986, 1997 and 2017 and many of us who were here then carry FEMA flood insurance. (Title insurance doesn't doesn't seem to provide this historical flooding information to new buyers.) Three neighbors reported that they received notification from FEMA that their flood insurance was available to help them finance raising their homes. Hope that some SOV residents can attend today's meeting. Ann Kohl	

10/27/2020	Supervisor Susan Peters; Chris Tooker; Mary Swisher; Jenny Smith; Beth McClure; Barbara Gardner and Dohald Thornberry; Lois Kerr; Mike Grace Sara Hunt; Sara Lu and Zane Vorhes; Karen and Dennis Loheit; Anne Bowlus; Norm and Sue Poppon; Will Roxburgh; Kitty Sorrells; Henry and Darleen Saunders; Kenneth Noack; Rob Burness; Roland Brady; Gregg Fishman; Terri Townsend; Ted and Lauri Defazio	X			In the update presently underway we are seeking assurance that the County Alert system for flooding will monitor and include the Sierra Branch of the Strong Ranch Slough. Presently it does not. See the DWR County study map of the Sierra Branch's two tributaries for recent history of flooding. I received the DWR "Be Storm Ready!" mailer. It does include a lot of very valuable information. Please email me a copy and I will send it again to all my neighbors on the Sierra Branch Committee. Our neighborhoods are presently seeing significant changes in drainage with all the new construction and renovations, with the decrease in impervious surface area and diminished floodplains and water retention areas. We need for there to be information included from the County DWR that all owner's are required to get permits for any new construction and renovations. Impervious surface area must be limited and not be increased. Those of us lower in the watershed's natural drainage system, or even next door, are now being flooded from storm water runoff with new construction and renovation projects. We need for the County DWR to monitor permits pulled by owners for their projects, so that their stormwater runoff will be retained on site.	Their comment was acknowledged and was circulated to the County. With respect to the permit process, it was confirmed that there is a permit process with specific requirements to address stormwater issues that must be followed in any development project.

A.3 Sacramento County Step 3: Coordinate (with other Agencies)

This planning step credits coordinating with other agencies and key stakeholders and incorporating other plans and other agencies' efforts into the floodplain management plan or LHMP. Other agencies and organizations were contacted to determine if they have studies, plans and information pertinent to the floodplain management plan, to determine if their programs or initiatives may affect the community's program, inviting them to participate in the planning process, and otherwise asking them to support the community's efforts in this LHMP Update. Coordination efforts with these other agencies are documented in Table A-3 below and as detailed throughout the LHMP Update, specifically in Chapters 3 and 4, as well as in Appendix B, references.

Table A-3 List of Agencies and Key Stakeholders Coordinated with Through the 2021 LHMP Update Process

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
CA DWR/ Michael Gill	10/28/2020		X			Obtained NFIP Community Information System Data to support the LHMP Update process
CA DWR/ Sami Nall	11/10/2020		X			Obtained input on DSOD dam data to support the LHMP process and inviting input to the process
California Dept of Conservation	11/6/2020	Website request	X	X		Williamson Act data
California Dept of Conservation	11/13/2020		X	X		Williamson Act data and other important famland
National Weather Service/ Michelle Mead	12/7/2020		X			Checked in with NWS to determine any new data sources for weather to support the LHMP update

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
City of Citrus Heights/Jason Baldwin, Police Lieutenant	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
City of Citrus Heights/Kris Frey, Police Lieutenant	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
City of Elk Grove/Jamie Hudson, Real-Time Info Supervisor	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
City of Folsom/Rick Hillman, Police Chief	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
City of Galt/ Brian Kalinowski, Div. Commander Galt PD	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
City of Rancho Cordova/ Todd Humphrey, Facilities Manager	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
City of Rancho Cordova/ Tim Watson, Facilities Manager staff	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Law Agencies/Mark Cherry, Sergeant Sac Sheriff	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
Fire Districts/Charles Jenkins, Assistant Chief, SMFD	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Fire Districts/Tyler Wagaman, Assistant Chief, SMFD	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Flood Control and Reclamation District/Lennard Bravo, Associate Civil Engineer	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Flood Control and Reclamation District/Rodney Goss, Senior Civil Engineer	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Water Districts/ Steve Pimentel, DWR Sr. Civil Engineer	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Utility Districts/ Kyle Broyhill, Emergency Preparedness Specialist II SMUD, Vice Chairperson	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Utility Districts/ Antoinette Benson, SMUD Project Manager II	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Public Health/ Olivia Kasirye, DHHS Public Health Officer	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
Public Health/ Brian Aiello, DHHS Sr. Health Program Coordinator	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Non-governmental organizations/ Holly Brown, Program Manager Hands on Sacramento	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Non-governmental organizations/ Lynn Pesely, MRC	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento County Coroner/ Kimberly Gin, Sac County Coroner	7/28/2021	Sacramental Operational Area Council Outreach email via County OES	X			Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento Metro Fire/ Robert Bruce	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento Metro Fire/ Randall Hein	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
Sacramento Metro Fire/ Maurice Johnson	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Child Action Inc./ Carmela Garcia	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Child Action Inc./ Jennine Greenwell	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
211 Sacramento/ Laurie Simon	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
Cal OES/Lindsey Stanley	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
California Department of Development Services/ Tamara Rodriquez	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
California Highway Patrol/ Robin Johnson	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento City Unified School District/ Miamah Reed	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
Sacramento City Unified School District/ Victoria Flores	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento County Office of Education/ Joelle Orrock	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Yolo County/ Douglas Brim, EMS Coordinator	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
SMUD/ Patrick Durham	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
The Regional Center for Volunteerism-Hands On Sacramento and the Sacramento region Emergency Food & Shelter Program/Community Link Capital Region/ Valeri Mihanovich	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento-Yolo Mosquito and Vector Control District/ Gary W Goodman, Manager	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento Native American Health Center, Sacramento/ Britta Guerrero, CEO	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento Food Bank/JR Hine	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
FBI/DF Dewall	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento Air Quality Management District/ J Arno	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento Air Quality Management District/ M Loutzenhiser	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
Sacramento Air Quality Management District/ J Chan	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft

Agency Name/ Contact	Date	Mechanism	Contacted via Mail/email	Contacted via Phone	Contacted Face-to Face/Virtual Meeting	Topics Discussed
Sacramento Air Quality Management District/ J Arno	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
City of Sacramento Fire Department/R Potter	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
City of Sacramento Fire Department/JM Sirney	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft
California Highway Patrol/VT Goonis	1/28/2020 & 7/29/2021	Public Health Emergency Preparedness (PHEP) Partnership Meeting (1/28/20) and PHEP Outreach email (7/29/21)	X		X	In 2020, informed the group that the LHMP Update was soon to be initiated/Solicited input on the Sacramento County LHMP Update Public Review Draft

CA DWR/Michael Gill

From: Gill, Michael@DWR <Michael.Gill@water.ca.gov>
Sent: Wednesday, October 28, 2020 2:06 PM
To: Jeanine Foster <jeanine.foster@fostermorrison.com>
Subject: RE: NFIP community data request

Hi Jeanine,

I have attached the CIS information of the nine communities that were requested below. If you need anything else please let me know.

Thank You,

Michael Gill
Engineer, Water Resources
Community Assistance Section
Office of Floodplain Management
Division of Flood Management
CA Dept. of Water Resources
Office: 916-574-1471
Mobile: 916-261-2582

California Dept of Conservation

Good Morning,

Your request for Williamson Act data was forwarded to me.

Due to the lack of city and county reported enrollment data, the Department of Conservation does not host Williamson Act enrollment maps and/or data. For the most current and up to date information on the status of Williamson Act contracted parcels the Department suggests that interested parties contact the city or county in which the property resides. As you know the Williamson Act allows local landowners to enter into contracts with cities and/or counties, and as such, the participating city/county must retain a copy of each contract and therefore should have a record of each contracted parcel within its jurisdiction.

Sincerely,

Farl Grundy
Associate Environmental Planner
Division of Land Resource Protection
Williamson Act / CEQA

California Department of Conservation
801 K Street, MS 14-15, Sacramento, CA 95814
T: (916) 324-7347
E: Farl.Grundy@conservation.ca.gov

California Dept of Conservation

From: Kisko, Kerri@DOC <Kerri.S.Kisko@conservation.ca.gov>
Sent: Friday, November 13, 2020 5:45 PM
To: Chris Morrison <chris.morrison@fostermorrison.com>
Subject: RE: Release of documents

Chris,

I have finished updating all the documents for Placer (2016), Sacramento (2018), Sutter (2018), and Yuba (2018). I have not had time to update the links on the website yet, but I didn't want you to have to wait until next week.

I have attached the documents that meet the Accessibility Standards for publishing. These include: Prime & Statewide Soils Lists (Sacramento_gSSURGO.pdf, Sutter_gSSURGO.pdf, and Yuba_gSSURGO.pdf); Land Use Summary Tables (SAC_1988_2018.xlsx, SUT_1988_2018.xlsx, and YUB_1988_2018.xlsx); and Alternate Conversion Tables (Alternate_Sacramento_County_2016-2018_Land_Use_Conversion.pdf, Alternate_Sutter_County_2016-2018_Land_Use_Conversion.pdf, and Alternate_Yuba_County_2016-2018_land_Use_Conversion.pdf).

Several of our documents are not currently ADA compliant for the web due to time constraints and/or complexity. These documents are available through our File Request System. I have included the links to these documents below:

Placer County 2016:

(Placer 2014-2016 Conversion Table) placon16.xls:
https://filerequest.conservation.ca.gov/RequestFile/2817629

(Placer Prime & Statewide Soils List) Placer_gSSURGO.pdf:
https://filerequest.conservation.ca.gov/RequestFile/2817748

(Placer Land Use Summary Table) PLA_1984_2016.xls:
https://filerequest.conservation.ca.gov/RequestFile/2817823

(Placer 2016 PDF Map) Pla16.pdf:
https://filerequest.conservation.ca.gov/RequestFile/2816267

Placer County Important Farmland Metadata.docx:
https://filerequest.conservation.ca.gov/RequestFile/2816268

Sacramento County 2018:

(Sacramento 2016-2018 Conversion Table) saccon18.xlsx:
https://filerequest.conservation.ca.gov/RequestFile/2817662

(Sacramento 2018 PDF Map) sac18.pdf:
https://filerequest.conservation.ca.gov/RequestFile/2816273

Sacramento County Important Farmland Metadata.docx:
https://filerequest.conservation.ca.gov/RequestFile/2816274

Sutter County 2018:

(Sutter 2016-2018 Conversion Table) sutcon18.xlsx:
https://filerequest.conservation.ca.gov/RequestFile/2817671

(Sutter 2018 PDF Map) sut18.pdf:
https://filerequest.conservation.ca.gov/RequestFile/2816308

Sutter County Important Farmland Metadata.docx:
https://filerequest.conservation.ca.gov/RequestFile/2816309

CA DWR/Sami Nall

Email Log

Project: Sacramento County 2021 LHMP Update		**Date: 11/10/20**
Contact Name	Sami Nall, Sr. Engineer	
Contact Organization	CA DWR, Office of Floodplain Management	
Contact Email	Sami.Nall@water.ca.gov	
Subject	DSOD Dam Data: Hazard Classifications and Inundation Data	

Items Discussed
Reached out to Sami Nall at CA DWR to find out what source should be the most current for determining Hazard
Classifications and inundation data for dams, as different sources reported different data even within the CA DWR
DSOD. Sami indicated that both an annual document and the DSOD viewer should be current, but that the viewer
Should take precedent.

Follow-up		
By	Name:	Organization
	Jeanine Foster	Foster Morrison

From: Nall, Sami@DWR <Sami.Nall@water.ca.gov>
Sent: Tuesday, November 10, 2020 8:53 AM
To: Jeanine Foster <jeanine.foster@fostermorrison.com>
Subject: RE: California DWR, DSOD data

Hi Jeanine, Let me ask DSOD about this as I would think the viewer would be more current. However there is an updated document (dated 2019) at this link: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/All-Programs/Division-of-Safety-of-Dams/Files/Publications/2019-Dams-Within-Jurisdiction-of-the-State-of-California-Alphabetically-by-County_a_y20.pdf.

I believe DSOD publishes an updated list every year. However, it may be taking longer to publish it because of accessibility rules. I'll also check to see if an updated list will be published in 2020.

Thanks,
Sami

Sami Nall, P. E.
Senior Engineer, Office of Floodplain Management
Department of Water Resources
3464 El Camino Avenue, Suite 200
Sacramento, CA 95821
Office: 916.574.1432
Email: Sami.Nall@water.ca.gov

National Weather Service/ Michelle Mead

Email Log

Project: Sacramento County 2021 LHMP Update	**Date: 12/7/20**
Contact Name	Michelle Mead, Meteorologist in Charge
Contact Organization	National Weather Service, WFO Sacramento
Contact Email	michelle.mead@NOAA.gov
Subject	Weather Data and Available Weather Stations

Items Discussed
Reached out to Michelle to determine where to go for better/updated weather data as some of the weather stations
have limited data and some have stopped keeping data altogether. We try to find the stations that have the most data
for the longest period of record (POR). Michelle suggested looking at: XMACIS: https://xmacis.rcc-acis.org/ - a site
that has a lot of climate information.

Follow-up		
By	Name:	Organization
	Jeanine Foster	Foster Morrison

From: Michelle Mead - NOAA Federal <michelle.mead@noaa.gov>
Sent: Monday, December 7, 2020 11:39 AM
To: Jeanine Foster <jeanine.foster@fostermorrison.com>
Subject: Re: California Weather Data

Good morning Jeanine~

XMACIS: https://xmacis.rcc-acis.org/ is a site that has alot of climate information you may also find useful. It's not the most user friendly, but does give you access to all historical climatological data. The Marysville AP data on this site is up to date. I added the max temps for Marysville over the past 20 years as an example.

I have been getting these hazard mitigation emails, but have not been able to attend.

Sincerely,
Michelle

Michelle Mead
Meteorologist in Charge (MIC)
National Weather Service
WFO Sacramento
3310 El Camino Ave. Suite 228 95821-6373
Office: (916) 979-3041 x222
Cell: (406) 370-8882

City of Citrus Heights/Jason Baldwin, Police Lieutenant

From: Gieselman. David <GieselmanD@SacOES.org>
Sent: Wednesday, July 28, 2021 12:25 PM
To: Flynn. MaryJo <FlynnM@sacoes.org>; Hawkins. Matthew <HawkinsM@SacOES.Org>; dbowers@cityofsacramento.org; jgottlob@cityofsacramento.org; jbaldwin@citrusheights.net; kfrey@citrusheights.net; Hudson. Jamie <jhudson@elkgrovepd.org>; rhillman@folsom.ca.us; Kalinowski. Brian <bkalinowski@galtpd.com>; cbergson@cityofisleton.com; thumphrey@cityofranchocordova.org; twatson@cityofranchocordova.org; Cherry. Mark (SacSheriff) <MCherry@sacsheriff.com>; jenkins.charles@metrofire.ca.gov; Wagaman. Tyler S. <Wagaman.Tyler@metrofire.ca.gov>; Bravo. Lennard <bravole@saccounty.net>; Goss. Rodney <gossr@SacCounty.NET>; Pimentel. Steven <PimentelSt@saccounty.net>; christopher.broyhill@smud.org; antoinette.benson@smud.org; Kasirye. Olivia <KasiryeO@saccounty.net>; Aiello. Brian <AielloB@saccounty.net>; hbrown@communitylinkcr.org; Pesely. Lynn <peselyl@SacOES.Org>; Gin. Kimberly <GinK@saccounty.net>
Cc: Jeanine Foster <jeanine.foster@fostermorrison.com>; Booth. George <boothg@SacCounty.NET>
Subject: Comments Requested: Sac County 2021 LHMP Update

This message is sent to all Sacramento Operational Area (OA) Council representatives and alternate reps.

Please see the attached Press Release related to the LHMP Update, as well as the text and weblink below from Jeanine Foster at Foster Morrison Consulting.
Contact information and comment instructions are provided in the attachment. Due date for comments is August 13, 2021.

Thank you,

David Gieselman, Senior Office Assistant, Sacramento County OES
3720 Dudley Bl. #122, McClellan, CA 95652 gieselmand@sacoes.org
Desk (916) 874-4673, Mobile (916) 366-6119, Fax (916) 854-9565

*** ***
*** ***

All,

WE WANT YOUR INPUT! The Sacramento County 2021 Local Hazard Mitigation Plan (LHMP) Update - Public Review Draft is available for review and comment on the County StormReady.org website at: https://waterresources.saccounty.net/stormready/Pages/Local-Hazard-Mitigation-Plan-2017-Update.aspx.
See attached Press Release for information on how to submit comments and information for attending the final Public and Planning Committee Meetings for this project.

This 2021 LHMP Update Project, kicked off in August 2020, resulted in an updated Countywide LHMP that will guide natural hazard mitigation in the County over the next five years. With 32 participating jurisdictions from the Sacramento County Planning Area and well over 225

mitigation actions and projects identified to date, a FEMA approved LHMP Update for Sacramento County will enable participating jurisdictions to be eligible for FEMA pre and post mitigation grant programs and also supports a reduction in flood insurance premiums to residents of Sacramento County and the City of Sacramento through their participation in the National Flood Insurance Program's (NFIP) Community Rating System (CRS).

If you have any questions, please contact Jeanine Foster at Jeanine.foster@fostermorrison.com or boothg@saccounty.net.

Thanks for your support on this important project!

Jeanine Foster
Foster Morrison Consulting
(303) 717-7171

City of Citrus Heights/Kris Frey, Police Lieutenant

See above image for City of Citrus Heights/Jason Baldwin.

City of Elk Grove/Jamie Hudson, Real-Time Info Supervisor

See above image for City of Citrus Heights/Jason Baldwin.

City of Folsom/Rick Hillman, Police Chief

See above image for City of Citrus Heights/Jason Baldwin.

City of Galt/ Brian Kalinowski, Div. Commander Galt PD

See above image for City of Citrus Heights/Jason Baldwin.

City of Rancho Cordova/ Todd Humphrey, Facilities Manager

See above image for City of Citrus Heights/Jason Baldwin.

City of Rancho Cordova/ Tim Watson, Facilities Manager staff

See above image for City of Citrus Heights/Jason Baldwin.

Law Agencies/Mark Cherry, Sergeant Sac Sheriff

See above image for City of Citrus Heights/Jason Baldwin.

Fire Districts/Charles Jenkins, Assistant Chief, SMFD

See above image for City of Citrus Heights/Jason Baldwin.

Fire Districts/Tyler Wagaman, Assistant Chief, SMFD

See above image for City of Citrus Heights/Jason Baldwin.

Flood Control and Reclamation District/Lennard Bravo, Associate Civil Engineer

See above image for City of Citrus Heights/Jason Baldwin.

Flood Control and Reclamation District/Rodney Goss, Senior Civil Engineer

See above image for City of Citrus Heights/Jason Baldwin.

Water Districts/ Steve Pimentel, DWR Sr. Civil Engineer

See above image for City of Citrus Heights/Jason Baldwin.

Utility Districts/ Kyle Broyhill, Emergency Preparedness Specialist II SMUD, Vice Chairperson

See above image for City of Citrus Heights/Jason Baldwin.

Utility Districts/ Antoinette Benson, SMUD Project Manager II

See above image for City of Citrus Heights/Jason Baldwin.

Public Health/ Olivia Kasirye, DHHS Public Health Officer

See above image for City of Citrus Heights/Jason Baldwin.

Public Health/ Brian Aiello, DHHS Sr. Health Program Coordinator

See above image for City of Citrus Heights/Jason Baldwin.

Non-governmental organizations/ Holly Brown, Program Manager Hands on Sacramento

See above image for City of Citrus Heights/Jason Baldwin.

Non-governmental organizations/ Lynn Pesely, MRC

See above image for City of Citrus Heights/Jason Baldwin.

Sacramento County Coroner/ Kimberly Gin, Sac County Coroner

See above image for City of Citrus Heights/Jason Baldwin.

Sacramento Metro Fire/ Robert Bruce

From: Jeanine Foster
Sent: Thursday, July 29, 2021 6:27 PM
To: jarno@airquality.org; Bruce.robert@metrofire.ca.gov; scajkowskij@scada.org; carmela.garcia@childaction.org; Jenninegreenwell@childaction.org; hein.randall@metrofire.ca.gov; Johnson.maurice@metrofire.ca.gov; jonesmj@sacsheriff.com; metzingerj@saccounty.net; vmihanovich@communitylinkcr.org; myerspaul@saccounty.net; rpotter@sfd.cityofsacramento.org; tamara.rodriguez@dds.ca.gov; laurie.simon@211sacramento.org; jmsirney@sfd.cityofsacramento.org; Lindsey.stanley@caloes.ca.gov; pkent@elkgrovepd.org; jkearsing@elkgrovepd.org; vtgoonis@chp.ca.gov; Johnson, Robin@CHP <RoJohnson@chp.ca.gov>; mloutzenhiser@airquality.org; DBowers@cityofsacramento.org; lgroves@cityofsacramento.org; dfdewall@fbi.gov; stephanie.carillo@phl.org; miamah-reed@scusd.edu; Victoria-flores@scusd.edu; jorrock@scoe.net; nwoodsandrews@scoe.net; jrhine@sacramentofoodbank.org; jchan@airquality.org; brittaag@snahc.org; gwgoodman@fightthebite.net; frodriguez@folsom.ca.us; douglas.brim@yolocounty.org; Patrick.Durham@smud.org; AalborgH@saccounty.net; barcellosm@saccounty.net; CossioC@saccounty.net
Cc: Booth. George <boothg@SacCounty.NET>; Chris Morrison <chris.morrison@fostermorrison.com>
Subject: Sacramento County Local Hazard Mitigation Plan Update - Public Review Draft

All – this message is being sent to the PHEP Partnership Group.

WE WANT YOUR INPUT! The Sacramento County 2021 Local Hazard Mitigation Plan (LHMP) Update - Public Review Draft is available for review and comment on the County StormReady.org website at: https://waterresources.saccounty.net/stormready/Pages/Local-Hazard-Mitigation-Plan-2017-Update.aspx.
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If you have any questions, please contact Jeanine Foster at Jeanine.foster@fostermorrison.com or boothg@saccounty.net.

Thanks for your support on this important project!

From:	Booth. George on behalf of DEP-Johnson. Prabhjot
To:	Pimentel. Dawn; Booth. George
Cc:	Aalborg. Hannah; jarno@airquality.org; troybair@csdfire.com; Barcellos. Mark; Bruce.robert@metrofire.ca.gov; Cantelme. Steve; czajkowskij@sacda.org; Cossio. Carlos; Flynn. MaryJo; carmela.Garcia@childaction.org; GardnerRa@saccounty.net; Gonzalez. Anthony; Jenninegreenwell@childaction.org; Harris. Pamela (DHS); Hein.Randall@metrofire.ca.gov; incer@sacOES.org; Johnson.maurice@metrofire.ca.gov; Ssd-jonesmj@sacsheriff.com; Kasirye. Olivia; Kunker. Shelly; Lewis. Chad (SacSheriff); Magnino. David; Merin. Benjamin; McCoy. Kelly; metzingerj@saccounty.net; vmihanovich@communitylinkcr.org; Moriki. Kelly; myerspaul@saccounty.net; Olson. Karen; Pena. Phyllis; Pesely. Lynn; rpotter@sfd.cityofsacramento.org; Tamara.Rodriguez@dds.ca.gov; Schaefers. James (SacSheriff); Laurie.simon@211sacramento.org; jmsirney@sfd.cityofsacramento.org; Lindsey.stanley@caloes.ca.gov; Tam. Karman; Van Buren. James; Whaley. Doug (DA); White. Jamie; pkent@elkgrovepd.org; jkearsing@elkgrovepd.org; Hawkins. Matthew; vtgonis@chp.ca.gov; rojohnson@chp.ca.gov; MLOUTZENHISER@airquality.org; Mori. Dominico (Nick); DBowers@cityofsacramento.org; lgroves@cityofsacramento.org; dfdewaal@fbi.gov; Gallelo. Julie; stephanie.carillo@phi.org; miamah-reed@scusd.edu; Victoria-Flores@scusd.edu; jorrock@scoe.net; nwoodsandrews@scoe.net; jrhine@sacramentofoodbank.org; jchan@airquality.org; Saelee. Gen (SacSheriff); Cotten. Cody (SacSheriff); brittaag@snahc.org; gwgoodman@fightthebite.net; frodriguez@folsom.ca.us; Bongiorno. Brenda; Sandoval. Andrea; Abe. Elvira; Kelly.Soule@water.ca.gov; Floyd. Megan; Booth. Dana; Karidis. Dennis; Duncan. Robert; douglas.brim@yolocounty.org; Bridges. Clarice; Mohar. Craig (Sacramento PD); Patrick.Durham@smud.org
Subject:	FW: PHEP Partnership Meeting
Start:	Tuesday, January 28, 2020 9:00:00 AM
End:	Tuesday, January 28, 2020 11:00:00 AM
Location:	7001A East Parkway, Sacramento, CA 95823 - Conference Room 1
Attachments:	image002.jpg PHEP Partnership Agenda January 2020.docx

I pitched LHMP at this meeting

Just FYI for CRS credits

FOSTER MORRISON CONSULTING

Meeting Record

Project: LHMP UPDATE - SAC COUNTY	Date: 8/18/20
Meeting Purpose: Public Health Emergency Preparedness Part. Mtg. (PHEP)	

Attendees see attached SIGN-IN (and outside agencies noted below)

Name	Title	Contact Phone

Items Discussed

George Booth represented County DWR in providing presentation on Sac County floodplains. As part of this presentation, George informed the group that the Sacramento County LHMP Update was scheduled to be kicked off in late summer 2020. He further informed the group how they could be involved in the 2020 Sac County LHMP Update.

Follow-up

Consider including PHEP attendees on LHMP Outreach List & inviting them to LHMP Update meetings & providing additional information on how they could be involved in the process

By	Name	Organization
	Jeanine Foster for George Booth	Foster Morrison/Sac County DWR

Sacramento Metro Fire/ Randall Hein

See above image for Sac Metro Fire/Robert Bruce.

Sacramento Metro Fire/ Maurice Johnson

See above image for Sac Metro Fire/Robert Bruce.

Child Action Inc./ Carmela Garcia

See above image for Sac Metro Fire/Robert Bruce.

Child Action Inc./ Jennine Greenwell

See above image for Sac Metro Fire/Robert Bruce.

211 Sacramento/ Laurie Simon

See above image for Sac Metro Fire/Robert Bruce.

Cal OES/Lindsey Stanley

See above image for Sac Metro Fire/Robert Bruce.

California Department of Development Services/ Tamara Rodriquez

See above image for Sac Metro Fire/Robert Bruce.

California Highway Patrol/ Robin Johnson

See above image for Sac Metro Fire/Robert Bruce.

Sacramento City Unified School District/ Miamah Reed

See above image for Sac Metro Fire/Robert Bruce.

Sacramento City Unified School District/ Victoria Flores

See above image for Sac Metro Fire/Robert Bruce.

Sacramento County Office of Education/ Joelle Orrock

See above image for Sac Metro Fire/Robert Bruce.

Yolo County/ Douglas Brim, EMS Coordinator

See above image for Sac Metro Fire/Robert Bruce.

SMUD/ Patrick Durham

See above image for Sac Metro Fire/Robert Bruce.

The Regional Center for Volunteerism-Hands On Sacramento and the Sacramento region Emergency Food & Shelter Program/Community Link Capital Region/ Valeri Mihanovich

See above image for Sac Metro Fire/Robert Bruce.

Sacramento-Yolo Mosquito and Vector Control District/ Gary W Goodman, Manager

See above image for Sac Metro Fire/Robert Bruce.

Sacramento Native American Health Center, Sacramento/ Britta Guerrero, CEO

See above image for Sac Metro Fire/Robert Bruce.

Sacramento Food Bank/JR Hine

See above image for Sac Metro Fire/Robert Bruce.

FBI/DF Dewall

See above image for Sac Metro Fire/Robert Bruce.

Sacramento Air Quality Management District/ J Arno

See above image for Sac Metro Fire/Robert Bruce.

Sacramento Air Quality Management District/ M Loutzenhiser

See above image for Sac Metro Fire/Robert Bruce.

Sacramento Air Quality Management District/ J Chan

See above image for Sac Metro Fire/Robert Bruce.

Sacramento Air Quality Management District/ J Arno

See above image for Sac Metro Fire/Robert Bruce.

City of Sacramento Fire Department/R Potter

See above image for Sac Metro Fire/Robert Bruce.

City of Sacramento Fire Department/JM Sirney

See above image for Sac Metro Fire/Robert Bruce.

California Highway Patrol/VT Goonis

See above image for Sac Metro Fire/Robert Bruce.

A.4 Meeting Handouts

Below are the handouts for each meeting held during the planning process for this Plan Update.

A.4.1. Kickoff Meeting Handouts

Sacramento County Hazard Identification and Profiles –2021

Disaster Declarations and National Weather Service Research

Sacramento County – Disaster Declarations 1950-2020

Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
2020	Covid-19	Pandemic	Pandemic	DR-4482	3/4/2020	1/20/2020
2017	California Severe Winter Storms, Flooding, Mudslides	Flood	Storms	DR-4308	3/7/2017	4/1/2017
2017	California Severe Winter Storms, Flooding, And Mudslides	Flood	Storms	DR-4305	2/10/2017	3/16/2017
2017	California Severe Winter Storms, Flooding, Mudslides	Flood	Storms	DR-4301	–	2/14/2017
2014	Napa Earthquake	Natural	Earthquake	EM-4193	–	9/17/2014
2014	California Drought	Drought	Drought	GP 2014-13	1/17/2014	–
2008	Central Valley Drought	Drought	Drought	GP 2008-03	6/12/2008	–
2008	2008 January Storms	Flood	Storms	GP 2008-01	1/5/2008	–
2005/2006	2005/06 Winter Storms	Flood	Storms	DR-1628	–	2/3/2006
2005	Hurricane Katrina Evacuations	Economic	Hurricane	EM-3248 2005	–	9/13/2005
2001	Energy Emergency	Economic	Greed	GP 2001	1/1/2001	–
1998	1998 El Nino Floods	Flood	Storms	DR-1203	Proclaimed	2/19/1998

Year	Disaster Name	Disaster Type	Disaster Cause	Disaster #	State Declaration #	Federal Declaration #
1997	1997 January Floods	Flood	Storms	DR-1155	1/2/97-1/31/97	1/4/1997
1996	Torrential Winds and Rain	Flood	Storms	GP 96-01	1/21/1996	–
1995	1995 Late Winter Storms	Flood	Storms	DR-1046	Proclaimed	1/10/1995
1995	1995 Severe Winter Storms	Flood	Storms	DR-1044	1/6/95-3/14/95	1/13/1995
1989	Loma Prieta Earthquake	Earthquake	Earthquake	DR-845	10/18/89-10/30/89	10/18/1989
1986	1986 Storms	Flood	Storms	DR-758	2/18-86-3/12/86	2/18/1986
1983	Winter Storms	Flood	Flood	DR-677	12/8/82-3/21/83	2/9/1983
1982	High Tides and Rains	Flood	Storms	-	12/8/1982	–
1982	Heavy Rains and Flooding	Flood	Storms	DC 82-03	4/1/1982	–
1980	Delta Levee Break	Flood	Levee break	EM-3078	1/23/1980	1/23/1980
1977	1977 Drought	Drought	Drought	EM-3023	–	1/20/1977
1973	Southern Pacific Railroad Fires and Explosions (Roseville)	Fire	Explosion	–	4/30/1973	–
1972	Andrus Island Levee Break	Flood	Levee break	DR-342	6/21/1972	6/27/1972
1969	1969 Storms	Flood	Storms	DR-253	1/23/69-3/12/69	1/26/1969
1964	1964 Late Winter Storms	Flood	Storms	DR-183	–	12/24/1964
1963	1963 Floods	Flood	Storms	–	2/14/1964	–
1958	1958 April Storms and Floods	Flood	Storms	DR-52	4/5/1958	4/4/1958
1958	1958 February Storms and Floods	Flood	Storms	CDO 58-03	2/26/1958	–
1955	1955 Floods	Flood	Flood	DR-47	12/22/1955	12/23/1955
1950	1950 Floods	Flood	Flood	OCD 50-01	11/21/1950	–

Source: FEMA, Cal OES

Sacramento County Disaster Declaration Summary Table by Hazard Type 1950-2020

Disaster Type	State Declarations		Federal Declarations	
	Count	Years	Count	Years
Drought	2	2008, 2014	1	1977
Economic	1	2001	0	–
Earthquake	1	1989	2	1989, 2014
Flood (including heavy rains and storms)	19	1950, 1955, 1958 (twice), 1963, 1969, 1982 (twice), 1983, 1986, 1995 (twice), 1996, 1997, 1998, 2008, 2017 (three times)	14	1955, 1958, 1964, 1969, 1983, 1986, 1995 (twice), 1997, 1998, 2006, 2017 (three times)
Hurricane	0	–	1	2005
Levee Break	2	1972, 1980	2	1972, 1980
Pandemic	1	2020	1	2020
Fire	1	1973	0	–
Totals	**27**	–	**21**	**–**

Source: FEMA, Cal OES

Disasters since 2016 Plan

As detailed above, there have been four federal disaster declarations and three state disaster declarations since the 2016 plan:

- 2017 Floods (three federal and two state)
- 2020 Pandemic (state and federal)

NCDC Severe Weather Events for Sacramento County 1950-5/31/2020*

Event Type	Number of Events	Deaths	Deaths (indirect	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Cold/Wind Chill	14	0	1	0	0	$0	$0
Dense Fog	6	6	1	38	0	$2,120,000	$0
Dense Smoke	2	0	0	0	0	$0	$0
Drought	32	0	0	0	0	$0	$0
Excessive Heat	5	6	2	1	0	$0	$0
Extreme Cold/Wind Chill	1	0	0	0	0	$0	$0
Flash Flood	4	1	0	0	0	$4,400,000	$0
Flood	80	1	0	1	0	$8,877,000	$7,800,000
Frost/Freeze	8	0	0	0	0	$200,000	$5,000,000
Funnel Cloud	7	0	0	0	0	$0	$0
Hail	9	0	0	0	0	$111,030	$0
Heat	33	0	1	30	1	$0	$0

Event Type	Number of Events	Deaths	Deaths (indirect	Injuries	Injuries (indirect)	Property Damage	Crop Damage
Heavy Rain	28	0	0	1	0	$365,000	$50,000
Heavy Snow	1	0	0	0	0	$0	$0
High Surf	1	0	0	0	0	$0	$0
High Wind	40	1	0	0	0	$8,957,000	$39,000
Lightning	1	0	0	0	0	$150,000	$0
Strong Wind	26	0	2	2	1	$3,651,000	$0
Thunderstorm Winds	9	0	0	0	0	$50,000	$0
Tornado	13	0	0	0	0	$1,480,000	$0
Wildfire	7	0	1	2	0	$5,000,000	$0
Winter Storm	2	0	0	0	0	$0	$0
Total	**338**	**15**	**8**	**75**	**2**	**$35,411,030**	**$12,889,000**

Source: NCDC

*Note: Losses reflect totals for all impacted areas

**Due to the regional nature of reporting certain hazard events, these hazards are included in the NCDC database for Sacramento County

Sacramento County Hazards Comparison Summary

2016 Sacramento County Plan	General Plan Safety Element	2018 State of California Plan Applicable Hazards	Proposed Sacramento County 2021 Hazards
Agricultural Hazards	–	Agricultural and Silvicultural Pests and Diseases	Agricultural Hazards
Bird Strike	–	–	–
Climate Change	–	Climate Change and Related	Climate Change
Dam Failure	Flooding	Dam Failure	Dam Failure
Drought/Water Shortage	–	Droughts and Water Shortage	Drought & Water shortage
Earthquake	Seismic and Geologic Hazards	Earthquake	Earthquake/ Earthquake Liquefaction
Earthquake: Liquefaction	Seismic and Geologic Hazards	Earthquake	Earthquake: Liquefaction
Flood: 100/200/500-year	Flooding	Flood	Flood: 100/200/500-year
Flood: Localized Stormwater Flooding	Flooding	Flood	Flood: Localized Stormwater Flooding
Landslides	Seismic and Geologic Hazards	Landslide	Landslides
Levee Failure	Flooding	Levee Failure and Safety	Levee Failure
–	–	Pandemic	Pandemic
River/Stream/Creek Bank Erosion	Seismic and Geologic Hazards	Part of Flood hazard	River/Stream/Creek Bank Erosion
Severe Weather: Extreme Temperatures – Cold/Freeze	–	Severe Weather and Storms	Severe Weather: Extreme Cold/ Freeze
Severe Weather: Extreme Temperatures – Heat	–	Severe Weather and Storms	Severe Weather: Extreme Heat
Severe Weather: Fog	–	Severe Weather and Storms	Severe Weather: Fog
Severe Weather: Heavy Rains and Storms (Thunderstorms, Hail, and Lightning)	–	Severe Weather and Storms	Severe Weather: Heavy rain and Storms
Severe Weather: Wind and Tornadoes	–	Severe Weather and Storms	Severe Weather: Wind and Tornado
Subsidence	Seismic and Geologic Hazards	Part of Geologic Hazards	Subsidence
Volcano	–	Volcano	Volcanoes
Wildfire (Burn Area/Smoke)	Fire Hazards	Wildfire	Wildfire

Sacramento County Hazard Identification 2021

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change					–
Dam Failure					Medium
Drought & Water Shortage					High
Earthquake/ Earthquake Liquefaction					Low
Floods: 1%/0.2% annual chance					Medium
Floods: Localized Stormwater					Medium
Landslides					Medium
Levee Failure					Medium
Pandemic					Medium
Severe Weather: Extreme Cold and Freeze					Medium
Severe Weather: Extreme Heat					High
Severe Weather: Heavy Rains and Storms					Medium
Severe Weather: High Winds and Tornadoes					Medium
Wildfire					High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

HISTORIC HAZARD EVENTS WORKSHEET

Please fill out one sheet for each significant hazard event with as much detail as possible. Attach supporting documentation, photocopies of newspaper articles, or other original sources.

Type of event	
Nature and magnitude of event	
Location	
Date of event	
Injuries	
Deaths	
Property damage	
Infrastructure damage	
Crop damage	
Business/economic impacts	
Road/school/other closures	
Other damage	
Insured losses	
Federal/state disaster relief funding	
Opinion on likelihood of occurring again	
Source of information	
Comments	

	Please return worksheets by mail, email, or fax to: Jeanine Foster, Foster Morrison 10298 Boulder Ridge Dr Peyton, CO 80831 fax: (720) 893-0863 email: jeanine.foster@fostermorrison.com
Prepared by:	
Phone:	
Email:	
Date:	

A.4.2. Risk Assessment Meeting Handouts

Status of the 2021 Sacramento LHMP Update Project/Next Steps

LHMP Update Project Schedule/Key Dates

2021 LHMP Update Meetings

- **March 24** (Wednesday) HMPC Meeting #3 (Mitigation Strategy: Goals Development) (1:30-3:30 pm)
- **March 30** (Tuesday) HMPC Meeting #4 (Mitigation Strategy: Actions and Projects) (1:30-4:00 pm)
- **August 3** (Tuesday) Public Meeting #2 (5:30-7:00 pm)
- **August 4** (Wednesday) HMPC Meeting #5 (1:30-4:00 pm)

Mitigation Strategy Meetings - Follow up

- **April 2 (**Friday**)** Mitigation Strategy Actions and Projects processed and voting site launched
- **April 9** (Friday) Voting ends
- **April 13** (Tuesday) Foster Morrison to send Mitigation Action prioritization follow up to HMPC
- **May 7 (**Friday) Planning Team Mitigation Action (Project) Worksheets due to Foster Morrison

LHMP Document Drafts

- **March 15** – **April 1**: Foster Morrison to send out Jurisdictional Annexes for input
- **May 1**: Jurisdictions to return updated Annexes to Foster Morrison
- **May 21** (Friday): HMPC (First) Draft LHMP to County
- **June 18** (Friday): HMPC comments due on Draft Plan
- **July 2** (Friday): Comments incorporated into Public Review (Second) Draft to County
- **July 12** (Monday): Public Review Draft on County website
- **August 13** (Friday**):** all Planning Team and Public input to Foster Morrison
- **September:** Public and HMPC comments incorporated and LHMP submittal to Cal OES – September 2021

Participating Jurisdictions

- County
- All 7 incorporated communities (have base data returned from all but 2 cities)
- 13 Reclamation District Annexes – (have base data returned for all but 7 RDs)
- 9 other Districts
- **30 Total Participating Jurisdictions**

Table 4 Sacramento County Hazard Identification Table

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Significant	Occasional	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Medium	High
Earthquake	Extensive	Occasional	Catastrophic	Medium	Low
Earthquake Liquefaction	Limited	Occasional	Critical	Medium	Low
Floods: 1%/0.2% annual chance	Significant	Likely	Catastrophic	High	Medium
Floods: Localized Stormwater	Extensive	Highly Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Occasional	Limited	Low	Medium
Levee Failure	Extensive	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
Severe Weather: Heavy Rains and Storms	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Medium	Low
Subsidence	Significant	Highly Likely	Limited	Medium	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Critical	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.

Magnitude/Severity
Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths
Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability
Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability
Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Significance
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Climate Change Influence
Low: minimal potential impact
Medium: moderate potential impact
High: widespread potential impact

Risk Assessment Methodology

Calculating Likelihood of Future Occurrence

The frequency of past events is used in this section to gauge the likelihood of future occurrences. Based on historical data, the likelihood of future occurrence is categorized into one of the following classifications:

- **Highly Likely**: Near 100% chance of occurrence in next year, or happens every year.
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Calculating Vulnerability

Vulnerability is measured in general, qualitative terms, and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential:

- **Extremely Low**: The occurrence and potential cost of damage to life and property is very minimal to non-existent.
- **Low**: Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium**: Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High**: Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have already occurred in the past.
- **Extremely High**: Very widespread and catastrophic impact.

Defining Significance (Priority) of a Hazard

Defining the significance or priority of a hazard to a community is based on a subjective analysis of several factors. This analysis is used to focus and prioritize hazards and associated mitigation measures for the plan. These factors include the following:

- **Past Occurrences**: Frequency, extent, and magnitude of historic hazard events.
- **Likelihood of Future Occurrences**: Based on past hazard events.
- **Ability to Reduce Losses through Implementation of Mitigation Measures**: This looks at both the ability to mitigate the risk of future occurrences as well as the ability to mitigate the vulnerability of a community to a given hazard event.

Risk Assessment Summary: Sacramento County Planning Area

Climate Change

- The 2013 and 2018 State of California Multi-Hazard Mitigation Plan stated that climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and both snowmelt and rainwater running off sooner in the year. Climate Change has the potential to alter the nature and frequency of most hazards.
- THE SACRAMENTO COUNTY CLIMATE ACTION PLAN (CAP) VULNERABILITY ASSESSMENT HAD LOTS OF GREAT CLIMATE CHANGE INFO THAT WE USED IN 2016. WHAT IS THE STATUS OF THE FINAL CAP – STILL A DRAFT IN FEBRUARY 2021?
- DOES ANYONE HAVE ANY CLIMATE CHANGE CONCERNS/ISSUES TO NOTE?
- Likelihood of Future Occurrence: Likely
- Vulnerability: Medium
- Priority Hazard

Dam Failure

- There are 27 dams in Sacramento County constructed for flood control, storage, electrical generation, and recreational purposes. Of the 27 dams, 11 are rated as High Hazard, 6 as Significant Hazard, and 10 as Low Hazard.
- 2 Extremely High and 5 High Hazard dams located in neighboring counties also have the potential to impact the Sacramento County Planning Area.
- Since the 2016 LHMP, Folsom Dam has made significant improvements and are continuing to do so. A failure of this dam is unlikely; a significant (200-year) type release would be the likely event.
- A search of the National Performance of Dams database data shows two dam failure incidents for Sacramento County since 1994, both related to the Folsom Dam. However, these incidents were limited in scope and since the incidents occurred, improvements to the Folsom Dam system have been made. Since the 2016 LHMP, the Oroville spillway incident occurred. No disaster declaration in Sacramento for this Oroville event.
- ANY SPECIFIC DAM ISSUES/CONCERNS TO NOTE?
- Likelihood of Future Occurrence: Occasional
- Vulnerability: Extremely High
- Priority Hazard

Drought and Water Shortage

- Historical drought data for the Sacramento County Planning Area and region indicate there have been 5 significant multi-year droughts in the last 84 years.
- 1 federal disaster declarations in 1977; 1 state disaster declaration in 2008; 1 drought State of Emergency in 2014.
- 15 USDA Secretarial Disaster Declarations from drought in Sacramento County since 2002.

- WHAT HAS BEEN IMPACTED THE MOST? HOW HAS WATER SUPPLY BEEN AFFECTED IN THE COUNTY FROM THIS MOST RECENT DROUGHT? WHAT ARE THE MOST SIGNIFICANT CONCERNS MOVING FORWARD?
- Likelihood of Future Occurrence: Likely
- Vulnerability: High
- Priority Hazard

Earthquake

- Geological data indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta area. Numerous faults are located in neighboring counties.
- Recent seismic studies of the Delta area show areas of significant seismic risk.
- There have been two disaster declarations in Sacramento County: 1989 Loma Prieta; 2014 Napa
- There have been several felt occurrences in the County from area earthquakes, with limited damages to the County: USGS reports 40 earthquakes of 5.0 magnitude or greater within 90 miles of Sacramento County since 1850. Only 2 (5.1 and 5.09) of these occurred since the 2014 Napa earthquake, both in 2016.
- WHAT ARE THE MOST SIGNIFICANT ISSUES RELATED TO EARTHQUAKE?
- Likelihood of Future Occurrence: Unlikely – large, damaging earthquake; Occasional – minor earthquake
- Vulnerability: High
- Priority Hazard

Earthquake: Liquefaction

- Sacramento County has two areas that have been suggested as posing potential liquefaction problems due to loose sandy soils and silt and presence of faults- the downtown area and the Delta.
- Although no historic examples of seismically induced levee failure are known in the Delta, the modern levee network has not been subjected to strong shaking. Again recent data shows a significant seismic risk in the Delta that could lead to levee failures.
- HAVE THERE BEEN ANY ISSUES IN THE COUNTY ASSOCIATED WITH LIQUEFACTION?
- Likelihood of Future Occurrence: Occasional
- Vulnerability: High
- Priority Hazard

Flood Hazards

1%/0.5%/0.2% year

- Historically, portions of Sacramento County have always been at risk to flooding because of its annual percentage of rainfall and the number of watercourses and miles of levees that traverse the County.
- Multiple state and federal disaster declarations related to heavy rains and flooding.
- PLEASE – EACH JURISDICTION - PROVIDE PAST OCCCURRENCES OF FLOOD EVENTS SINCE THE 2016 LHMP.
- Likelihood of Future Occurrence: 1%-Occasional; 0.5%-Unlikely; 0.2%-Unlikely
- Vulnerability: High
- Priority Hazard

Localized/Stormwater flooding

- Significant localized flood history in the County – occurs annually
- Each jurisdiction is updating this information on problem areas
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Priority Hazard

Landslides and Debris Flows

- The NCDC contains no records of landslides in the County. There have been no disaster declarations associated with landslides in Sacramento County.
- The topography of the majority of Sacramento County is relatively flat and not subject to landslide. In Sacramento County, only a narrow strip along the eastern boundary, from the Placer County line to the Cosumnes River, is considered to have landslide potential. However, future slides on these slopes are expected to be minor in nature and do not pose a large scale threat to life or property. The American River Bluffs downstream from Folsom and in Fair Oaks and Carmichael are considered stable and are generally not subject to fracture or landslides. TRUE? OTHER AREAS? PAST OCCURRENCES?
- Likelihood of Future Occurrence: Unlikely
- Vulnerability: Low
- Non-Priority Hazard

Levee Failure

- Over 500 miles of levees throughout the County.
- There have been two federal disaster declarations in Sacramento County related to levee failure: 1980 Delta Levee Break and 1972 Andrus Island Levee Break.
- Although numerous documented levee breaks in the Delta area since 1900, most were prior to 1990 and do not reflect future failure potential due to extensive levee improvements in the area.
- Various levee systems improvements are in process throughout the Planning Area that will reduce overall risk of this hazard.
- WHAT ARE THE MOST SIGNIFICANT AREAS/CONCERNS/ISSUES WITH THESE LEVEES MOVING FORWARD?
- Likelihood of Future Occurrence: Occasional
- Vulnerability: Extremely High
- Priority Hazard

Pandemic

- The 20th Century had 3 Pandemics (WHO): 1918-1919 Influenza Pandemic (H1N1),1957-1958 Influenza Pandemic (H2N2), and the 1968 Influenza Pandemic (H3N2). The 21st Century had 2 Pandemics (WHO): 2009 Swine Flu (H1N1) and 2020 Covid-19.
- One 2020 state and federal declaration for Covid-19; the NCDC does not track pandemics.
- As of mid-February 2021, there had been over 90,000 cases of Covid-19 in the County and around 1,372 deaths.
- WHAT ARE SACRAMENTO COUNTY'S BIGGEST COVID-19 IMPACTS/RESPONSE EFFORTS/PRIMARY ISSUES/CONCERNS?

- WHAT ABOUT THE 2009 SWINE FLU?
- Likelihood of Future Occurrence: Likely
- Vulnerability: High
- Priority Hazard

Severe Weather

Extreme Temperatures: Cold and Freeze

- Annual occurrences of winter weather, including extreme cold and freeze. The lowest recorded daily extreme was 17°F on December 11, 1932. In a typical year, minimum temperatures fall below 32°F on 8.3 days with no days falling below 0°F.
- 4 USDA Secretarial Disaster Declarations from cold and freeze in Sacramento County since 2002.
- The NCDC data recorded 26 cold and freeze incidents for Sacramento County since 1993.
- No state or FEMA disaster declarations related to cold or freeze.
- ANY NOTABLE EXTREME COLD/FREEZE EVENTS SINCE 2016 PLAN? WE HAVE NOTED THAT SIX DEATHS OCCURRED IN 2018 AND ANOTHER SIX OCCURRED IN 2019 DUE TO ENVIRONMENTAL EXPOSURE DUE TO EXTREME COLD EVENTS.
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Non-Priority Hazard

Extreme Heat

- Annual occurrences – it gets hot every summer. The highest recorded daily extreme was 114°F on July 17, 1925. In a typical year, maximum temperatures exceed 90°F on 65.4 days.
- 2 USDA Secretarial Disaster Declarations from extreme heat in Sacramento County since 2002.
- The NCDC data shows 38 extreme heat incidents for Sacramento County since 1993.
- ANY NOTABLE EXTREME HEAT EVENTS SINCE 2016 (WE HAVE EVENTS IN 2017 AND 2020 WHERE COOLING CENTERS WERE OPENED)?
- PSPS events had occurred in the Region on June 8-9 of 2019, August 23-25 of 2019, and again on September 23-24 of 2019. OTHERS – DO YOU KNOW IF YOU WILL HAVE PSPS EVENTS IN THE FUTURE?
- Climate change will affect this hazard in the future.
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Priority Hazard?

Heavy Rains and Storms (Thunderstorms, Hail, Lightning)

- Significant County history: annual occurrences
- Multiple state (14) and federal (19) disaster declarations associated with Heavy Rains and Storms and Flooding. 9 USDA Secretarial Disaster Declarations from heavy rains and storms in Sacramento County since 2002.
- The NCDC data shows 38 extreme heavy rains and storm events for Sacramento County since 1950.
- Severe storms/heavy rains are the primary cause of most major flooding.
- ANY NOTABLE HEAVY RAINS/STORM EVENTS SINCE 2016?

- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Medium
- Priority Hazard

Wind and Tornadoes

- Annual occurrences of wind events
- The NCDC data shows 95 high wind events for Sacramento County since 1993.
- The NCDC data shows 19 tornado events (7 funnel clouds, 8 F0s, 3 F1s, 1 F2) for Sacramento County since 1993.
- ANY NOTABLE HIGH WINDS OR TORNADO EVENTS SINCE 2011?
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Low
- Non-Priority Hazard

Subsidence

- Subsidence in the Delta has been a historical problem, occurring on an annual basis. Areas with peat thickness over 10 feet have a great potential for continued subsidence.
- ANY NOTABLE AREAS OF CONCERN BOTH INSIDE AND OUTSIDE OF THE DELTA AREA?
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: Low
- Non-Priority Hazard

Volcano

- Of the approximately 20 volcanoes in the California, only a few are active and pose a threat. Of these, Long Valley Caldera and Lassen Peak are the closest to Sacramento County.
- According to the State Multi-Hazard Mitigation Plan, Sacramento County is not considered to be vulnerable to eruption, but could see some ash (depending on wind direction) from these volcanoes.
- Likelihood of Future Occurrence: Unlikely
- Vulnerability: Extremely Low
- Non-Priority Hazard

Wildfire

- Wildfires occur on an annual basis in the Sacramento County Planning Area
- Any ignition has the potential to become an out of control wildfire.
- Likelihood of Future Occurrence: Highly Likely
- Vulnerability: High
- Priority Hazard

A.4.3. Mitigation Strategy Meeting Handouts

Handouts specific to the ~~Risk~~ Mitigation~~Assessment~~ Strategy Meetings can be found in Appendix C.

A.4.4. Final HMPC Meeting Handouts

The Final Meeting handout is contained in Section 2.2 of the Base Plan.

A.4.5. ~~Initial~~ Early Public Meeting Handouts

Sacramento County LHMP Update: 2021 Hazards

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Earthquake Liquefaction
- Floods: 1%/0.2% annual chance
- Floods: Localized Stormwater
- Landslides, Mudslides, and Debris Flow
- Levee Failure
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms
- Severe Weather: Wind and Tornado
- Subsidence
- Volcano
- Wildfire

Sacramento County Historic Hazard Worksheet (Past Occurrences)

Please fill out one sheet for each significant hazard event with as much detail as possible. Attach supporting documentation, photocopies of newspaper articles, or other original sources.

Type of event	
Nature and magnitude of event	
Location	
Date of event	
Injuries	
Deaths	
Property damage	
Infrastructure damage	
Crop damage	
Business/economic impacts	
Road/school/other closures	
Other damage	
Insured losses	
Federal/state disaster relief funding	
Opinion on likelihood of occurring again	
Source of information	
Comments	

	Please return worksheets by mail, email, or fax to: Jeanine Foster, Foster Morrison 10298 Boulder Ridge Dr. Peyton, CO 80831 fax: (720) 893-0863 email: jeanine.foster@fostermorrison.com
Prepared by:	
Phone:	
Email:	
Date:	

A.4.6. Final Public Meeting Handouts

~~The Final Meeting handout is contained in Section 2.2 of the Base Plan.~~There were no handouts for this meeting; only a PowerPoint presentation.

Appendix B References

2016 Sacramento County LHMP

2018 California State Hazard Mitigation Plan

ArkStorm at Tahoe - Stakeholder Perspectives on Vulnerabilities and Preparedness for an Extreme Storm Event in the Greater Lake Tahoe, Reno and Carson City Region. 2014.

Bureau of Land Management

CA DWR Best Available Maps

Cal Adapt – Extended Drought Scenarios

CAL FIRE GIS datasets

Cal OES

Cal-Adapt

Cal-Adapt – Annual Average of Acres Burned

Cal-Adapt – Number of Extreme Heat Days by Year

Cal-Adapt – Precipitation: Decadal Averages Map

CalAtlas

California Adaptation Planning Guide

California Climate Adaptation Strategy (CAS) – 2014

California Department of Finance

California Department of Fish and Game

California Department of Parks and Recreation Office of Historic Preservation

California Department of Water Resources

California Department of Water Resources (CA DWR) Division of Safety of Dams

California Department of Water Resources Best Available Maps

California Division of Mines and Geology

California Geological Survey

California Natural Diversity Database

California Office of Emergency Services – Dam Inundation Data

California Office of Emergency Services (CAL OES)

California's Drought of 2007-2009, An Overview. State of California Natural Resources Agency, California Department of Water Resources.

Climate Change and Health Profile Report – Sacramento County

Existing plans and studies

FEMA

FEMA Disaster Declaration Database

FEMA: Building Performance Assessment: Oklahoma and Kansas Tornadoes

FEMA's HAZUS-MH 4.2 GIS-based inventory data

Hazus MH 4.2

HMPC input

Integrated Regional Water Management Plan

IPCC Fifth Assessment Synthesis Report (2014)

Kenward, Alyson PhD, Adams-Smith, Dennis, and Raja, Urooj. Wildfires and Air Pollution – The Hidden Health Hazards of Climate Change. Climate Central. 2013.

Levees in History: The Levee Challenge. Dr. Gerald E. Galloway, Jr., P.E., Ph.D., Water Policy Collaborative, University of Maryland, Visiting Scholar, USACE, IWR.

Liu, J.C., Mickley, L.J., Sulprizio, M.P. et al. Climatic Change. 138: 655. doi:10.1007/s10584-016-1762-6. 2016.

Multi-Hazard Identification and Risk Assessment, FEMA 1997

National Drought Mitigation Center

National Drought Mitigation Center – Drought Impact Reporter

National Integrated Drought Information System

National Levee Database

National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) Storm Events Database

National Oceanic and Atmospheric Administration's National Climatic Data Center

National Weather Service

Natural Resource and Conservation Service

NOAA Storm Prediction Center

Pacific Gas and Electric Company

Personal interviews with planning team members and staff from the County

Proceedings of the National Academy of Sciences

Public Health Alliance of Southern California

Public Policy Institute of California

Sacrament County 2035 General Plan

Sacramento Bee

Sacramento County 2035 General Plan

Sacramento County Agricultural Commissioner's Reports, 2010-2014

Sacramento County Airport System

Sacramento County Climate Adaptation Plan (2017 Final and 2021 Draft Update)

Sacramento County Department of Water Resources

Sacramento County Department of Water Resources – 2011 to 2015 Storm Reports

Sacramento County Flood Insurance Study, June 16, 2015

Sacramento County General Plan Background Report

Sacramento County General Plan Environmental Impact Report

Sacramento County General Plan Open Space Element Background

Sacramento County Watershed Master Plan

Sacramento County WMA Strategic Plan

Science Magazine

State of California Department of Conservation

Statewide GIS datasets from other agencies such as Cal OES, FEMA, USGS, CGS, Cal Atlas, and others

U.S. Census Bureau 2010 Household Population Estimates

U.S. Fish and Wildlife Service

U.S. Fish and Wildlife Service's National Wetlands Inventory maps

U.S. Forest Service GIS datasets

U.S. Geological Survey

U.S. Occupational Safety and Health Administration

United States Geological Survey Open File Report 2015-3009

University of California

US Army Corps of Engineers

US Census Bureau

US Department of Agriculture

US Farm Service Agency

US Fish and Wildlife Service

USDA Forest Service Region 5

USGS Bulletin 1847

USGS National Earthquake Information Center

USGS Publication 2014-3120

Vaisala National Lightning Detection Network

Western Regional Climate Center

World Health Organization

Written descriptions of inventory and risks provided by Sacramento County

Appendix C Mitigation Strategy

Sacramento County
Local Hazard Mitigation Plan Update
HMPC Meetings #3 & 4 - Mitigation Strategy Meetings
March 24 & 30, 2021

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AGENDA

Sacramento County
Local Hazard Mitigation Plan (LHMP) Update
HMPC Meetings #3 & #4 - Mitigation Strategy Meetings
March 24 & 30, 2021

HMPC Meeting #3: (2 hours)

1. Introductions
2. LHMP Project Status and Next Steps/Timeline
3. Priority Hazards Review
4. Develop Plan Goals and Objectives
5. Introduction to HMPC Meeting #4: Mitigation Alternatives/Actions/Projects

HMPC Meeting #4: (2 to 2.5 hours)

1. Introductions
2. Review Mitigation Categories and Selection Criteria
3. Brainstorming of Mitigation Alternatives/Actions/Projects by Hazard
4. Review of Voting Process for Prioritization of Mitigation Actions/Projects
5. Questions

Mitigation Strategy Meetings
March 24 & 30, 2021
Day 1

Status of the 2021 Sacramento County LHMP Update Project/Next Steps

FEMA's 4-Phase-10 Step DMA/CRS Planning Process

Phase I: Organize Resources

1) Get organized

2) Plan for public involvement

3) Coordinate with other departments and agencies

Phase II: Risk Assessment

4) Identify the hazard(s)

5) Assess the risks

Capability Assessment

Phase III: Mitigation Strategy

6) Set planning goals

7) Review mitigation alternatives

8) Draft and action plan

Phase IV: Adoption and Implementation

9) Adopt the plan

10) Implement the plan, evaluate its worth, and revise as needed

LHMP Update Project Schedule/Key Dates

2021 LHMP Update Meetings

- **March 24** (Wednesday) HMPC Meeting #3 (Mitigation Strategy: Goals Development) (1:30-3:30 pm)
- **March 30** (Tuesday) HMPC Meeting #4 (Mitigation Strategy: Actions and Projects) (1:30-4:00 pm)
- **August 3** (Tuesday) Public Meeting #2 (5:30-7:00 pm)
- **August 4** (Wednesday) HMPC Meeting #5 (1:30-4:00 pm)

Mitigation Strategy Meetings - Follow up

- **April 2 (**Friday**)** Mitigation Strategy Actions and Projects processed and voting site launched
- **April 9** (Friday) Voting ends
- **April 13** (Tuesday) Foster Morrison to send Mitigation Action prioritization follow up to HMPC
- **May 7 (**Friday) Planning Team Mitigation Action (Project) Worksheets due to Foster Morrison

LHMP Document Drafts

- **March 15** – **April 1**: Foster Morrison to send out Jurisdictional Annexes for input
- **May 7**: Jurisdictions to return updated Annexes to Foster Morrison
- **May 21** (Friday): HMPC (First) Draft LHMP to County
- **June 18** (Friday): HMPC comments due on Draft Plan
- **July 2** (Friday): Comments incorporated into Public Review (Second) Draft to County
- **July 12** (Monday): Public Review Draft on County website
- **August 13** (Friday**):** all Planning Team and Public input to Foster Morrison
- **September:** Public and HMPC comments incorporated and LHMP submittal to Cal OES – September 2021

Sacramento County Hazard Identification & Profiles

Hazard	Geographic Extent	Likelihood of Future Occurrences	Magnitude/ Severity	Significance	Climate Change Influence
Climate Change	Extensive	Likely	Limited	Medium	–
Dam Failure	Significant	Occasional	Catastrophic	High	Medium
Drought & Water Shortage	Extensive	Likely	Limited	Medium	High
Earthquake	Extensive	Occasional	Catastrophic	Medium	Low
Earthquake Liquefaction	Limited	Occasional	Critical	Medium	Low
Floods: 1%/0.2% annual chance	Significant	Likely	Catastrophic	High	Medium
Floods: Localized Stormwater	Extensive	Highly Likely	Limited	Medium	Medium
Landslides, Mudslides, and Debris Flow	Limited	Occasional	Limited	Low	Medium
Levee Failure	Extensive	Occasional	Critical	High	Medium
Pandemic	Extensive	Likely	Catastrophic	Medium	Medium
Severe Weather: Extreme Cold and Freeze	Extensive	Highly Likely	Limited	Medium	Medium
Severe Weather: Extreme Heat	Extensive	Highly Likely	Limited	Medium	High
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Severe Weather: Wind and Tornado	Extensive	Highly Likely	Limited	Medium	Low
Subsidence	Significant	Highly Likely	Limited	Medium	Medium
Volcano	Extensive	Unlikely	Negligible	Low	Low
Wildfire	Significant	Highly Likely	Critical	High	High

Geographic Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Likelihood of Future Occurrences
Highly Likely: Near 100% chance of occurrence in next year, or happens every year.
Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less.
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- **High**: Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have already occurred in the past.
- **Extremely High**: Very widespread and catastrophic impact.

Defining Significance (Priority) of a Hazard

Defining the significance or priority of a hazard to a community is based on a subjective analysis of several factors. This analysis is used to focus and prioritize hazards and associated mitigation measures for the plan. These factors include the following:

- **Past Occurrences**: Frequency, extent, and magnitude of historic hazard events.
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- **Ability to Reduce Losses through Implementation of Mitigation Measures**: This looks at both the ability to mitigate the risk of future occurrences as well as the ability to mitigate the vulnerability of a community to a given hazard event.

Sacramento County Priority Hazards

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Earthquake Liquefaction
- Flood: 1%/0.2% annual chance
- Flood: Localized/Stormwater
- Levee Failure
- Pandemic
- Severe Weather: Extreme Cold and Freeze
- Severe Weather: Extreme Heat
- Severe Weather: Heavy Rains and Storms (hail, lightning)
- Severe Weather: High Winds and Tornadoes
- Subsidence
- Wildfire

Non-Priority Hazards:

- Landslide, Mudslide, Debris Flow
- Volcano

Jurisdiction: _____

Priority Hazards???

- Climate Change
- Dam Failure
- Drought & Water Shortage
- Earthquake
- Earthquake Liquefaction
- Flood: 1%/0.2% annual chance
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- Volcano
- Wildfire

Participating Jurisdictions

- County
- All 7 incorporated communities
- 14 Flood Control/ Reclamation District Annexes
- 8 other Districts
- **30 Total Participating Jurisdictions**

Data Needs

Review of Key Items to Date

- Hazard-specific data
  - ✓ Hazard ID tables
  - ✓ Historic Hazard Worksheets or list of past hazard occurrences and impacts to each jurisdiction
    - Old participating jurisdictions – need past occurrences/hazard history since 2016
    - New participating jurisdictions –significant hazard occurrences - back 50 years or so
- Risk Assessment Worksheet (County)
  - ✓ Data on future development areas (County/Cities)
- Status updates to 2016 Mitigation Actions/Projects

Other Data Items

- Photos, Photos, Photos
- Updated Goals Statements **by April 2**
- New/Carry over Mitigation Action Worksheets due **by May 7h**
- Jurisdictions to return updated Annexes to Foster Morrison **by May 7th**

Mitigation Strategy: Goals

The most important element of the LHMP is the resulting mitigation strategy which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy is comprised of three components:

6. Mitigation Goals
7. Mitigation Actions
8. Mitigation Action (Implementation) Plan

Mitigation Goals

Up to now, the HMPC has been involved in collecting and providing data for the Sacramento County Local Hazard Mitigation Plan Update. From this information, a Risk Assessment has been developed that describes the risk and vulnerability of the Sacramento County Planning Area to identified hazards and includes an assessment of the area's current capabilities for countering these threats through existing policies, regulations, programs, and projects.

This analysis identifies areas where improvements could or should be made. Formulating Goals will lead to incorporating these improvements into the Mitigation Strategy portion of the LHMP. Our planning goals should provide direction for what loss reduction activities can be undertaken to make the Planning Area and Participating Jurisdictions more disaster resistant.

Mitigation Goals are general guidelines that represent the community's vision for reducing or avoiding losses from identified hazards. Goals are stated without regard for achievement, that is, implementation, cost, schedule, and means are not considered. ***Goals are public policy statements that:***

- **Represent basic desires of the jurisdiction;**
- **Encompass all aspects of planning area, public and private;**
- **Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;**
- **Are future-oriented, in that they are achievable in the future; and**
- **Are time-independent, in that they are not scheduled events.**

  - ***While goals are not specific (quantitative), they should not be so general as to be meaningless or unachievable.***

  - ***Goals statements will form the basis for objectives. They should be stated in such a way as to develop one or more objectives related to each goal.***

  - ***The key point in writing goals is to remember that they must deal with results, not the activities that produce those results.***

  - ***Consider other planning area goals from other regional/county/city programs, plans and priorities.***

Types/Sources of other area mitigation plans/ programs include:

- General Plans
- Stormwater Program and Plans
- Flood/Watershed Management Plans and Studies
- Drought Plans, Urban/Integrated Regional Water Management Plan
- Community Wildfire Protection Plans
- Strategic Fire Plans
- Dam Emergency Action Plans
- Emergency Operations Plans
- Climate Adaptation Plans
- Others?

2018 State Plan/2016 Sacramento County LHMP Goals

Goals from the 2018 California State Hazard Mitigation Plan

1. Significantly reduce life loss and injuries.

2. Minimize damage to structures and property, as well as minimizing interruption of essential services and activities.

3. Protect the environment.

4. Promote community resilience through integration of hazard mitigation with public policy and standard business practices.

Sacramento County 2016 LHMP Update (This is what we are updating)

Mission Statement: This Local Hazard Mitigation Plan assesses natural hazards of concern to the Sacramento community; evaluates risk to life safety, public health, property, and the environment; and evaluates mitigation measures to reduce these risks and vulnerabilities, minimize losses, and increases community resilience.

GOAL 1: Minimize risk and vulnerability of the Sacramento County community to the impacts of natural hazards and protect lives and reduce damages and losses to property, public health, economy, and the environment.

Objectives:

- Protect, preserve, and promote public health and safety, livability, and the environment
- Assure long term protection and resiliency of existing and future development (including infill areas) from natural hazards
- Protect critical facilities from natural hazards and minimize interruption of essential infrastructure, utilities, and services
- Protect natural resources; Protect and enhance water quality and supply, critical aquatic resources and habitat for beneficial uses.
- Maintain/enhance the flood mitigation program to provide 100/200/500-year flood protection
- Minimize risk of levee breach, overtopping or other failures

- Mitigate Repetitive Loss Properties
- Continued enhancement of CRS programs
- Address localized drainage issues
- Reduce the potential of wildfire in Sacramento County and protect the community from adverse effects of wildfire, including secondary impacts such as air quality
- Protect vulnerable populations from the threat of natural hazards
- Address climate change influence in project design and development
- Promote hazard mitigation as an integrated public policy and as a standard business practice

GOAL 2: Improve public outreach, awareness, education, and preparedness for all hazards to minimize hazard related losses

Objectives:

- Increase outreach, communication and awareness of natural hazards and reduce exposure to all hazard related losses, including climate change
- Improve the communities' understanding of natural hazards and how to effectively be prepared and take action to mitigate the impacts of hazard events
- Develop and target outreach and education for each hazard type and risk area
- Increase access to natural hazard information via enhanced web and mobile applications before, during, and after a disaster
- Enhance public outreach programs to target all vulnerable populations, including multi-language communications and multi-mode delivery
- Continued promotion of flood insurance

GOAL 3: Improve the capabilities of the community to mitigate losses and to be prepared for, respond to, and recover from a disaster event

Objectives:

- Promote interagency coordination of mitigation planning and implementation efforts
- Minimize hazard-related damage in order to maintain current service levels
- Continued enhancements to emergency services capabilities, integrating new technologies to reduce losses and save lives
- Promote intergovernmental and interagency coordination, planning, training, exercising and communication to ensure effective community preparedness, response, and recovery
- Increase the use of coordinated, shared resources between agencies
- Promote public/private partnerships in hazard mitigation and preparedness programs
- Identify, coordinate, and implement countywide evacuation and shelter in place planning for all populations and increase community awareness of these activities

GOAL 4: Assure conformance to Federal and State Hazard Mitigation Initiatives and Maximize Potential for Mitigation Implementation

Objectives:

- Maintain FEMA Eligibility/Position Jurisdictions for Grant Funding
- Maintain good standing with FEMA and State hazard mitigation programs, regulations and requirements

- Develop an overall mitigation funding strategy to prioritize and pursue mitigation projects in an equitable manner to benefit all populations
- Maximize funding opportunities through identification and tracking of all types of Federal and state grant programs to implement identified mitigation projects

Other Example Goal Statements

- Minimize risk and vulnerability from natural hazards
- Increase communities' awareness of vulnerability to hazards
- Increase the use of shared resources
- Improve communities' capabilities to mitigate losses
- Maintain coordination of disaster plans with changing DHS/FEMA needs
- Maintain FEMA eligibility/position jurisdictions for grant funding
- Maintain/enhance the flood mitigation program to provide 200/500-year flood protection
- Maintain current service levels
- Provide protection for existing buildings from hazards
- Provide protection for future development from hazards
- Provide protection for natural and cultural resources from hazard impacts
- Provide protection for people's lives from hazards
- Provide protection for public health
- Provide protection for critical services (fire, police, etc.) from hazard impacts
- Provide protection for critical lifeline utilities from hazard impacts
- Reduce exposure to hazard related losses
- Reduce the number of emergency incidents
- Make better use of technology

General Recommendation for Categories of Goals

- Reduce Losses/Protection of Life, Property, Public Health, and the Environment from all Hazards
- Reduce Losses/Protection of Critical Facilities and Infrastructure from all Hazards
- Public Education
- Increase County Capabilities to all Hazards
- Any Hazard-specific goals

Goals Development

The purpose of goal's development is to reach a consensus on updated goals for the Sacramento County 2021 LHMP Update. Provided above are example goals for this LHMP and goals from the previous 2016 Sacramento County LHMP. ***You may reword those above or develop your own updated goals.***

Each person should provide either via chat (on this zoom call) or email to Jeanine.foster@fostermorrison.com: Two (2) goals they would like to see included for this 2021 Sacramento County LHMP Update. (Please submit by Friday, April 2)

When collated, we will combine and rework them into 4-6 goals for this LHMP Update and send them out to the HMPC for further review and refinement.

Mitigation Strategy Meetings
March 24 & 30, 2021
Day 2

Mitigation Strategy Action Development: Ground Rules

Rule 1: All Participating Jurisdictions MUST have a Mitigation Action/Project to address each of their Priority Hazards (those rated as a high or medium significance in their respective Hazard Identification table).

Rule 2: Every Mitigation Action/Project MUST be supported by Risk Assessment Data contained within Chap 4 of the Base Plan and/or within each Participating Jurisdictions' Annexes. Note: this might necessitate backfilling the hazard risk assessment data.

Rule 3: The Mitigation Actions/Projects for this 2021 LHMP Update should reflect each Participating Jurisdictions' WISH LIST for mitigation, regardless of funding source.

Rule 4: Any Mitigation Action/Project that might be considered for FEMA mitigation grant funding over the next 5-years covered by this LHMP MUST be included in this 2021 LHMP Update.

Rule 5: While the updated Mitigation Strategy should include all potential Mitigation Actions/Projects for each Participating Jurisdiction (regardless of funding source), keep in mind that no one is obligated to implement ANY of the identified Mitigation Actions/Projects – all are always subject to funding and changing priorities.

Rule 6: Each Mitigation Action/Project to be included in this LHMP Update MUST have a Mitigation Action Worksheet completed by each Participating Jurisdiction. This applies to Mitigation Actions/Projects being carried forward from the 2016 LHMP.

Rule 7: Participating Jurisdictions CAN include Mitigation Actions/Projects that might not get identified during this Mitigation Action/Project Prioritization process – the key is to complete a Mitigation Action Worksheet for any project to be included in the updated LHMP prior to submittal to Cal OES/FEMA.

REMEMBER: Having a FEMA approved LHMP for your Jurisdiction is a prerequisite for being eligible to apply for FEMA pre and post mitigation funding.

Mitigation Strategy: Actions

Mitigation Actions are specific projects and activities that help achieve the goals and accomplish risk reduction in the community.

Categories of Mitigation Measures

PREVENTION: Preventive measures are designed to keep the problem from occurring or getting worse. Their objective is to ensure that future development is not exposed to damage and does not increase damage to other properties.

- Planning
- Zoning
- Open Space Preservation
- Land Development Regulations
  - ✓ Subdivision regulations
  - ✓ Building Codes
    - Fire-Wise Construction
  - ✓ Floodplain development regulations
  - ✓ Geologic Hazard Areas development regulations (for roads too!)
- Storm Water Management
- Fuels Management, Fire-Breaks

EMERGENCY SERVICES: protect people during and after a disaster. A good emergency services program addresses all hazards. Measures include:

- Warning (flooding, tornadoes, winter storms, geologic hazards, fire)
  - ✓ NOAA Weather Radio
  - ✓ Sirens
  - ✓ "Reverse 911" (Emergency Notification System)
- Emergency Response
  - ✓ Evacuation & Sheltering
  - ✓ Communications
  - ✓ Backup power supply/generators
  - ✓ Emergency Planning
    - Activating the EOC (emergency management)
    - Closing streets or bridges (police or public works)
    - Shutting off power to threatened areas (utility company)
    - Holding/releasing children at school (school district)
    - Ordering an evacuation (mayor)
    - Opening emergency shelters (Red Cross)
    - Monitoring water levels (engineering)
    - Security and other protection measures (police)
- Critical Facilities Protection (Buildings or locations vital to the response and recovery effort, such as police/fire stations, hospitals, sewage treatment plants/lift stations, power substations)

- ✓ Buildings or locations that, if damaged, would create secondary disasters, such as hazardous materials facilities and nursing homes
- ✓ Lifeline Utilities Protection

➢ Post-Disaster Mitigation

➢ Building Inspections
- ✓ ID mitigation opportunities & funding before reconstruction

PROPERTY PROTECTION: Property protection measures are used to modify buildings subject to damage rather than to keep the hazard away. A community may find these to be inexpensive measures because often they are implemented by or cost-shared with property owners. Many of the measures do not affect the appearance or use of a building, which makes them particularly appropriate for historical sites and landmarks.

➢ Retrofitting/disaster proofing
- ✓ Floods
  - Wet/Dry floodproofing (barriers, shields, backflow valves)
  - Relocation/Elevation
  - Acquisition
  - Retrofitting
- ✓ High Winds/Tornadoes
  - Safe Rooms
  - Securing roofs and foundations with fasteners and tie-downs
  - Strengthening garage doors and other large openings
- ✓ Winter Storms
  - Immediate snow/ice removal from roofs, tree limbs
  - "Living" snow fences
- ✓ Geologic Hazards (Landslides, earthquakes, sinkholes)
  - Anchoring, bracing, shear walls
  - Dewatering sites, agricultural practices
  - Catch basins
- ✓ Drought
  - Improve water supply (transport/storage/conservation)
  - Remove moisture competitive plants (Tamarisk/Salt Cedar)
  - Water Restrictions/Water Saver Sprinklers/Appliances
  - Grazing on CRP lands (no overgrazing-see Noxious Weeds)
  - Create incentives to consolidate/connect water services
  - Recycled wastewater on golf courses
- ✓ Wildfire, Grassfires
  - Replacing building components with fireproof materials
  - Roofing, screening
  - Create "Defensible Space"
  - Installing spark arrestors
  - Fuels Modification
- ✓ Noxious Weeds/Insects

- Mowing
- Spraying
- Replacement planting
- Stop overgrazing
- Introduce natural predators

- Insurance

NATURAL RESOURCE PROTECTION: Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. These natural and beneficial floodplain functions include the following:

- storage of floodwaters
- absorption of flood energy
- reduction in flood scour
- infiltration that absorbs overland flood flow
- groundwater recharge
- removal/filtering of excess nutrients, pollutants, and sediments from floodwaters
- habitat for flora and fauna
- recreational and aesthetic opportunities

Methods of protecting natural resources include:

- Wetlands Protection
- Riparian Area/Habitat Protection/Threatened-Endangered Species
- Erosion & Sediment Control
- Best Management Practices

Best management practices ("BMPs") are measures that reduce nonpoint source pollutants that enter the waterways. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams. BMPs can be implemented during construction and as part of a project's design to permanently address nonpoint source pollutants. There are three general categories of BMPs:

9. Avoidance: setting construction projects back from the stream.
10. Reduction: Preventing runoff that conveys sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage.
11. Cleanse: Stopping pollutants after they are en route to a stream, such as using grass drainageways that filter the water and retention and detention basins that let pollutants settle to the bottom before they are drained

- Dumping Regulations
- Set-back regulations/buffers
- Fuels Management
- Water Use Restrictions

- Landscape Management
- Weather Modification

STRUCTURAL: Projects that have traditionally been used by communities to control flows and water surface elevations. Structural projects keep flood waters away from an area. They are usually designed by engineers and managed or maintained by public works staff. These measures are popular with many because they "stop" flooding problems. However, structural projects have several important shortcomings that need to be kept in mind when considering them for flood hazard mitigation:

- They are expensive, sometimes requiring capital bond issues and/or cost sharing with Federal agencies, such as the U.S. Army Corps of Engineers or the Natural Resources Conservation Service.
- They disturb the land and disrupt natural water flows, often destroying habitats or requiring Environmental Assessments.
- They are built to a certain flood protection level that can be exceeded by a larger flood, causing extensive damage.
- They can create a false sense of security when people protected by a structure believe that no flood can ever reach them.
- They require regular maintenance to ensure that they continue to provide their design protection level.

Structural measures include:

- Detention/Retention structures
- Erosion and Sediment Control
- Basins/Low-head Weirs
- Channel Modifications
- Culvert resizing/replacement/Maintenance
- Levees and Floodwalls
- Anchoring, grading, debris basins (for landslides)
- Fencing (for snow, sand, wind)
- Drainage System Maintenance
- Reservoirs (for flood control, water storage, recreation, agriculture)
- Diversions
- Storm Sewers

PUBLIC INFORMATION: A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. These activities can motivate people to take protection:

- Hazard Maps and Data
- Outreach Projects (mailings, media, web, speakers, displays)
- Library Resources
- Real Estate Disclosure
- Environmental Education

Mitigation Measures from 2016 Sacramento County LHMP (This is what we are updating)

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Sacramento County				
Multi-Hazard Actions				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan				
Enhance Public Education and Awareness of Natural Hazards and Public Understanding of Disaster Preparedness				
Increase pedestrian and bicycle evacuation routes by constructing regional bike/pedestrian trail infrastructure, and expanding connection to neighborhoods (particularly in vulnerable areas)				
Community Rating System (CRS) Program for Public Information (PPI)				
Flood Insurance Assessment, Awareness, and Promotion				
Public Outreach Mailers				
Toxic Substance Release				
Climate Change Actions				
Increase average fuel efficiency and reduce GHG emissions from the County Fleet and Fuels				
Reduce Sacramento County's vulnerability to Climate Change by reducing GHG emissions in the commercial and residential sectors by making energy efficiency a priority through building code improvements				
Mitigate Climate Change impacts by integrating climate change research and adaptation planning into County operations and services				
Reduce Sacramento County's vulnerability to extreme heat events and associated hazards by Increase tree planting/canopy preservation/enhancement				
Drought Actions				
Implement Water Supply CIP				
Flood, Levee Failure, and Localized Flood Actions				
Keep the PPI current				
Alder Creek flood control				
Alder Creek flood mitigation (dam)				
Alder Creek miners reservoir, property owned by the City of Folsom				
Delta Small Communities flood protection - structural and nonstructural mitigation				
Gum Ranch flood control - joint use basin				
Implement Storm Drain CIP				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Laguna Creek at Triangle Aggregate flood control -joint use basins				
Laguna Creek mitigate flood hazard south of Jackson Highway				
Model Sacramento River levee breach (LAMP) south of Freeport				
Morrison Creek Miners Reach Flood Insurance Study				
Morrison Creek Miners Reach levee improvements				
Outreach stormwatch guide (ALERT, Stormready, weather radio)				
Peak flow floodplain mitigation Arcade Creek near Auburn Blvd				
Risk Map (flood frequency, depth, velocity)				
Elevation & Acquisition Projects (to Mitigate Flood Risk)				
Repetitive Loss Properties (to Mitigate Flood Risk)				
Five-Year Capital Improvement Plan – Drainage Projects				
Arcade Creek Corridor Plan				
Elevate Homes on Long Island (Grand Island Road, Sacramento River)				
Repetitive Loss Church Building on Dry Creek				
South Branch Arcade Creek – Gum Ranch Basin (with Fair Oaks Park District) and Kenneth Avenue Bridge Improvements (with Sacramento County Department of Transportation)				
Dry Creek Flood Hazard Mitigation Acquisitions with County Regional Park Department				
Arcade Creek at Evergreen Estates Floodwall Improvements				
Linda Creek Peak Flow Mitigation				
Flood Preparation in the American River Parkway				
Improve County ALERT (Automated Local Evaluation in Real Time) System of Stream and Rain Gauges				
Update County Hydrology Standards				
Woodside Condominiums Repetitive Flood Loss Property				
Bridge Replacement on Elk Grove Florin Road at Elder Creek				
Michigan Bar Bridge Replacement at the Cosumnes River				
El Camino Avenue Phase 2 Road Improvements				
Improve Flood Protection and/or Evacuation Planning for Mobile Home/RV Park at Manzanita/Auburn. Alternatively, the Park Should Establish Flood Warning and evacuation procedures.				
Hydromodification and Stormwater Quality Countywide				
Evacuation Mapping				
Regional Flood Management Plan Projects				
River/Stream/Creek Bank Erosion				
Erosion Site Repairs				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Wildfire Actions				
Wildfire Suppression				
Wildfire Fighting - Support				
Wildfire Suppression – Regional Parks and Open Space (urban interface)				
City of Citrus Heights				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts				
Rinconada Flood Wall				
Drainage Project Implementation				
City of Elk Grove				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts				
Mutual Aid Agreements				
Elk Grove Green Street Project: Repurposing Urban Runoff with Green Instructure Technologies				
Hazard Education and Risk Awareness				
City of Elk Grove's Storm Drainage Master Plan (SDMP)				
City of Folsom				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts				
Stormwater Basin Maintenance and Operation Project				
Alder Creek Watershed Council				
Drainage System Maintenance Tax Assessment				
Floodplain Mapping				
Redevelopment Area Drainage Improvements				
Stormwater Basin Maintenance and Operation Project				
Heating and Cooling Centers				
Public Education/Outreach Extreme Weather				
Weed Abatement Program				
Arson Prevention and Control Outreach				
Wildfire Hazard Identification				
Ignition Resistant Building Construction Upgrades				
Wildfire Prevention Outreach				
City of Galt				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan, as well as other Local Planning Efforts				
Increase Redundancy/Functionality of Water Wells and Sewer Lift Stations				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Drain Inlet Retrofit Capital Improvement Plan (CIP)				
Creek/Streams Vegetation Management Plan				
Increase Data Capacity of Emergency Frequencies				
City of Isleton*				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan				
Storm Water Runoff Rehabilitation Project				
Wastewater Treatment Plant Pond Levee Elevation Raise to 200-year Flood Standard				
City of Rancho Cordova				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan				
Sunrise Boulevard Widening Kiefer to Jackson				
City of Rancho Cordova Disaster Debris Management Plan				
Transportation Interconnectivity				
Intergovernmental Agreement between the County of Sacramento and the City of Rancho Cordova				
Land Use (Long range)				
Post disaster training for staff				
Update/Maintain Emergency Operation Plans (EOPs)				
Increase Everbridge Enrollment				
Developing and maintaining a database to track community vulnerability.				
City Website HMP and City Website, Press Notification, and Social Media Emergency Information				
Building & Safety Division Disaster Inspector Training				
Landscape and Irrigation Requirements/Retro				
Landscape Ordinance				
Impervious surface				
Porous pavement and vegetative buffers				
Storm Water Pump Station Infrastructure Upgrades				
SB-5 Urban Level of Flood Protection				
Channel Vegetation Management and Erosion Control				
Adoption of Hydromodification and Low Impact Development (LID) Standards				
Stormwater Capital Improvement Program Master Plan				
Sunrise Blvd. & Monier Circle Drainage Improvements				
Roundabouts				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
City of Sacramento				
Multi-Hazard Actions				
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan				
Coordination with Relevant Organizations and Agencies to Consider the Impacts of Urbanization and Climate Change on Long-Term Natural Hazard Safety				
Maintain and Identify Changes in Critical Facilities GIS Layer to Support Emergency Management Efforts				
Community Outreach on Multi-Hazard Preparation & Pre-mitigation				
Evaluation and Mitigation of Critical Facilities in Identified Hazard Areas				
Retrofit of Repetitive Loss Properties				
Safeguard Essential Communication Services				
Multi-lingual Disaster Education				
Cal OES Safety Assessment Program Evaluators				
National Flood Insurance Program & Community Rating System Continuation				
Coordinate with Sacramento Area Flood Control Agency on Completion of South Sacramento Streams Group Projects				
Develop a Master Generation Plan for Pump Stations				
Develop a Disaster Housing Plan				
Disaster Resistant Business Program				
Develop Enhanced Emergency Planning for Special Needs Populations in the City of Sacramento Emergency Operations Plan and Other Planning Documents				
Establish a Post-Disaster Action Plan				
Flood Recovery Plan				
Public Information Flood Response Plan				
Construction of a new Emergency Operation Center (EOC)				
Emergency Operation Center (EOC) Expansion and Information Technology Upgrade				
Protection of Transportation Infrastructure				
Public Education Campaign for Everbridge System				
Regional Emergency and Disaster Preparedness Exercises to Test Operational & Emergency Plans				
Special Needs and Critical Facilities Database and Advanced Warning System				
Assets Inventory				
Protection of City Assets from Cyber Terrorism				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Protection of City Information Technology Infrastructure				
Cell Booster				
Travel Time Model for Lower American and Sacramento Rivers and their Major Tributaries				
Watershed Spill Contamination to Drinking Water Quality: Preparedness for Events and Recovery				
Purchase Drones for Use in Disaster Preparedness, Mitigation, and Response				
Climate Change Actions				
Map and Assess Vulnerability to Sea Level Rise				
Emission Study of City Sump and Pump Stations				
Climate Change Mitigation Actions/Climate Change Adaptation Plan for Drinking Water Quality				
Harmful Algal Bloom (HAB) Surveillance and Response Planning				
Drought and Water Shortage Actions				
Aquifer Storage				
Perform a Groundwater Recharge Feasibility Study				
Earthquake Actions				
Map and Assess Community Vulnerability to Earthquakes				
Seismic Vulnerability Assessment on Sacramento Levees, Infrastructure & Buildings				
Retrofit Historical Buildings				
Extreme Cold and Heat Actions				
Heating Centers in High Priority Locations				
Cooling Centers in High Priority Locations				
Extreme Weather Outreach Strategy				
Severe Weather Action Plan				
Flood, Localized Flood, and Levee Failure Actions				
Coordinate with Stakeholder on Proposed Flood Control Project on Magpie Creek				
Adopt Additional Floodplain Development Standards				
Drainage Projects for Repetitive Loss Properties				
Emergency Notification and Evacuation Planning				
Historic Magpie Creek				
Natomas Internal Drainage Canals/Levees				
Drainage Projects from the City's Priority Drainage Project List				
Projects Identified in the Combined Sewer System Improvement Plan Update				
Easements for Open Land Along Levees				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Emergency Management Planning and Levee Security				
Flood Fighting Equipment				
Flood Management Land Use Planning and Development				
Florin Creek Pump at Pomegranate Avenue				
Internal Drainage System Improvements				
Levee and Structural Flood Management Improvements				
Master planning to identify facilities needed to prevent 10-year event street flooding and 100-year event structure flooding				
Retrofit Pumping Plants with Discharge Monitoring Devices				
Risk Communication and NFIP/CRS Projects				
Steamers and Rio City Café Floodwalls				
Trash Racks and Debris Cages				
Multi-Jurisdictional Modeling for Drainage Watersheds Greater Than 10 Square Miles				
Post-Flood Water Treatment Facility Recovery				
Wind and Tornado Actions				
Tree Trimming & Debris Removal				
Upgrading Overhead Utility Lines & Burying Critical Power Lines				
Install Redundancies and Loop Feeds for Power Lines & Infrastructure				
Erosion Actions				
Stabilization of Erosion Hazard Areas				
Wildfire Actions				
Implement a Fire Education and Information Program				
Fuels Reduction on the American River Parkway				
Outreach on the Effects of Smoke on Air Quality				
Cosumnes Community Services District				
Flood Response Equipment				
Flood Response Training				
Los Rios Community College				
District Wide Roofing Renovations				
ARC Drainage at Arcade Creek				
Protect District Property				
Metro Fire District				
Relocate the essential facilities in the 200-year flood plain				
Perform seismic study of all district facilities and identify those facilities at greatest risk for earthquake damage.				
Implement a Wildland Urban Interface (WUI) Building/Fire Code				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Develop and Implement a comprehensive WUI fuels management program.				
Deploy 2 remote automated weather stations (RAWS) in Metro Fire jurisdiction				
Defensible space ordinance				
Brannan Andrus Levee Maintenance District				
Implement Bioengineered Bank Stabilization techniques				
Development of Dredge Stockpile Site				
Georgiana Slough Waterside Erosion Repair				
Hydrographic surveys and data collection				
Mokelumne River Crown Raising				
San Joaquin River Waterside Erosion Repair				
Sevenmile Slough French Drain and Seepage Berm				
Reclamation District #3*				
Levee Improvements				
Reclamation District #341*				
San Joaquin River Setback Levee/Habitat Bench Multi-Benefit Project, Phase 1				
Complete Projects from Regional Flood Management Plan				
Reclamation District #369				
Pump Station Upgrades and Backup Generators				
Levee Maintenance Program Improvements				
RD 551*				
Levee Improvements				
Reclamation District #554*				
Apply for a Letter of Map Revision (LOMR) to bring the District back into Zone X. (outside of the 100-year flood zone)				
Fill Abandoned Slough				
Geotechnical Investigation				
Snodgrass Slough Levee Improvements				
Reclamation District #556*				
Flood Response Activities, Georgiana Slough Weir				
Georgiana Slough Vegetation Management				
Georgiana Slough Waterside Erosion Repair				
Topographic and Hydrographic Surveys and Data Collection				
Reclamation District #563*				
Rock Slope Protection Project				
HMP and PL-8499 Levee Improvement Projects				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Reclamation District #800				
Erosion Repair				
Emergency Supplies				
Reclamation District #1000				
River Berm and Levee Erosion				
Erosion Protection Canal Banks				
Implement Security Measures at Key Facilities				
2014 Capital Improvement Plan				
Implement Supervisory Control and Acquisition Data system (SCADA) on District canals and pump stations				
Public Outreach and Education				
Stockpile and pre-stage flood emergency response materials				
Emergency response improvements including radios for communications				
Emergency Back-up Generator for pump stations				
Reclamation District #1002*				
Geotechnical Investigation				
Snodgrass Slough Levee Improvements				
Snodgrass Slough Vegetation Management				
Reclamation District #1601*				
Levee Improvement Project				
Reclamation District #2111*				
Rock Slope Protection Project				
HMP and PL-8499 Levee Improvement Projects				
Sacramento Regional County Sanitation District				
South River Pump Station Flood Protection Project				
Reduction of Fire Hazard SRCSD Bufferlands				
Sacramento Area Sewer District				
MOU for Dedicated Cell Phone Tower and Cell Phone Pack				
Southgate Recreation and Park District				
Drought Mitigation Actions/Drought Contingency Plan				
Flood Mitigation Actions/Land Acquisition				
Conservation Easements				
Multi-jurisdictional Cooperation within Watersheds				
Storm Water Management Practices – Implement Storm Water Management Practices as identified in Stormwater Quality Design Manual				

Action Title	Complete	Ongoing	Not Started	Project in Plan Update
Severe Weather: Heavy Rains and Storms Mitigation Actions/Tree Management				
Twin Rivers School District				
New drainage plans to sites within the flood areas including, site drainage, storm drain upgrades and re-grading fields to shed water (on-site) away from buildings				
Work with City/County/Water departments to create defensible spaces at sites where nearby creeks are prone to flooding. Build-up earthen berms (off-site) to shed water away from critically located schools.				
Working with the Department of the State Architect (DSA) on Earthquake Retrofit Plan on all sites.				
Revise and update district-wide Storm Water Prevention Plan				
Create defensible perimeter space – for fire areas. Trees trimmed and vegetation removed to minimize impact during fire season.				

Mitigation Strategy: Action (Implementation) Plan

The mitigation action plan describes how the mitigation actions will be implemented, including how those actions will be prioritized, administered, and incorporated into the community's existing planning mechanism. Each participating jurisdiction must have a mitigation action(s) and an action plan specific to that jurisdiction and its priority hazards and vulnerabilities.

Mitigation Criteria

For use in selecting and prioritizing Proposed Mitigation Measures

1. STAPLEE

Social: Does the measure treat people fairly? (different groups, different generations)

- Community Acceptance
- Effect on Segment of Population
- Social Benefits

Technical: Will it work? (Does it solve the problem? Is it feasible?)

- Technical Feasibility
- Reduce Community Risk
- Long Term Solution/Sustainable
- Secondary Impacts

Administrative: Do you have the capacity to implement & manage project?

- Staffing
- Funding Allocated
- Maintenance/Operations

Political: Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?

- Political Support
- Local Champion
- Public Support
- Achieves Multiple Objectives
- Supported by a broad array of Stakeholders

Legal: Does your organization have the authority to implement? Is it legal? Are there liability implications?

- Existing Local Authority
- State Authority
- Potential Legal Challenges

Economic: Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?

- Benefit of Action
- Cost of Action
- Cost Effective/Economic Benefits
- Economically Viable
- Outside Funding Required

Environmental: Does it comply with Environmental regulations?

- Effect on Land/Water
- Effect on Endangered Species
- Effect on Cultural Resources
- Effect on Hazmat sites
- Consistent with Community Environmental Goals
- Consistent with Environmental Laws
- Environmental Benefits

2. SUSTAINABLE DISASTER RECOVERY

- Quality of Life
- Social Equity
- Hazard Mitigation
- Economic Development
- Environmental Protection/Enhancement
- Community Participation

3. SMART GROWTH PRINCIPLES

- Infill versus Sprawl
- Efficient Use of Land Resources
- Full Use of Urban Resources
- Mixed Uses of Land
- Transportation Options
- Detailed, Human-Scale Design

4. OTHER

- Does measure address area with highest risk?
- Does measure protect …
  - ✓ The largest # of people exposed to risk?
  - ✓ The largest # of buildings?
  - ✓ The largest # of jobs?
  - ✓ The largest tax income?
  - ✓ The largest average annual loss potential?
  - ✓ The area impacted most frequently?
  - ✓ Critical Infrastructure (access, power, water, gas, telecommunications)
- Timing of Available funding
- Visibility of Project
- Community Credibility

Mitigation Action Prioritization (Voting) Instructions

The mitigation actions and projects will be further collated by hazard and will be presented back to the HMPC for prioritization. **An email link to the voting site will be launched Friday April 2nd; voting will be open for a week and will close Friday April 9th.** The voting website location is https://fostermorrison.aweeba.com/.

Each person will have 9 votes total to vote for their preferred mitigation actions/projects:

- ***3 high priority votes (5 points each)***
- ***3 medium priority votes (3 points each)***
- ***3 low priority votes (1 point each)***

Your votes will indicate the consensus of the team.

Use the list of mitigation selection criteria (above) to help you make your determinations.

After the votes are tabulated, we will send out an email detailing mitigation action prioritization results and next steps.

Sacramento County
Mitigation Action Worksheet

Jurisdiction:	
Mitigation Action/Project Title:	
Hazards Addressed:	
Issue/Background:	
Project Description:	
Other Alternatives:	
Existing Planning Mechanism(s) through which Action Will Be Implemented:	
Responsible Office/Partners:	
Cost Estimate:	
Benefits (Losses Avoided):	
Potential Funding:	
Timeline:	
Project Priority (H, M, L):	

Worksheet completed by:	
Name and Title:	
Phone:	

Sacramento County 2021 LHMP Update

Mitigation Strategy Meetings – Action Prioritization

56 Voting Members

Actions sorted by Vote Totals

Mitigation Action Title	Hazards Addressed	Points/ Worksheet Status
Evacuation planning - countywide	Multi-Hazard	60
Drainage improvement projects to address localized flooding and runoff, permeable and impermeable surfaces	Flood	43
Implement the actions contained within the Sac County/Cities Climate Adaptation/Action Plans	Climate Change	43
Flood Master Planning – understanding flood impacts and recommendations to mitigate floods through master planning	Flood	39
Integrate Local Hazard Mitigation Plan into Safety Element of General Plan	Multi-Hazard	38
Establish an Operational Area level public education and outreach to provide consistent messaging, coordinating resource delivery, etc.	Multi-Hazard	37
ALL HAZARDS: Enhance public education and awareness of natural hazards and public understanding of disaster preparedness	Multi-Hazard	34
Stream and creek channel and drainageway invasives/overgrowth clearing and maintenance projects	Flood	30
Critical facilities and infrastructure – flood protection projects	Flood	29
Backup power supply for critical facilities and infrastructure/Generator projects	Multi-Hazard	28
Levee improvement projects	Levee Failure	27
Develop/update/implement stormwater master plans	Flood	26
Elevation projects to reduce flood risk	Flood	25
Fuel reduction projects	Wildfire	23
Develop and conduct countywide (operational area) exercises for priority hazards	Multi-Hazard	19
USACE efforts for erosion, seepage, and stability improvements to the American River and Sacramento River levees (2020-2025)	Levee Failure	19
Increase tree plantings around buildings to shade parking lots and along public rights-of-way	Severe Weather: Heat	18
Defensible space and vegetation management projects	Wildfire	16
Flood fighting for Delta legacy communities: Hood, Courtland, Locke, Walnut Grove	Flood	16
Increase use of permeable surfaces and rainwater catchment/retention systems in developed areas to enhance groundwater recharge	Drought & Water Shortage	16
Develop/implement water shortage contingency plan	Drought & Water Shortage	16
Expand broadband/wifi access	Multi-Hazard	15

Mitigation Action Title	Hazards Addressed	Points/ Worksheet Status
Telecommute implementation to reduce emissions/isolate	Climate Change/Pandemic	15
Development of a Climate Adaptation/Action Plan	Climate Change	15
Carbon Farming Plans, incentives, pilot programs	Climate Change	15
Add more purple air monitors around county for additional localized information on air quality/smoke	Wildfire	15
Completion of Folsom Dam improvements	Dam Failure	14
Mitigation of repetitive loss flood areas and properties	Flood	14
Flood insurance studies (modeling and mapping the special flood hazard area)	Flood	14
Operational protocol updates for American River pump stations that are affected by the reoperation of Folsom Dam to include analysis, modeling and mapping	Flood	13
Develop Urban Forestry Fire Management Plan	Wildfire	13
Fleet electrification charging infrastructure and back up power for fleet resiliency to avoid disruption for providing essential services dependent on e mobility	Climate Change	13
Bridge and road improvement projects	Flood	12
Critical Facilities and other structure hardening projects	Wildfire	12
Maintain and improve Sacramento River levee from south of Freeport to south of Hood, a reach owned and operated by CA DWR Maintenance Area 9	Levee Failure	11
Implement Delta Small Communities (flood risk reduction plan for the communities of Hood, Courtland, Locke, Walnut Grove East, and Walnut Grove West/Ryde)	Flood	11
Water conservation and green infrastructure implementation	Drought & Water Shortage	11
Maintain and improve railroad embankment levee from south of Freeport to south of Hood, a reach owned by CA Parks Department (Railroad Museum)	Levee Failure	11
Delta area jurisdictions – drainage improvement projects to address sea level rise	Climate Change	10
EOP, mass care and shelter plan, logistics support Annex	Multi-Hazard	10
Using cool roofing products that reflect sunlight and heat away from buildings	Severe Weather: Heat	9
Backup power sources	Severe Weather/ Multi-hazard	9
Beach Stone Lakes area flood risk reduction program (reduce flood frequency, increase flood protection, flood insurance)	Flood	9
Building electrification subsidies, battery storage, and other peak demand projects	Climate Change	9
Utilize parks to serve as water collection/permeable surfaces	Flood	9
Aquifer storage and recovery (ASR) projects	Drought & Water Shortage	9
Improve water systems for suppression and resiliency against wildfires	Wildfire	8

Mitigation Action Title	Hazards Addressed	Points/ Worksheet Status
Cooling centers/Ensure that County facilities used as cooling centers are equipped with backup power supplies, including on-site renewable energy generation and energy storage systems as feasible	Severe Weather: Heat	8
Undergrounding of utilities	Severe Weather/ Multi-hazard	8
Park debris clean up	Pandemic	8
Co generation of electric vehicles in order to maintain service in a dark sky event or in the event of grid disruptions	Climate Change	8
Support water forum and water forum 2.0 successor effort	Drought & Water Shortage	8
Enhance/enforce weed abatement ordinance/hazardous vegetation ordinance	Wildfire	8
Storm Ready Outreach (Weather radio, understanding the hazard and risk, high water notices describing the flood depth, brochures, outreach)	Flood	8
Code enhancement/enforcement	Wildfire	7
Update Pandemic Plan(s)	Pandemic	7
Identification and outreach to critical facilities located in the dam inundation areas	Dam Failure	7
Open Space fire prevention & vegetation management prescribed grazing/goats	Wildfire	7
Erosion repair projects	Levee Failure	6
Microgrid projects	Multi-Hazard	6
Evaluate the need and feasibility of improving fire prevention for the historic business districts	Wildfire	6
Delta RDs – create habitat/wetland areas to assist with flood mitigation	Levee Failure	6
Conduct a Climate Resiliency Study	Climate Change	5
Consider mobile power station rather than generators for essential fleet and facilities	Severe Weather/ Multi-hazard	5
McCormack Williamson flood control weir	Levee Failure	5
Enhanced multi model transportation options	Climate Change	5
HVAC system upgrades	Pandemic/Wildfire (Smoke)	4
Establish warming centers with backup power	Severe Weather: Extreme Cold and Freeze	4
Conduct seismic evaluation and retrofits of public buildings and critical facilities and infrastructure	Earthquake	4
Add more cameras to public property/infrastructure to the Alert Wildfire project to allow better real-time monitoring	Wildfire	4
Additional funding for Everbridge enhancements	Multi-Hazard	4
Update Hydrology Standards (Analyze historic rainfall records, update the statistical analysis/ DDF, consider climate change)	Flood	3
Traffic light replacement to round abouts – they work during power outages	Severe Weather/ Multi-hazard	3

Mitigation Action Title	Hazards Addressed	Points/ Worksheet Status
Mesh Networks/redundancy	Pandemic	3
Update County GIS aerial photography and LiDAR topography	Flood	3
Community Mobility Resilience Plan, to include projected climate impacts and resilience strategies (air quality benefits)	Climate Change	3
Water bank projects	Drought & Water Shortage	3
Establish system requirements/capabilities to work from home- conferencing capabilities, VPN, etc.	Climate Change/Pandemic	2
Bottle filler stations for public buildings/areas	Pandemic	2
Air filtration system enhancements/ filter replacements	Pandemic/Wildfire (Smoke)	1
Water system intertie projects	Drought & Water Shortage	1
Delta RDs – address internal drainage issues	Levee Failure	1
Floodproofing of nonresidential structures	Flood	1
Acquisition projects of flood prone structures	Flood	1
Dam Safety (Activity 630) - Develop an emergency management and public outreach effort using the Community Rating System Activity 630 as our guide	Dam Failure	1
Additional disinfection/ thermometer stations	Climate Change/Pandemic	0
Severe Weather Annex update and revision	Severe Weather/ Multi-hazard	0
Signal changing technology enhancements	Severe Weather/ Multi-hazard	0
Develop climate change annex to EOP	Climate Change	0
Increase broadband systems and access	Pandemic	0
Hillside Slope Stabilization	Flood/Landslide	0
Flood risk mitigation for mobile home and recreational vehicle parks/ Flood risk reduction, flood warning systems, evacuation procedures	Levee Failure	0
Model Water Efficient Landscape Ordinance (MWELO) implementation	Drought & Water Shortage	0
Add pumping plants	Levee Failure	0
Laguna Creek basin flood control, modeling, and mapping	Flood	0
Water source redundancy and reliability projects	Drought & Water Shortage	0
Arcade Creek flood control implementation (Gum Ranch basin, floodwalls and levees, pump station(s), public information)	Flood	0
Alder Creek flood hazard mitigation	Flood	0
Plan for Public Information (PPI)/CRS program implementation	Flood	0

Mitigation Action Title	Hazards Addressed	Points/ Worksheet Status
Flood Risk Mapping enhancements to include the frequency, depth, and velocity of the water	Flood	0

C.1 Categories of Mitigation Measures Considered

The following categories of mitigation measures are based on the Community Rating System.

- Prevention
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information

C.2 Sacramento County Analysis of Alternative Mitigation Measures per Category

Note: This review of mitigation measures is in compliance with the FEMA's nationally accepted six mitigation categories and FEMA's CRS Program requirement to provide a comprehensive evaluation of the six mitigation categories with a specific requirement that Preventative Measures be thoroughly reviewed. This review leads to the projects incorporated into the mitigation strategy action plan. This Section specifically focuses on the mitigation measures and potential mitigation strategies specific to Sacramento County and City of Sacramento, the two CRS communities to this plan.

C.2.1. Preventive Measures

Preventive measures are designed to keep a problem - such as flooding - from occurring or from getting worse. The objective of preventive measures is to ensure that future development is not exposed to damage and does not cause an increase in damages to other properties. Building, zoning, planning and code enforcement offices usually administer preventive measures. Some examples of types of preventive measures include:

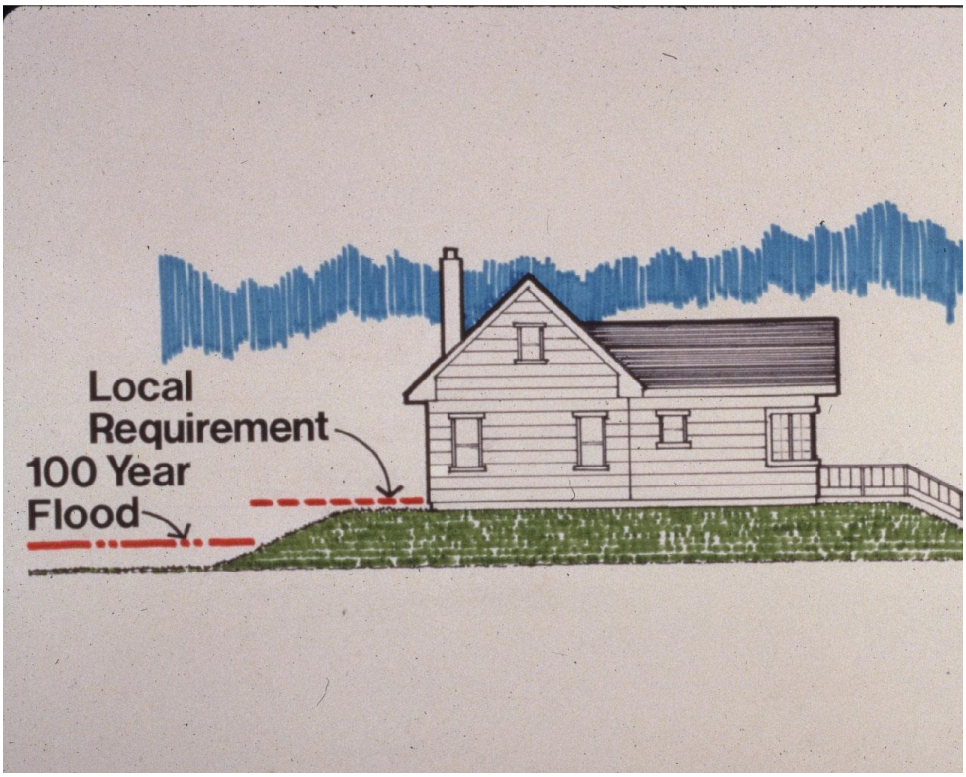
- Building codes and floodplain regulations
- Comprehensive land use planning, zoning, and open space preservation
- Stormwater management and subdivision regulations

Building Codes

Building codes provide one of the best methods of addressing natural hazards. When properly designed and constructed according to code, the average building can withstand many of the impacts of natural hazards. Hazard protection standards for all new and improved or repaired buildings can be incorporated into the local building code. Building codes can ensure that the first floors of new buildings are constructed to be

higher than the elevation of the 100-year flood (the flood that is expected to have a one percent chance of occurring in any given year). This is shown in Figure C-1.

Figure C-1 Building Codes and Flood Elevations



Floodplain Regulations

Most communities with a flood problem participate in the National Flood Insurance Program (NFIP). The NFIP sets minimum requirements for the participating communities' standards for development, subdivision of land, construction of buildings, installation of mobile homes, and improvements and repairs to buildings. These are usually spelled out in a separate ordinance.

The NFIP minimum requirements are summarized below. It should be stressed that these are minimum requirements. Local conditions, such as high velocity flooding or the presence of a potential dam failure, may warrant higher local standards.

Enforcement

To ensure that communities are meeting the NFIP standards, FEMA periodically conducts a Community Assessment Visit. During this visit, the maps and ordinances are reviewed, permits are checked, and issues are discussed with staff. Failure to meet all of the requirements can result in one or more consequences:

- Reclassification under the Community Rating System to a higher class
- Probation, which entails a $50 surcharge on every flood insurance policy in the community, or

- Suspension from the NFIP.

Suspension is the most serious. It means that the community is out of the NFIP and the following sanctions are imposed:

- Flood insurance will not be available. No resident will be able to purchase a flood insurance policy.
- Existing flood insurance policies will not be renewed.
- No direct federal grants or loans for development may be made in identified flood hazard areas under programs administered by federal agencies, such as HUD, EPA, and the Small Business Administration.
- Federal disaster assistance will not be provided to repair insurable buildings located in identified flood hazard areas for damage caused by a flood.
- No federal mortgage insurance or loan guarantees may be provided in identified flood hazard areas. This includes policies written by FHA, VA, and others.
- Federally insured or regulated lending institutions, such as banks and credit unions, must notify applicants seeking loans for insurable buildings in flood hazard areas that there is a flood hazard and the property is not eligible for federal disaster relief.

These sanctions can be severe for any community with a substantial number of buildings in the floodplain. Most communities with a flood problem have joined the NFIP and are in full compliance with their regulatory obligations.

One way to assure good administration and enforcement is to have Certified Floodplain Managers on staff. The Association of State Floodplain Managers administers the national Certified Floodplain Manager (CFM®) program.

Minimum National Flood Insurance Program Regulatory Requirements

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA). As a condition of making flood insurance available for their residents, communities that participate in the NFIP agree to regulate new construction in the area subject to inundation by the 100-year (base) flood. The floodplain subject to these requirements is shown as an A or V Zone on the Flood Insurance Rate Map (FIRM).

There are five major floodplain regulatory requirements. Additional floodplain regulatory requirements may be set by state and local laws.

1. All development in the 100-year floodplain must have a permit from the community. The NFIP regulations define "development" as any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.
2. Development along a river or other channel cannot obstruct flows so as to cause an increase in flooding on other properties. An analysis must be conducted to demonstrate that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

3. New buildings may be built in the floodplain, but they must be protected from damage from the base flood. In riverine floodplains, the lowest floor of residential buildings must be elevated to be at or above the base flood elevation (BFE). Nonresidential buildings must be either elevated or floodproofed.
4. Under the NFIP, a "substantially improved" building is treated as a new building. The NFIP regulations define "substantial improvement" as any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the start of construction of the improvement. This requirement also applies to buildings that are substantially damaged.
5. Communities are encouraged to adopt local ordinances that are more comprehensive or provide more protection than the federal criteria. The NFIP's Community Rating System provides insurance premium credits to recognize the additional flood protection benefit of higher regulatory standards.

Local Implementation: Sacramento County and the City of Sacramento

Sacramento County and the City of Sacramento have adopted the 2019 California Building Code based on the 2018 International Building Code. Sacramento County has a Floodplain Management Ordinance (2017) that exceeds minimum NFIP standards and includes some higher regulatory standards. This most recent update incorporated additional SB 5 standards addressing the 200-year flood standard of protection in urban or urbanizing areas (i.e., ULOP). The City of Sacramento also has a Floodplain Management Ordinance (2016) that exceeds minimum NFIP standards and includes some higher regulatory standards. The City's ordinance was recently updated in March 2016 to incorporate the ULOP requirements of SB 5.

Just as important as having code standards is the enforcement of the code. Adequate inspections are needed during the course of construction to ensure that the builder understands the requirements and is following them. Making sure a structure is properly elevated and anchored requires site inspections at each step. Both Sacramento County and the City of Sacramento indicate that their Floodplain Management Ordinances are adequately enforced.

Reduce Future Flood Losses

Future flood losses should be reduced by enforcement of current floodplain regulations:

Sacramento County. For new residential construction or substantial improvements, Sacramento County requires that either the lowest finished floor be elevated at least 1.5 feet above the base flood elevation. For nonresidential construction or substantial improvements, Sacramento County requires that either the lowest finished floor be elevated at least 1.5 feet above the base flood elevation or that below the base flood level the structure is dry flood-proofed and watertight, with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

City of Sacramento. For new residential construction or substantial improvements in Zones A, AH and AE, the City of Sacramento requires that either the lowest floor, including basement, be elevated at least 1 foot above the base flood elevation. For new residential construction, or substantial improvements in Zone AO, the City of Sacramento requires that either the lowest floor, including basement, be elevated above the highest grade to the depth number specified in feet on the FIRM or 2 feet above the highest adjacent grade

if no depth number is specified. For nonresidential construction or substantial improvements, the City of Sacramento requires that either the lowest floor, including basement be elevated in conformance with the residential standards described above, together with attendant utility and sanitary facilities or be dry floodproofed below the elevation required for the lowest floor so that the structure is watertight, with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

Enacting and enforcing the current standards and/or adopting higher regulatory standards reduces future flood losses by regulating development within flood hazard areas.

Current Standards

As described above, Sacramento County and the City of Sacramento have Floodplain Management Ordinances that meet all of the NFIP's minimum floodplain regulatory requirements and exceed some of them such as establishing additional freeboard. Their regulations are designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding;
- Minimize business interruptions;
- Minimize damage to public facilities, including streets, sewers, bridges, and utilities;

The County and City's regulations include methods and provisions for:

- Restricting or prohibiting development which are dangerous to health, safety, and property due to flood hazards, or which result in damaging increase in flood heights or velocities;
- Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
- Controlling fill, grading, dredging, and other development which may increase flood damage; and
- Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

In addition, all new construction or substantial improvements shall be:

- Designed or modified and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy
- Constructed in ways that minimize flood damage
- Constructed with materials resistant to flood damage
- Constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities designed or located so as to prevent water from entering or accumulating within components during flooding

Sacramento County and the City of Sacramento also have regulations that exceed minimum NFIP standards. These include:

- Floodways are delineated and certain requirements apply to construction within these floodways so as to not result in any increase in flood levels during the occurrence of the base flood discharge.
- Requiring new construction and substantial improvements to have the lowest flood, including basement, elevated a minimum of 1.5 feet (Sacramento County) above the base flood elevation.
- For the City, base flood elevations for new construction are required to be 1 foot above the FIRM flood depth for zones A, AH, and AE. In zones AO, the lowest floor will be elevated to one foot above the FIRM flood depth, or two feet above the highest adjacent grade if not depth number is specified.
- Restrictions and standards are included on the use of enclosures below elevated buildings.

In addition, Sacramento County's and the City of Sacramento's floodplain management programs are implemented by Certified Floodplain Managers on staff.

Manufactured Homes

Manufactured or mobile homes are usually not regulated by local building codes. They are built in a factory in another state and are shipped to a site. They do have to meet construction standards set by the U.S. Department of Housing and Urban Development. All mobile homes constructed after 1976 must comply with HUD's National Manufactured Home Construction and Safety Standards. These standards apply uniformly across the country and it is illegal for a local unit of government to require additional construction requirements. Local jurisdictions may regulate the location of these structures and their on-site installation.

Local Implementation

Both the Sacramento County and the City of Sacramento Floodplain Management Ordinances include specific requirements for the placement, installation, elevation, and anchoring of manufactured homes

CRS Credit

Building Codes: The CRS encourages strong building codes. It provides credit in two ways: points are awarded based on the community's BCEGS classification and points are awarded for adopting the International Code series. The CRS also has a prerequisite for a community to attain a Class 6 or better within the CRS program, the community must have a BCEGS class of 5/5 or better. To attain a Class 4 or better in the CRS program, the community must have a BCEGS class of 4/4 or better.

Sacramento County has a BCEGS classification of 3/3. Sacramento County has adopted the 2019 California Building Code which includes the International Code series with State enhancements.

The City of Sacramento's BCEGS classification is a 2/2. The City of Sacramento has also adopted the 2019 California Building Code which includes the International Code series with State enhancements.

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. The National Flood Insurance Reform Act of 1994 codified the Community Rating System in the NFIP.

- The CRS recognizes 18 creditable activities, organized under four categories numbered 300 through 600:
  - ✓ Public Information
  - ✓ Mapping and Regulations

- ✓ Flood Damage Reduction
- ✓ Flood Preparedness

- Sacramento County and the City of Sacramento participate in the Community Rating System (CRS) of the National Flood Insurance Program.
- By implementing these floodplain management activities, the residents of Sacramento County and the City of Sacramento qualify for flood insurance premium rate reductions. When communities go beyond the minimum standards for floodplain management, the CRS can provide discounts up to 45% off flood insurance premiums.

Sacramento County is currently a Class 2 community, which provides a 40% discount on flood insurance to properties located in the Special Flood Hazard Area and up to a 10% discount for those properties located outside the special flood hazard zone.

The City of Sacramento is also currently a Class 3 community, which provides a 35% discount on flood insurance to properties located in the Special Flood Hazard Area and up to a 10% discount for those properties located outside the special flood hazard zone.

Floodplain Management – Higher Regulatory Standards: There are many higher regulatory standards that warrant CRS credit. These standards include:

- Delineating a floodway, the area of higher hazard near the channel. This would allow development outside the floodway (called the "floodplain fringe") without engineering studies to determine their impact on others.
- Requiring all new construction to be elevated one or two feet above the base flood elevation to provide an extra level of protection from waves and higher floods. This extra protection is reflected in a distinct reduction in flood insurance rates.
- Having all developers (not just the larger ones) provide flood data where none are available.
- Specifications to protect foundations from erosion, scour and settling.
- Prohibiting critical facilities from all or parts of the floodplain.
- Prohibiting hazardous materials.
- Requiring buffers adjacent to streams or natural areas.
- Restrictions on use of enclosures below elevated buildings.
- Flood storage lost due to filling and construction must be compensated for by removal of an equal volume of storage.
- The CRS also provides credit for having trained staff and a higher credit if the staff members are Certified Floodplain Managers.

It should be noted that one of the prerequisites for participation in the CRS is that the community be in full compliance with the minimum requirements of the NFIP. A community with a number of "potential violations" risks being removed from the CRS entirely.

Manufactured homes: The NFIP allows communities to exempt mobile homes in existing mobile home parks from some of the flood protection requirements. The CRS provides up to 50 points if the community does not use this exemption.

Comprehensive Land Use Planning, Zoning, and Open Space Preservation

Building codes provide guidance on how to build in hazardous areas. Planning and zoning activities direct development away from these areas, particularly floodplains and wetlands. They do this by designating land uses that are compatible with the natural conditions of land that is prone to flooding, such as open space or recreation. Planning and zoning activities can also provide benefits by simply allowing developers more flexibility in arranging improvements on a parcel of land through the planned development approach.

General and Comprehensive Plans

These plans are the primary tools used by communities to address future development. They can reduce future flood-related damages by indicating open space or low density development within floodplains and other hazardous areas. Unfortunately, natural hazards are not always emphasized or considered in the specific land use recommendations.

Generally, a plan has limited authority. It reflects what the community would like to see happen. Its utility is that it guides other local measures, such as capital improvement programs, zoning ordinances, and subdivision regulations.

Capital Improvement Plans

A capital improvement plan can guide a community's major public expenditures for a 5- to 20-year period. Capital expenditures may include acquisition of open space within the hazardous areas, extension of public services into hazardous areas, or retrofitting existing public structures to withstand a hazard.

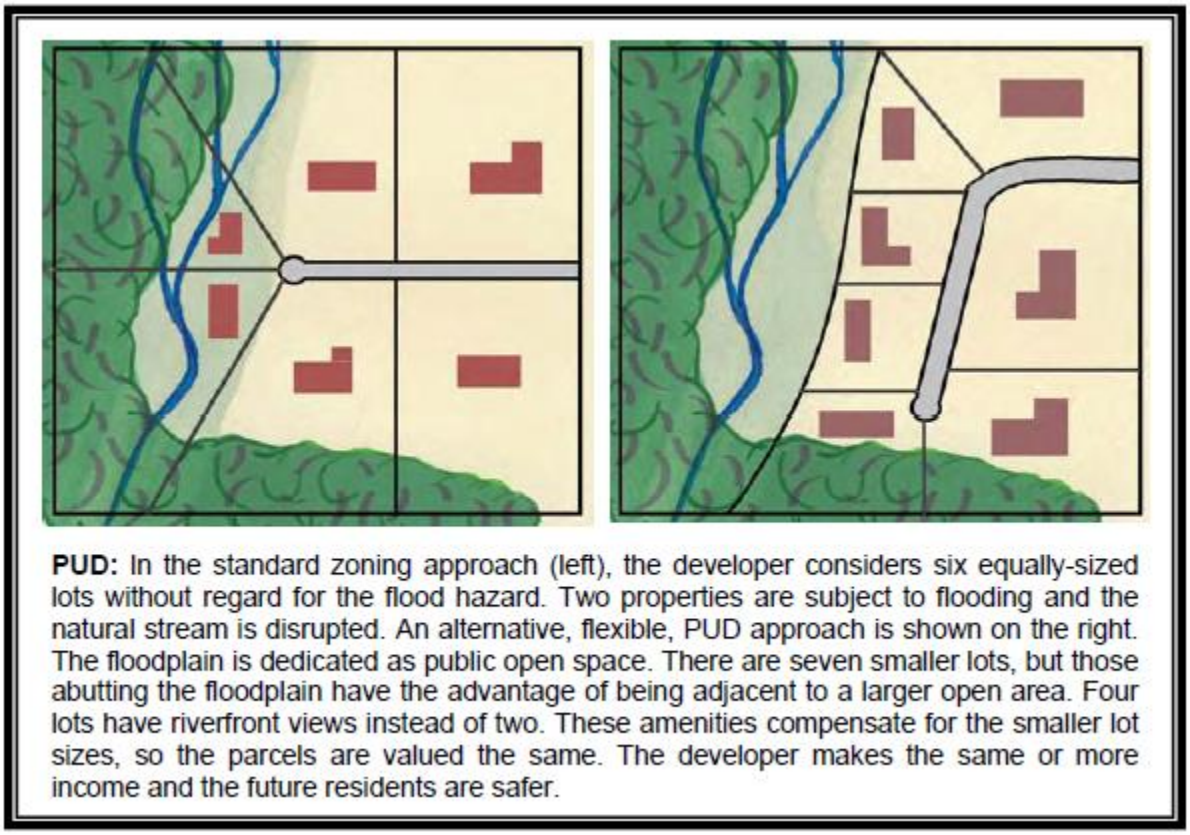
Zoning

A zoning ordinance regulates development by dividing a community into zones or districts and setting development criteria for each of those zones or districts. Zoning codes are considered the primary tool to implement a general/comprehensive plan's guidelines for how land should be developed.

Zoning ordinances can limit development in hazardous areas, such as reserving floodplain zones for agricultural uses. Often, developers will produce a standard grid layout. The ordinance and the community can allow flexibility in lot sizes and location so developers can avoid hazardous areas.

One way to encourage such flexibility is to use the planned unit development (PUD) approach or cluster development. The PUD and cluster approaches allow the developer to easily incorporate flood hazard mitigation measures into the project. Open space or floodplain preservation can be facilitated as site design standards and land use densities can be adjusted to fit the property's specific characteristics, as shown in Figure C-2.

Figure C-2 Zoning for Development in the Floodzone



PUD: In the standard zoning approach (left), the developer considers six equally-sized lots without regard for the flood hazard. Two properties are subject to flooding and the natural stream is disrupted. An alternative, flexible, PUD approach is shown on the right. The floodplain is dedicated as public open space. There are seven smaller lots, but those abutting the floodplain have the advantage of being adjacent to a larger open area. Four lots have riverfront views instead of two. These amenities compensate for the smaller lot sizes, so the parcels are valued the same. The developer makes the same or more income and the future residents are safer.

Open Space Preservation

Keeping the floodplain and other hazardous areas open and free from development is the best approach to preventing damage to new developments. Open space can be maintained in agricultural use or can serve as parks, greenway corridors and golf courses.

Comprehensive and capital improvement plans should identify areas to be preserved by acquisition and other means, such as purchasing an easement. With an easement, the owner is free to develop and use private property, but property taxes are reduced or a payment is made to the owner if the owner agrees to not build on the part set aside in the easement.

Although there are some federal programs that can help acquire or reserve open lands, open space lands and easements do not always have to be purchased. Developers can be encouraged to dedicate park land and required to dedicate easements for drainage and maintenance purposes. These are usually linear areas along property lines or channels. Maintenance easements also can be donated by streamside property owners in return for a community maintenance program.

Local Implementation

General Plan: Sacramento County's current General Plan was last adopted in 2017. This 2017 General Plan Update included provisions to address new flood protections requirements that establish a 200-year state requirement for the ULOP. This is the primary policy change that will affect construction in urban or urbanizing areas that are in a SFHA or a Moderate Flood Zone. Areas not considered to be urbanizing will remain subject to the FEMA 0.1% standard of flood protection. General Plan amendments addressed: agency coordination, setbacks along levees, elevation and construction standards, flood map data, flood emergency response, floodway management, building design standards, and the process for making legal determinations and project approvals for development in flood hazard zones.

The City of Sacramento recently updated its General Plan in 2015 to include requirements for establishing 200-year state requirements for the ULOP to comply with Senate Bill (SB) 5 regarding floodplain management.

Zoning and Open Space Preservation: Sacramento County's General Plan, in coordination with the local Codes, protects current open space. As described above, the County recently finalized updates to the general plan which also included updates to the County's Zoning Code.

The City of Sacramento's local codes in combination with the 2015 General Plan provides protection for and encourages open space preservation. The City's 2015 Floodplain Management Ordinance includes requirements for establishing 200-year state requirements for the ULOP to comply with Senate Bill (SB) 5 regarding floodplain management.

Reduce Future Flood Losses

Enacting the General Plans and the comprehensive zoning and future land uses contained in the County and City's General Plans will help to reduce future flood losses by managing development in hazardous areas and known floodplains.

Current Standards

Generally, Sacramento County's zoning ordinance separates hazardous land uses from sensitive land uses and addresses risks e.g. flood, erosion and traffic. The zoning ordinance contains a Flood (F) Combining Zoning District and Tributary Standards, and Natural Streams (NS) Combining Zoning District to reduce the impacts of flood hazards. Additionally, the ordinance contains a Parkway Corridor (PC) Combining Zoning District to ensure that bluff development does not create erosion or geologic instability.

Likewise, the City of Sacramento's zoning ordinance is an effective measure for reducing hazard impacts and is adequately administered and enforced. The City's ordinance includes a Flood Zone and an American River Parkway, Floodplain Zone (ARP-F). The Flood Zone is considered an Open Space Zone established to conditionally permit specified uses along the Sacramento and American Rivers and their tributaries. The ARP-F was established to prevent loss of life and property by prohibiting the erection of improvements or structures in a designated floodway, to protect the natural features of the American River floodplain, to prevent erosion and siltation, and to preserve valuable open space.

CRS Credit

The CRS provides flood insurance discounts to those communities that implement various floodplain management activities that meet certain criteria. Comparing local activities to those national criteria helps determine if local activities should be improved.

Credits are provided for regulations that encourage developers to preserve floodplains or other hazardous areas from development. There is no credit for a plan, only for the enforceable regulations that are adopted pursuant to a plan. Credits are also provided for setting aside floodplains for low density zoning, such as five acre lots or conservation

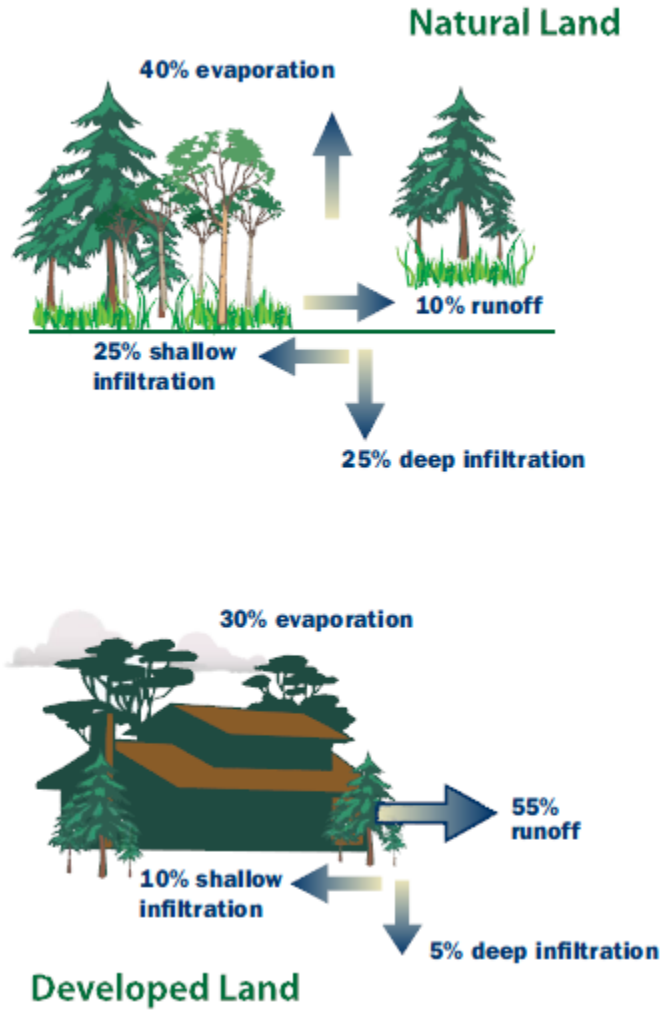
Preserving flood prone areas as open space is one of the highest priorities of the Community Rating System. Up to 1,450 points can be given, based on how much of the floodplain is in community public undeveloped properties, parks, wildlife refuges, golf courses, or other uses that can be depended on to stay open (Activity 420 - Open Space Preservation).

Stormwater Management and Subdivision Ordinance

Development in floodplains is development in harm's way. New construction in the floodplain increases the amount of development exposed to damage and can aggravate flooding on neighboring properties.

Development outside a floodplain can also contribute to flooding problems. Stormwater runoff is increased when natural ground cover is replaced by urban development (see Figure C-3). Development in the watershed that drains to a river can aggravate downstream flooding, overload the community's drainage system, cause erosion, and impair water quality.

Figure C-3 Runoff and Infiltration of Natural and Developed Land



There are three ways to prevent flooding problems caused by stormwater runoff:

- Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties, and
- Regulating all development to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions.
- Set construction standards so buildings are protected from shallow water.

Most communities participate in the NFIP, which sets minimum requirements for regulating development in the floodplain. All new buildings must be protected from the base or 100-year flood and no development can cause an increase in flood heights or velocities.

Stormwater runoff regulations require developers to build retention or detention basins to minimize the increases in the runoff rate caused by impervious surfaces and new drainage systems. Generally, each

development must not let stormwater leave at a rate higher than what existed under pre-development conditions.

Standards for drainage requirements are typical in subdivision regulations. Standards for storm sewers, ditches, culverts, etc., are best set when an area is laid out and developed. Traditionally, the national standard is to require that the local drainage system carry the 10-year storm. Recently, communities are finding that older estimates of the 10-year storm understated the true hazard, so they are addressing larger storms.

One problem with requiring the drainage system to carry water away is that runoff increases with urban development. The runoff equivalent of a 10-year storm occurs more frequently, and from smaller storms. The problem is just sent downstream onto someone else's property.

Accordingly, modern subdivision regulations require new developments to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions. This is usually done by constructing retention or detention basins to hold the runoff for a few hours or days, until flows in the system have subsided and the downstream channels can accept the water without flooding.

If the storm sewers or roadside ditches cannot handle a heavy rain, the standard subdivision design uses the streets to carry excess runoff. If the flows exceed the streets' capacity, adjacent properties will flood. Therefore, the third approach to protecting from stormwater flooding is to make sure new buildings are elevated one or two feet above the street or above adjacent grade.

Local Implementation

Reduce Future Flood Losses

Current practices and tracking mechanisms are seeking to reduce flood risks. Future flood control and stormwater improvements in Sacramento County and the City of Sacramento will help reduce localized flood risks by improving flood control mechanisms and drainage. In order to reduce future flood losses, the County and City may consider revisiting their stormwater management ordinances.

Current Standards

Sacramento County and the City of Sacramento have stormwater management ordinances.

Sacramento County’s Stormwater Management Ordinance authorizes the County to exercise its police power to protect and promote the public health, safety and general welfare. While stormwater runoff is one step in the natural cycle of water, human activities, including, but not limited to, agriculture, construction, manufacturing and the operation of an urban infrastructure, may result in undesirable discharges of pollutants and certain sediments. Such discharges may accumulate in local drainage channels and waterways and eventually may be deposited in the natural surface waters. The purpose of this chapter is to protect and enhance the watercourses within the unincorporated area of the County, by controlling the contribution of urban pollutants to stormwater runoff which enters the County storm drain system in a manner consistent with the Federal Clean Water Act, the Porter-Cologne Water Quality Control Act and Municipal discharge Permit No. CAS082597, and by controlling pollutants that are discharged directly to

natural surface waters. The County's Stormwater Program also uses its Land Grading and Erosion Control Ordinance to minimize damage to surrounding properties and public rights-of-way, the degradation of the water quality of watercourses, and the disruption of natural or County authorized drainage flows caused by the activities of clearing and grubbing, grading, filling and excavating of land, and sediment and pollutant runoff from other construction related activities, and to comply with the provisions of the County's National Pollutant Discharge Elimination System (NPDES) Permit Number, CA0082597, issued by the California Regional Water Quality Control Board (Regional Board). These goals will be achieved by establishing administrative procedures, minimum standards of review, and implementation and enforcement procedures for controlling erosion, sedimentation and other pollutant runoff, including construction debris and hazardous substances used on construction sites, and the disruption of existing drainage and related environmental damage caused by the aforementioned activities.

The City of Sacramento's Stormwater Management Ordinance is designed to protect and promote the health, safety and general welfare of the citizens of the City by controlling non-stormwater discharges to the stormwater conveyance system, by eliminating discharges to the stormwater conveyance system from spills, dumping, or disposal of materials other than stormwater, and by reducing pollutants in urban stormwater discharges to the maximum extent practicable. This chapter is intended to assist in the protection and enhancement of the water quality of watercourses, water bodies, and wetlands in a manner pursuant to and consistent with the Federal Water Pollution Control Act, Porter-Cologne Water Quality Control Act, and National Pollutant Discharge Elimination System (NPDES) Permit No. CAS082597, as such permit is amended and/or renewed.

Subdivision Regulations

In addition to controlling stormwater runoff as described above, subdivision regulations govern how land will be subdivided and they set construction standards. These standards generally address roads, sidewalks, utilities, storm sewers, and drainage ways. They can include the following flood protection standards:

- Requiring that the final plat show all hazardous areas
- Requiring that each lot be provided with a building site above the flood level
- Requiring that all roadways be no more than one foot below the flood elevation

Local Implementation

Sacramento County's subdivision ordinance regulates the design and improvement of land divisions and the dedication of public improvements needed in connection with land divisions. The subdivision ordinance does not address hazards.

The City of Sacramento's Subdivision Ordinance is designed to assist in the systematic implementation of the general plan, specific and community plans, the zoning ordinance, and other land use regulations, and to provide for public needs, health and safety, convenience, and general welfare. The City's subdivision requirements address floodplain management requirements. Specifically, the ordinance requires that the design of all subdivisions shall provide adequate drainage to reduce exposure to flood damage and shall in all respects conform to the requirements of Title 15.104 of this code, Floodplain Management Regulations, and the national flood insurance program regulations, set forth in Subchapter B of Title 44 of the Code of Federal Regulations Parts 59 and 60. All final subdivision improvement plans will provide the elevation of the proposed building site. If the site is filled above the base flood, the final pad elevation shall be

certified by a qualified registered professional engineer or surveyor and provided to the local administrator. All subdivision proposals shall be consistent with the need to minimize flood damage. All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage.

CRS Credit

CRS credit is provided for both higher regulatory standards in the floodplain and stormwater management standards for new developments. Credit is based on how those standards exceed the minimum NFIP requirements.

Conclusions and Recommendations

- Sacramento County and the City of Sacramento have floodplain development ordinances that exceed minimum national and state standards and will be helpful in preventing flood problems from increasing.
- With ongoing improvements to the regions' flood control facilities, requirements mandated by SB 5, and any resulting changes in the FEMA DFIRMs, the floodplain regulations for the County and City should be revisited and revised accordingly.
- Sacramento County and the City of Sacramento should continue to implement CRS activities to align with the recent changes in the 2017 Coordinator's Manual. The County and City should evaluate their floodplain management ordinances for incorporating additional higher standards.
- The County and City should review their zoning and subdivision ordinances for floodplain management and other hazard specific enhancements.
- The County and City should continue to enforce stormwater management best management practices to control post development site runoff. Consideration of a unified countywide stormwater ordinance will provide consistent regulations between all communities within the Sacramento County planning area.
- Standards in subdivision regulations for public facilities should account for the hazards present at the site. New building sites, streets, and water systems should facilitate access and use by fire and emergency equipment.

C.2.2. Property Protection Measures

Property protection measures are used to modify buildings or property subject to damage. Property protection measures fall under three approaches:

- Modify the site to keep the hazard from reaching the building,
- Modify the building so it can withstand the impacts of the hazard, and
- Insure the property to provide financial relief after the damage occurs.

Property protection measures are normally implemented by the property owner, although in many cases technical and financial assistance can be provided by a government agency.

Keeping the Hazard Away

Generally, natural hazards do not damage vacant areas. As noted earlier, the major impact of hazards is to people and improved property. In some cases, properties can be modified so the hazard does not reach the damage-prone improvements. For example, a berm can be built to prevent floodwaters from reaching a house.

Flooding

There are five common methods to keep a flood from reaching and damaging a building:

- Erect a barrier between the building and the source of the flooding.
- Move the building out of the floodprone area.
- Elevate the building above the flood level.
- Demolish the building.
- Replace the building with a new one that is elevated above the flood level.

Barriers

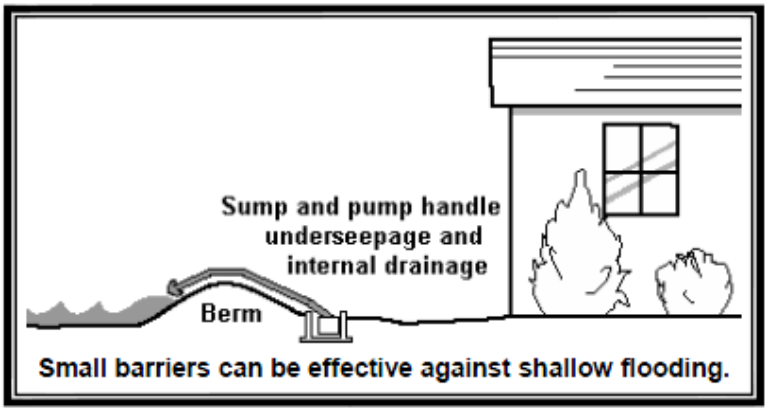
A flood protection barrier can be built of dirt or soil (a "berm") or concrete or steel (a "floodwall"). Careful design is needed so as not to create flooding or drainage problems on neighboring properties. Depending on how porous the ground is, if floodwaters will stay up for more than an hour or two, the design needs to account for leaks, seepage of water underneath, and rainwater that will fall inside the perimeter. This is usually done with a sump or drain to collect the internal groundwater and surface water and a pump and pipe to pump the internal drainage over the barrier.

Figure C-4 Types of Barriers

This low floodwall has landscaping to minimize the adverse impact on the property's appearance.

Small, wood frame buildings are the easiest to relocate

Source: Kennedy House Movers, Huntsville, AL



Small barriers can be effective against shallow flooding.

Barriers can only be built so high. They can be overtopped by a flood higher than expected. Barriers made of earth are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and

properly maintained. A berm can also settle over time, lowering its protection level. A floodwall can crack, weaken, and lose its watertight seal. Therefore, barriers need careful design and maintenance (and insurance on the building, in case of failure).

Relocation

Moving a building to higher ground is the surest and safest way to protect it from flooding. While almost any building can be moved, the cost increases for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings.

In areas subject to flash flooding, deep waters, or other high hazard, relocation is often the only safe approach. Relocation is also preferred for large lots that include buildable areas outside the floodplain or where the owner has a new flood-free lot (or portion of the existing lot) available.

Building Elevation

Raising a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation.

One concern with elevation is that it may expose the structure to greater impacts from other hazards such as wind and groundshaking. If not braced and anchored properly, an elevated building may have less resistance to the shaking of an earthquake and the pressures of high winds.

Demolition

Some buildings, especially heavily damaged or repetitively flooded ones, are not worth the expense to protect them from future damages. It is cheaper to demolish them and either replace them with new, flood protected structures ("pilot reconstruction"), or relocate the occupants to a safer site. Demolition is also appropriate for buildings that are difficult to move - such as larger, slab foundation or masonry structures - and for dilapidated structures that are not worth protecting. Generally, demolition projects are undertaken by a government agency, so the cost is not borne by the property owner, and the land is converted to public open space use, like a park.

Figure C-5 Demolition of Flooded Home

Demolishing a repetitively flooded home

One problem that sometimes results from an acquisition and demolition project is a "checkerboard" pattern in which nonadjacent properties are acquired. This can occur when some owners, especially those who have and prefer a waterfront location, are reluctant to leave their homes. Creating such an acquisition pattern in a community simply adds to the maintenance costs that taxpayers must support.

Pilot Reconstruction

If a building is not in good shape, elevating it may not be worthwhile or it may even be dangerous. An alternative is to demolish the structure and build a new one on the site that meets or exceeds all flood and wind protection codes. This was formerly known as "demo/rebuild." FEMA funding programs refer to this approach as "pilot reconstruction." It is still a pilot program, and not a regularly funded option.

Certain rules must be followed to qualify for federal funds for pilot reconstruction:

- Pilot reconstruction is only possible after it has been shown that acquisition or elevation are not feasible, based on the program's criteria.
- Funds are only available to people who owned the property at the time of the event for which funding is authorized.
- It must be demonstrated that the benefits exceed the costs.
- The new building must be elevated to the advisory base flood elevation.
- The new building must not exceed more than 10% of the old building's square footage.
- The new building must meet all flood and wind protection codes.
- There must be a deed restriction that states the owner will buy and keep a flood insurance policy.
- The maximum federal grant is 75% of the cost, up to $150,000. FEMA is developing a detailed list of eligible costs to ensure that disaster funds are not used to upgrade homes.

Local Implementation

Within the Sacramento County planning area, which includes the unincorporated Sacramento County and the City of Sacramento, acquisition and elevation projects have occurred. Historically, Sacramento County has participated in programs to acquire and elevate flooddprone structures within the County. The County is currently pursuing a FEMA HMGP Grant to elevate another approximately 35 structures. The City of Sacramento has also participated in similar programs.

CRS Credit

The CRS provides the most credit points for acquisition and relocation, because this measure permanently removes insurable buildings from the floodplain. The CRS credits barriers and elevating existing buildings (Activity 530 - Flood Protection). Elevating a building above the flood level will also reduce the flood insurance premiums on that individual building. Because barriers are less secure than elevation, not as many points are provided. Higher scores are possible, but they are based on the number of buildings removed compared to the number remaining in the floodplain.

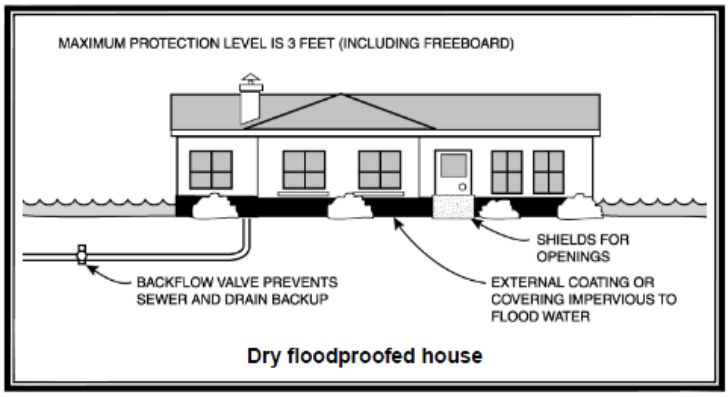
Retrofitting

An alternative to keeping the hazard away from a building is to modify or retrofit the site or building to minimize or prevent damage. There are a variety of techniques to do this, as described below.

Dry Floodproofing

Dry floodproofing means making all areas below the flood protection level watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings, such as doors, windows and vents, are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques.

Figure C-6 Dry Floodproofing



Dry floodproofing is only effective for shallow flooding, such as repetitive drainage problems. It does not protect from the deep flooding along lakes and larger rivers caused by hurricanes or other storms.

Wet Floodproofing

The alternative to dry floodproofing is wet floodproofing: water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

Local Implementation

Area residents have utilized both dry and wet floodproofing techniques for construction of homes in floodprone areas. Floodproofing requirements for new or substantially improved structures are addressed in the communities' Floodplain Management Ordinances.

CRS Credit

Credit for dry and wet floodproofing and sewer backup protection is provided under Activity 530 - Retrofitting. Because these property protection measures are less secure than barriers and elevation, not as many points are provided.

Insurance

Technically, insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild, and hopefully afford to incorporate some of the other property protection measures in the process. Insurance offers the advantage of protecting the property, as long as the policy is in force, without requiring human intervention for the measure to work.

Private Property

Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the NFIP. Flood insurance coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area.

Figure C-7 Flood Insurance Coverage

Table 5-1 Example Flood Insurance Premiums	
Building Exposure	**Premium**
In the Special Flood Hazard Area (AE Zone)	
Pre-FIRM ("subsidized") rate	$1,689
Post-FIRM (actuarial) rates	
2 feet above the base flood elevation	$440
1 foot above the base flood elevation	$643
At the base flood elevation	$1,167
1 foot below the base flood elevation	$4,379
Outside the Special Flood Hazard Area	$1,029
Premiums are for $150,000 in building coverage and $75,000 in contents coverage for a one story house with no basement and a $500 deductible, using the October 2008 *Flood Insurance Manual*. Premiums include the 5% Community Rating System discount in unincorporated St. Tammany Parish. Premiums are higher in the municipalities, which are not in the CRS.	

Most people purchase flood insurance because it is required by the bank when they get a mortgage or home improvement loan. Usually these policies just cover the building's structure and not the contents. Contents coverage can be purchased separately. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building. Most people don't realize that there is a 30-day waiting period to purchase a flood insurance policy and there are limits on coverage.

Public Property

Governments can purchase commercial insurance policies. Larger local governments often self-insure and absorb the cost of damage to one facility, but if many properties are exposed to damage, self-insurance can drain the government's budget. Communities cannot expect federal disaster assistance to make up the difference after a flood.

Under Section 406(d) of the Stafford Act:

> *"If an eligible insurable facility damaged by flooding is located in a [mapped floodplain] … and the facility is not covered (or is underinsured) by flood insurance on the date of such flooding, FEMA is required to reduce Federal disaster assistance by the maximum amount of insurance proceeds that would have been received had the buildings and contents been fully covered under a National Flood Insurance Program (NFIP) standard flood insurance policy. [Generally, the maximum amount of proceeds for a non-residential property is $500,000.]*

[Communities] Need to:

- Identify all insurable facilities, and the type and amount of coverage (including deductibles and policy limits) for each. The anticipated insurance proceeds will be deducted from the total eligible damages to the facilities.

- Identify all facilities that have previously received Federal disaster assistance for which insurance was required. Determine if insurance has been maintained. A failure to maintain the required insurance for the hazard that caused the disaster will render ineligible for Public Assistance funding…
- [Communities] must obtain and maintain insurance to cover [their] facility - buildings, equipment, contents and vehicles - for the hazard that caused the damage in order to receive Public Assistance funding. Such coverage must, at a minimum, be in the amount of the eligible project costs. FEMA will not provide assistance for that facility in future disasters if the requirement to purchase insurance is not met. - FEMA Response and Recovery Directorate Policy No. 9580.3, August 23, 2000

In other words, the law expects public agencies to be fully insured as a condition of receiving federal disaster assistance.

Local Implementation

Flood insurance is available in Sacramento County and the City of Sacramento.

NFIP insurance data provided by DWR indicates that as of March 24, 2020, there were 7,497 policies in force in the unincorporated County, resulting in $2,169,765,000 of insurance in force. Of these policies, 6,878 are for residential and 619 are for non-residential properties. There have been 1,747 closed paid losses totaling $24,741,813.70. Of these losses,1,178 were parcels in A zones and 544 parcels were in B, C, or X zone, with 25 claim unknown. Of the 1,747 claims, 1,352 claims were associated with pre-FIRM structures and 370 with post-FIRM structures, with 25 claims unknown. There have been 390 repetitive loss (RL) structures, and 6 severe repetitive loss (SRL) structures in the County with 606 paid losses totaling $14,987,148.49. Of these RL buildings, 187 are in the A zones and 103 are in the B, C, or X zone. There have been 137 substantial damage claims since 1978. Additional information on these policies for Sacramento County are described in Chapter 4 of the Base Plan.

NFIP data indicates that as of March 24, 2020, there were 43,303 flood insurance policies in force in the City with $6,937,000 of coverage. Of the 43,303 policies, 42,269 were residential, while 1,034 were non-residential structures. Of the 43,303 policies, 26,639 were in A zones, while 16,664 were in B, C, and X zones. There has been 1,855 historical claims for flood losses totaling $9,852,037.68. NFIP data further indicates that there are 106 repetitive loss (RL) and no severe repetitive loss (SRL) buildings in Sacramento. There have been 158 RL claims totaling $2,110,551.25. There have been 43 substantial damage claims since 1978. Additional information on these policies for the City of Sacramento are described in the City's Annex.

Both Sacramento County and the City of Sacramento make great efforts on flood insurance promotion. This includes public outreach efforts for flood insurance promotion under both of their CRS PPI programs as well as other outreach efforts as necessary to educate the public on this important mitigation program. More information on flood insurance, the County and City's PPI programs and other public outreach mechanisms regarding flood insurance promotion are included in Chapter 4 of the Base plan and the City's Annex.

CRS Credit

There is no credit for purchasing flood insurance, but the CRS does provide credit for local public information programs that explain flood insurance to property owners. The CRS also reduces the premiums for those people who do buy NFIP coverage.

The Government's Role

Property protection measures are usually considered the responsibility of the property owner. However, local governments should be involved in all strategies that can reduce flood losses, especially acquisition and conversion of a site to public open space. There are various roles a municipality can play in encouraging and supporting implementation of these measures.

One of the first duties of a local government is to protect its own facilities. Fire stations, water treatment plants and other critical facilities should be a high priority for retrofitting projects and insurance coverage. Often public agencies discover after the disaster that their "all-hazard" insurance policies do not cover the property for the type of damage incurred. Flood insurance is even more important as a mitigation measure because of certain Stafford Act provisions.

Providing basic information to property owners is the first step in supporting property protection measures. Owners need general information on what can be done. They need to see examples, preferably from nearby.

Communities can help owners by helping to pay for a retrofitting project. Financial assistance can range from full funding of a project to helping residents find money from other programs. Some communities assume responsibility for sewer backups, street flooding, and other problems that arise from an inadequate public sewer or public drainage system. Less expensive community programs include low interest loans, forgivable low interest loans and rebates. A forgivable loan is one that does not need to be repaid if the owner does not sell the house for a specified period, such as five years. These approaches don't fully fund the project, but they cost the community less and they increase the owner's commitment to the flood protection project. Often, small amounts of money act as a catalyst to pique the owner's interest to get a self-protection project moving.

The more common outside funding sources are listed below. Unfortunately, the last three are only available after a disaster, not before, when damage could be prevented.

Pre-disaster funding sources:

- FEMA's Building Resilient Infrastructure and Communities (BRIC) grants
- FEMA's Flood Mitigation Assistance (FMA) grants

- Community Development Block Grants
- Conservation organizations, although generally these organizations prefer to purchase vacant land in natural areas, not properties with buildings on them.

Post-disaster funding sources:

- Insurance claims
- The NFIP's Increased Cost of Compliance. This provision increases a flood insurance claim payment to help pay for a flood protection project required by code as a condition to rebuild the flooded building. It can also be used to help pay the non-federal cost-share of an elevation project.

Post-disaster funding sources, federal disaster declaration needed:

- FEMA's disaster assistance (for public properties). However, after a flood, the amount of assistance will be reduced by the amount of flood insurance that the public agency should be carrying on the property.
- Small Business Administration disaster loans (for non-governmental properties)
- FEMA's Hazard Mitigation Grant Program

Acquisition Agent

The community can be the focal point in an acquisition project. Most funding programs require a local public agency to sponsor the project. The local government could process the funding application, work with the owners, and provide some, or all, of the local share. In some cases, the local government would be the ultimate owner of the property, but in other cases another public agency could assume ownership and the attendant maintenance responsibilities.

Mandates

Mandates are considered a last resort if information and incentives are insufficient to convince a property owner to take protective actions. An example of a retrofitting mandate is the requirement that communities have to disconnect downspouts from the sanitary sewer line.

There is a mandate for improvements or repairs made to a building in the mapped floodplain. If the project equals or exceeds 50% of the value of the original building, it is considered a "substantial improvement." The building must then be elevated or otherwise brought up to current flood protection codes.

Another possible mandate is to require less expensive hazard protection steps as a condition of a building permit. For example, many communities require upgraded electrical service as a condition of a home improvement project. If a person were to apply for a permit for electrical work, the community could require that the service box be moved above the base flood elevation or the installation of a separate ground fault interrupter circuits in the basement.

Local Implementation

As previously described, both Sacramento County and the City of Sacramento have participated in programs to acquire and/or elevate structures in floodprone areas.

CRS Credit

Except for public information programs, the CRS does not provide credit for efforts to fund, provide incentives, or mandate property protection measures. CRS credits are provided for the actual projects after they are completed. However, to participate in CRS, a community must certify that it has adequate flood insurance on all properties that have been required to be insured. The minimum requirement is to insure those properties in the mapped floodplain that have received federal aid, as specified by the Flood Disaster Protection Act of 1973.

Repetitive Loss Properties and Analysis

Repetitive loss properties deserve special attention because they are more prone to damage by natural hazards than any other properties in the County planning area. Further, protecting repetitive loss buildings is a priority with FEMA mitigation funding programs.

Sacramento County: There have been 390 repetitive loss (RL) structures, and 1 severe repetitive loss (SRL) structure in the County with 606 paid losses totaling $14,987,148.49. Of these RL buildings, 187 are in the A zones and 103 are in the B, C, or X zone. Several more properties within Sacramento County may have reached the damage threshold for Repetitive Loss Properties, but not all properties are covered by flood insurance and flood insurance claims are not submitted for all flood damage sustained. Much more information and analysis of the County's RL properties can be found in Section 4.3.10 of the Base plan and the County's RLAA 2015 Report and 2021Annual Progress Report Update, included as an Appendix to this LHMP.

City of Sacramento: The City has 106 RL structures and no Severe Repetitive Loss structures. There have been 158 RL claims totaling $2,110,551.25. The RL properties are located throughout the city. Repetitive flooding is generally a result of a combination of poor drainage and homes below the street elevation. Drainage improvements in the area have alleviated some of the flooding issues to these RL structures over the years. Citizens are required to have flood insurance in an A zone if they have a federally backed mortgage. Repetitive loss properties are shown in Figure F-39 and detailed in Table F-46 of Annex F of this Plan Update. A more detailed repetitive loss area analyses of the City's repetitive loss properties is located in the City's Annex to this LHMP and in their most recent RLAA Report, also included as an Appendix to this LHMP.

Conclusions and Recommendations

- There are several ways to protect individual properties from damage by natural hazards. The advantages and disadvantages of each should be examined for each situation.
- Property protection measures can protect some of the most damage-prone buildings in the Sacramento County planning area including repetitive loss properties.
- Flood insurance promotion has been effective within both Sacramento County and the City of Sacramento as evidenced by the numbers of flood insurance policies.
- Property owners can implement some property protection measures at little cost, especially for sites in areas of low hazards (e.g., shallow flooding, sewer backup, and thunderstorms). For other measures, such as relocation and elevation, the owners may need financial assistance.
- Local government agencies can promote and support property protection measures through several activities, ranging from public information to financial incentives to full funding.

- Government properties, including critical facilities, should be evaluated to determine the extent to which they are protected from flooding.
- Because properties in floodplains are likely to be damaged at some point, efforts should continue to provide information and advice to floodplain property owners. Special attention should be given to repetitive loss and high hazard areas.
- Public education materials can be developed/enhanced to explain property protection measures that can help owners reduce their exposure to damage by floods and the various types of insurance that are available.
- All property protection projects should be voluntary to be most effective. Other than state and federally mandated regulations, local incentives should be positive as much as possible, such as providing financial assistance.
- A FEMA Hazard Mitigation Assistance (HMA) Grant workshop focused on private firms and citizens could be conducted annually to showcase the assistance that FEMA (HMGP, PDM, FMA, RFC and SRL) provides and to encourage public participation.
- A standard checklist could be developed to evaluate a property's exposure to damage from floods. It should include a review of insurance coverage and identify where more information can be found on appropriate property protection measures. The checklist should be provided to each agency participating in this planning process and made available to the public.
- Sacramento County and the City of Sacramento should evaluate its own properties using the standard checklist. A priority should be placed on determining critical facilities' vulnerability to damage and whether public properties are adequately insured.
- Sacramento County and the City of Sacramento should protect their own publicly owned facilities with appropriate mitigation measures.

C.2.3. Natural Resource Protection

Resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. These activities enable the naturally beneficial functions of fields, floodplains, wetlands, and other natural lands to operate more effectively. Natural and beneficial functions of watersheds, floodplains and wetlands include:

- Reduction in runoff from rainwater and snow melt in pervious areas
- Infiltration that absorbs overland flood flow
- Removal and filtering of excess nutrients, pollutants and sediments
- Storage of floodwaters
- Absorption of flood energy and reduction in flood scour
- Water quality improvement
- Groundwater recharge
- Habitat for flora and fauna
- Recreational and aesthetic opportunities

As development occurs, many of the above benefits can be achieved through regulatory steps for protecting natural areas or natural functions. The regulatory programs are discussed in Section 4.4, Capability Assessment, of the base plan. This Appendix C covers the resource protection programs and standards that can help mitigate the impact of natural hazards, while they improve the overall environment. Seven areas are reviewed:

- Wetland protection
- Erosion and sedimentation control

- River restoration
- Best management practices
- Dumping regulations
- Urban forestry
- Farmland protection

Wetland Protection

Wetlands are often found in floodplains and depressional areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as a natural filter, which helps to improve water quality, and they provide habitat for many species of fish, wildlife and plants.

Wetlands that are determined to be part of the waters of the United States are regulated by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency (US EPA) under Section 404 of the Clean Water Act. Before a "404" permit is issued, the plans are reviewed by several agencies, including the Corps and the U.S. Fish and Wildlife Service. Each of these agencies must sign off on individual permits.

There are also nationwide permits that allow small projects that meet certain criteria to proceed without individual permits. Wetlands not included in the Corps' jurisdiction or that are addressed by a nationwide permit may be regulated against by local authorities.

If a permit is issued by the Corps, County, or one of the cities, the impact of the development is typically required to be mitigated. Wetland mitigation can include creation, restoration, enhancement or preservation of wetlands elsewhere. Wetland mitigation is often accomplished within the development site, however, mitigation is allowed off-site and sometimes in another watershed. The appropriate type of mitigation is addressed in each permit.

Some developers and government agencies have accomplished the required mitigation by buying into a wetland bank. Wetland banks are large wetlands created for the purpose of mitigation. The banks accept money to reimburse the owner for setting the land aside from development.

When a wetland is mitigated at a separate site there are drawbacks to consider. First, it takes many years for a new wetland to approach the same quality as an existing one. Second, a new wetland in a different location (especially if it is in a different watershed) will not have the same flood damage reduction benefits as the original one did.

Local Implementation

Sacramento County and the City of Sacramento have ordinances that provide parameters for developing near wetlands. These include requirements for restricting grading and soil disturbances in wetlands, drainage ways, stream environment zones, or water bodies.

CRS Credit

The CRS focuses on activities that directly affect flood damage to insurable buildings. While there is no credit for relying on the Corps of Engineers' 404 regulations, there is credit for preserving open space in its natural condition or restored to a state approximating its natural condition. The credit is based on the

percentage of the floodplain that can be documented as wetlands protected from development by ownership or local regulations. Likewise, there is credit for maintaining water quality buffers that protect streams, rivers, lakes and shorelines in their natural condition or restoring them to an approximate natural state. Credit is also available for an approved habitat conservation plan.

Erosion and Sedimentation Control

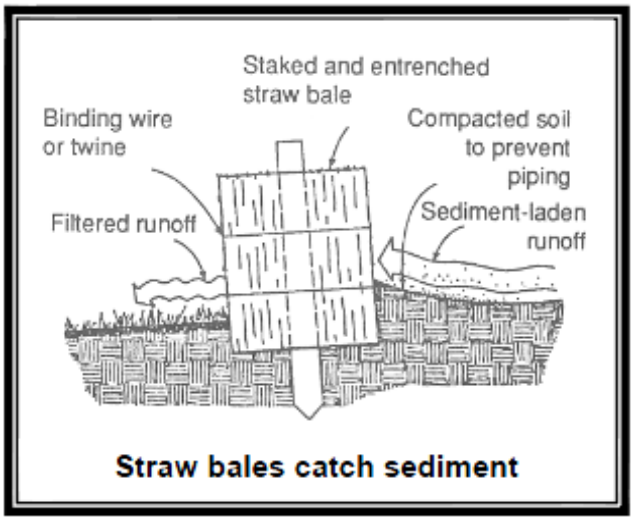
Farmlands and construction sites typically contain large areas of bare exposed soil. Surface water runoff can erode soil from these sites, sending sediment into downstream waterways. Erosion also occurs along stream banks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil.

Sediment suspended in the water tends to settle out where flowing water slows down. This can clog storm drains, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands. When channels are constricted and flooding cannot deposit sediment in the bottomlands, even more sediment is left in the channels. The result is either clogged streams or increased dredging costs.

Not only are the drainage channels less able to perform their job, but the sediment in the water reduces light, oxygen and water quality, and often carries chemicals, heavy metals and other pollutants. Sediment has been identified by the US EPA as the nation's number one nonpoint source pollutant for aquatic life.

There are two principal strategies to address these problems: minimize erosion and control sedimentation. Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices.

Figure C-8 Erosion Control



If erosion occurs, other measures are used to capture sediment before it leaves the site. Silt fences, sediment traps and vegetated filter strips are commonly used to control sediment transport. Runoff from the site can

be slowed down by terraces, contour strip farming, no-till farm practices, hay or straw bales, constructed wetlands, and impoundments (e.g., sediment basins and farm ponds). Slowing surface water runoff on the way to a drainage channel increases infiltration into the soil and reduces the volume of topsoil eroded from the site.

Erosion and sedimentation control regulations mandate that these types of practices be incorporated into construction plans. The most common approach is to require applicants for permits to submit an erosion and sediment control plan for the construction project. This allows the applicant to determine the best practices for the site.

Local Implementation

Both Sacramento County and the City of Sacramento have comprehensive Stormwater Quality Programs and Erosion and Sediment Control Programs which include ordinances and practices for erosion and sedimentation control. In addition, the South Sacramento Habitat Conservation Plan is a regional approach to addressing issues related to urban development, habitat conservation and agricultural protection. The Plan is still in process with a final draft provided for public review in May 2018.

CRS Credit

Local governments whose ordinances include erosion and sedimentation control provisions can qualify for up to 45 points for this measure.

River Restoration

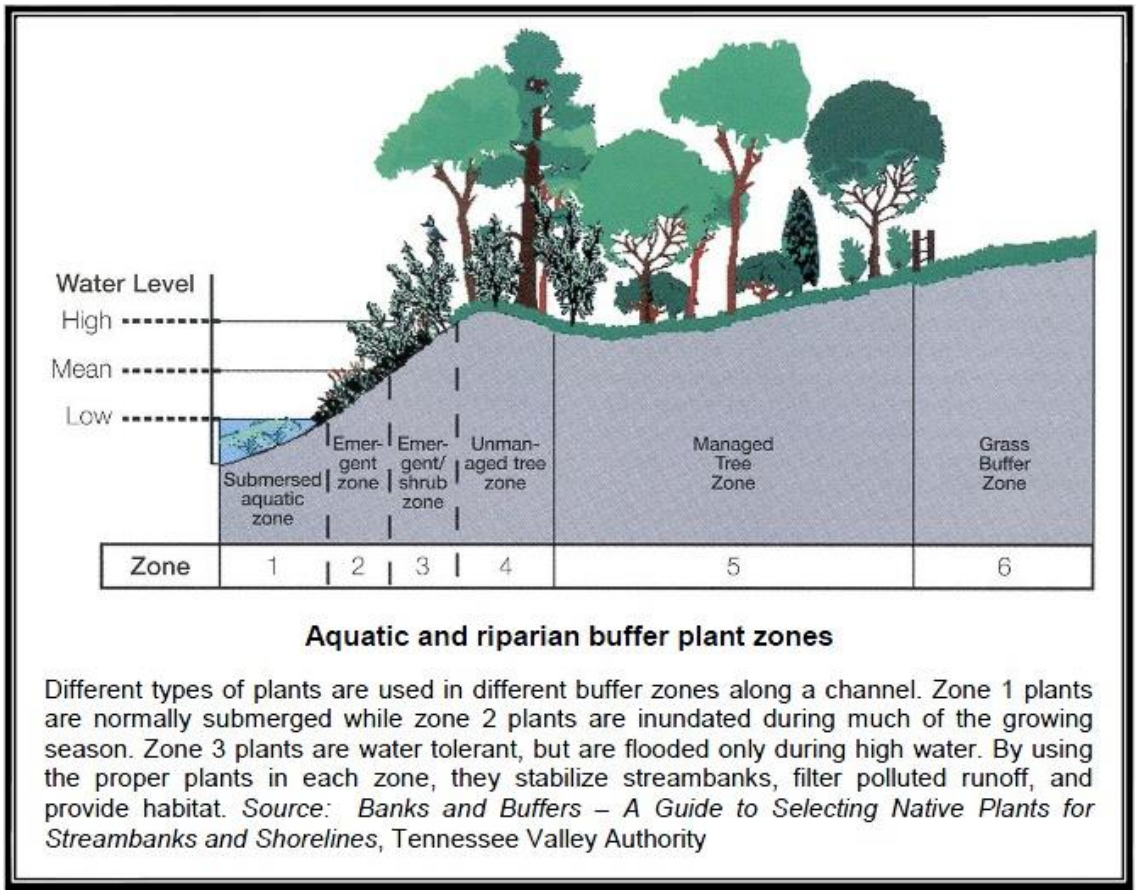
There is a growing movement that has several names, such as "stream conservation," "bioengineering," or "riparian corridor restoration." The objective of these approaches is to return streams, stream banks and adjacent land to a more natural condition, including the natural meanders. Another term is "ecological restoration," which restores native indigenous plants and animals to an area.

A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

- Reduces the amount of sediment and pollutants entering the water
- Enhances aquatic habitat by cooling water temperature
- Provides food and shelter for both aquatic and terrestrial wildlife
- Can reduce flood damage by slowing the velocity of water
- Increases the beauty of the land and its property value
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing and bird watching
- Reduces long-term maintenance costs

Figure C-9 River Restoration Zones



Aquatic and riparian buffer plant zones

Different types of plants are used in different buffer zones along a channel. Zone 1 plants are normally submerged while zone 2 plants are inundated during much of the growing season. Zone 3 plants are water tolerant, but are flooded only during high water. By using the proper plants in each zone, they stabilize streambanks, filter polluted runoff, and provide habitat. *Source: Banks and Buffers – A Guide to Selecting Native Plants for Streambanks and Shorelines*, Tennessee Valley Authority

Local Implementation

Sacramento County and the City of Sacramento implement a variety of these activities for water quality and floodplain management purposes under many of their existing programs.

CRS Credit

The CRS provides credits for preserving open space in its natural condition or restored to a state approximating its natural condition. There are also credits for channel setbacks, buffers and protecting shorelines. Sacramento County and the City of Sacramento currently receive some credit for open space conservation. Credit is also provided for open space land that is deed restricted

Best Management Practices

Point source pollutants come from pipes such as the outfall of a municipal wastewater treatment plant. They are regulated by the US EPA and the California Department of Water Resources. Nonpoint source pollutants come from non-specific locations and harder to regulate. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, other chemicals, animal wastes, oils from street surfaces and industrial areas,

and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams.

The term "best management practices" (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff rates and volumes, prevent erosion, protect natural resources and capture nonpoint source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple usages of drainage and storage facilities.

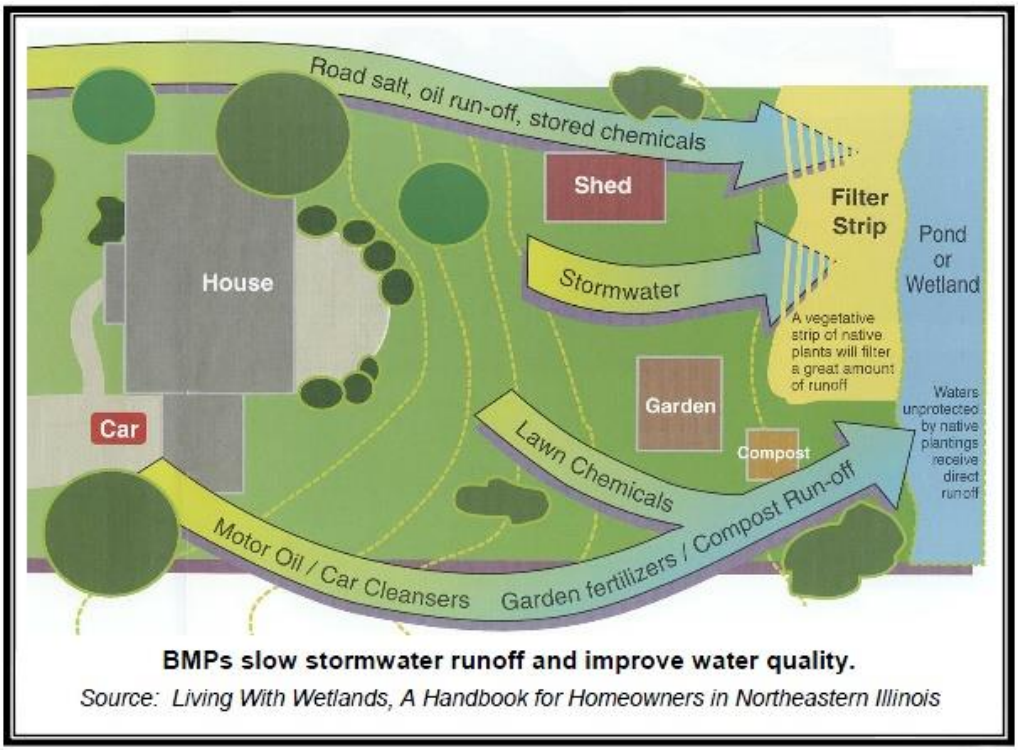
Local Implementation

Sacramento County and the City of Sacramento participate in the National Pollutant Discharge Elimination System permitting program and require BMPs to minimize stormwater impacts.

CRS Credit

A community can receive CRS points if regulations require new developments to include in the design of their permanent stormwater management facilities appropriate BMPs that will improve the quality of surface waters.

Figure C-10 Stormwater Best Management Practices



Dumping Regulations

BMPs usually address pollutants that are liquids or are suspended in water that are washed into a lake or stream. Dumping regulations address solid matter, such as shopping carts, appliances and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels' and wetlands' abilities to convey or clean stormwater.

Many communities have nuisance ordinances that prohibit dumping garbage or other "objectionable waste" on public or private property. Waterway dumping regulations need to also apply to "non-objectionable" materials, such as grass clippings or tree branches, which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard without realizing that is needed to drain street runoff. They may not understand how regarding their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

Local Implementation

Sacramento County ordinances makes it unlawful for anyone to deposit waste, trash, or debris into a waterway. Ordinances also prohibits the placing of any obstruction in a floodway, including buildings, fill, or fencing. It is also illegal to dump or discharge hazardous materials, trash, or other pollutants into the storm drains. Even grass, leaves and yard clippings that are repeatedly swept into catch basins can clog the drain, causing flooding and the potential for becoming a breeding ground for rodents and insects. Additionally, when grass and leaves decompose they encourage excessive growth of algae which can deprive fish of adequate oxygen.

The City of Sacramento has regulations that make it illegal for anyone to accumulate, store, keep, throw, place, deposit, or dump refuse in any water or waterway, or upon the levees or banks adjacent thereto. The City also has regulations prohibiting the discharge of trash and pollutants into storm drains.

Both the City and County publicize this information on their local websites and through other outreach mechanisms.

CRS Credit

The CRS provides credit for enforcing and publicizing a regulation that prohibits dumping in the drainage system.

Farmland Protection

Farmland protection is quickly becoming an important piece of comprehensive planning and zoning throughout the United States. The purpose of farmland protection is to provide mechanisms for prime,

unique, or important agricultural land to remain as such, and to be protected from conversion to nonagricultural uses.

Frequently, farm owners sell their land to residential or commercial developers and the property is converted to non-agricultural land uses. With development comes more buildings, roads and other infrastructure. Urban sprawl occurs, which can lead to additional stormwater runoff and emergency management difficulties.

Figure C-11 Floodplain Damages to Farmland

Farms on the edge of cities are often appraised based on the price they could be sold for to urban developers. This may drive farmers to sell to developers because their marginal farm operations cannot afford to be taxed as urban land. The Farmland Protection Program in the United States Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to state, tribal, and local governments as well as nonprofit organizations to help purchase easements on agricultural land to protect against the development of the land. Eligible land includes cropland, rangeland, grassland, pastureland, or forest land that is part of an agricultural operation. Certain lands within historical or archaeological resources are also included.

The hazard mitigation benefits of farmland protection are similar to those of open space preservation:

- Farmland is preserved for future generations,
- Farmland in the floodplain keeps damageable structures out of harm's way,
- Farmland keeps more stormwater on site and lets less stormwater runoff downstream,
- Rural economic stability and development is sustained,
- Ecosystems are maintain, restored or enhanced, and
- The rural character and scenic beauty of the area is maintained.

Local Implementation

Sacramento County currently implements the Williamson Land Conservation Act. This Act was passed by the California legislature to preserve agricultural and other open space lands. It was originally drafted to slow the loss of prime agricultural land, regardless of soil quality. In addition, it now provides protection

for wild life habitats, marshlands, salt flats and certain scenic highways. The Act authorizes local governments and property owners to commit land to specified uses of twenty years or more under a binding contract. Once committed, the land is to be valued as open space land pursuant to open space valuation laws (Revenue & Taxation Code Sections 421, et seq.) enacted pursuant to the Open Space Amendment of the California Constitution.

The City of Sacramento has a similar Urban Agriculture Incentive Zone, intended to promote urban agriculture by providing property tax incentives.

CRS Credit

Credit is given for preserving open space in the floodplain, regardless of why it is being preserved. Credit is also provided for density zoning of floodprone areas.

Conclusions and Recommendations

- A hazard mitigation program can use resource protection programs to support protecting areas and natural features that can mitigate the impacts of natural hazards.
- Sacramento County and the City of Sacramento enforce regulations that prohibit illicit discharges into public sewers or onto public or private property.
- Preserving farmland in the floodplain will maintain open space and prevent damage to homes, businesses, and other development.
- The public and decision makers should be informed about the hazard mitigation benefits of restoring rivers, wetlands and other natural areas. Restoration and protection techniques should be explained.
- Sacramento County and the City of Sacramento may consider publicizing their illicit discharge rules more widely.
- Public outreach activities should include informing the public about the need to protect streams and wetlands from dumping and inappropriate development and the relevant codes and regulations.

C.2.4. Emergency Services Measures

Emergency services measures protect people during and after a disaster. A good emergency management program addresses all hazards, and it involves all local government departments. At the state level, emergency services programs are coordinated by the California Office of Emergency Services (Cal OES). Locally, emergency services are coordinated by the Sacramento County Office of Emergency Services and the City of Sacramento Office of Emergency Services.

This section reviews emergency services measures following a chronological order of responding to an emergency. It starts with identifying an impending problem (threat recognition) and continues through post-disaster activities.

Threat Recognition

The first step in responding to a flood, storm, or other natural hazard is to know when weather conditions are such that an event could occur. With a proper and timely threat recognition system, adequate warnings can be disseminated.

Routine Monitoring for Alerts, Watches and Warnings

Emergency officials constantly monitor events and the environment to identify specific threats that may affect their jurisdiction and increase awareness levels of emergency personnel and the community when a threat is approaching or imminent.

The National Weather Service (NWS) is the prime agency for detecting meteorological threats, such as tornadoes, thunderstorms and winter storms. Severe weather warnings are transmitted through NOAA's Weather Radio System. Federal agencies can only look at the large scale, e.g., whether conditions are appropriate for the formation of a thunderstorm. Local emergency managers can provide more site-specific and timely recognition by sending out NWS trained spotters to watch the skies when the Weather Service issues a watch or a warning. The NWS page for Sacramento County is accessible through the Sacramento County website and at the following: http://forecast.weather.gov/MapClick.php?zoneid=CAZ017.

A flood threat recognition system predicts the time and height of a flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels.

On larger rivers, this measuring and calculating is performed by the NWS, a part of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Support for NOAA's efforts is provided by cooperating partners from state and local agencies. Forecasts of expected river stages are made through the Advanced Hydrologic Prediction Service (AHPS) of the National Weather Service. Flood threat predictions are disseminated on the NOAA Weather Wire or NOAA Weather Radio. NOAA Weather Radio is considered by the federal government as the official source for weather information.

On smaller rivers, locally established rainfall and river gauges are needed to establish a flood threat recognition system. The NWS may issue a "flash flood watch." This is issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain nor imminent. These events are so localized and so rapid that a "flash flood warning" may not be issued, especially if no remote threat recognition equipment is available. In the absence of a gauging system on small streams, the best threat recognition system is to have local personnel monitor rainfall and stream conditions. While specific flood crests and times will not be predicted, this approach will provide advance notice of potential local or flash flooding.

Local Implementation

Sacramento County and City of Sacramento Emergency Operations Plan's (EOP), include procedures for threat identification. The City and County work closely with the NWS for issuing an Emergency Alert System (EAS). Additional Sacramento County's threat identification mechanisms include:

California Data Exchange Center (CDEC). The CDEC provides information for flood forecasting information at http://cdec.water.ca.gov/. The CDEC installs, maintains, and operates an extensive hydrologic data collection network including automatic snow reporting gages for the Cooperative Snow Surveys Program and precipitation and river stage sensors for flood forecasting.

Automated Local Evaluation in Real Time (ALERT) System. ALERT was created by the NWS to provide continuous and automatic reports from river levels and rainfall gauges detect impending high water levels. ALERT information includes:

- Rainfall Summary
- Stage Summary
- Storm Ready
- Sandbag Information
- Detailed Forecast
- Quantitative Precipitation Forecasts (QPF)
- NWS River Forecasts

The Sacramento County's ALERT system consists of 2 base stations, and 50 gaging stations. The purpose of the County's ALERT website is to provide real time monitoring information to stage and rainfall information during storm events, which assist in informing the activation of additional warning and potential evacuation of affected areas. This information which can be accessed through the Sacramento County website includes information for: Stream Level Summaries and Maps; and Rainfall Summaries and Maps.

Dam Protocols. Should an event trigger the activation of an Emergency Action Plan (EAP) for a potential dam failure, County OES receives this information via direct phone calls from the originating source/agency or from PCSO Dispatch and/or Cal OES. County OES then follows the notification and evacuation procedures called for in the EAP.

Increased Readiness & Pre-Impact

Early threat identification and sufficient warning provides the opportunity for response agencies to increase readiness, which are actions designed to increase an agency's ability to effectively respond once the emergency occurs. This includes steps to brief key officials, disseminating information to the community, and through activation of EOCs, as necessary.

Community Preparedness and Awareness

Emergency public information is a priority during emergencies and disasters. County and City governments have a primary responsibility to provide accurate and timely information to the public regarding conditions, threats, and protective measures. Emergency information is best communicated when centralized and coordinated among all involved jurisdictions, agencies, and organizations.

The public's response to any emergency is based on an understanding of the nature of the emergency, the potential hazards, the likely response of emergency services, and knowledge of what individuals and groups should do to increase their chances of survival and recovery. Effective public awareness and education prior to an emergency or a disaster will directly affect the Sacramento County/City's emergency operations response and recovery efforts.

CRS Credit

Credit can be received for using river flood stage predictions for the NWS's gages. The actual score is based on how much of the community's floodplain is affected by these systems. Potential CRS credit is possible under Activity 610 - Flood Warning Program and Response.

Notifications and Warning Systems

Once a disaster is imminent, action is taken to control the situation, save lives, protect property, and minimize the effects of the disaster. During this phase, warning systems are activated; resources and first responders notified and mobilized; and evacuations begin.

After a threat recognition system tells the emergency services office that a flood, severe weather or other hazard is coming, the next step is to notify the public and staff of other agencies and critical facilities. Providing adequate and timely notification to the public is the greatest challenge, especially with sudden or no-notice events. The earlier and more specific the warning, the greater the number of people that can implement protection measures.

As previously described, the NWS issues notices to the public using two levels of notification:

- **Watch.** Conditions are right for flooding, thunderstorms, or other hazard event.
- **Warning**. A flood or other event has started or been observed.

A more specific warning may be disseminated by the community in a variety of ways. The following are the more common methods:

- Commercial or public radio or TV stations
- The Weather Channel
- Cable TV emergency news inserts
- Telephone trees/mass telephone notification
- NOAA Weather Radio
- Tone activated receivers in key facilities
- Outdoor warning sirens
- Sirens on public safety vehicles
- Door-to-door contact
- Mobile public address systems
- Email notifications

Multiple or redundant systems are most effective - if people do not hear one warning, they may still get the message from another part of the system. Each has advantages and disadvantages:

- Radio and television provide a lot of information, but people have to know when to turn them on. They are most appropriate for hazards that that develop over more than a day, such as a tropical storm, hurricane, or winter storm.
- NOAA Weather Radio can provide short messages of any impending weather hazard or emergency and advise people to turn on their televisions for more information, but not everyone has a Weather Radio.
- Outdoor warning sirens can reach many people quickly as long as they are outdoors. They do not reach people in tightly-insulated buildings or those around loud noise, such as at a factory, during a

thunderstorm, or in air conditioned homes. They do not explain what hazard is coming, but people should know to turn on a radio or television when they hear the siren.
- Automated telephone notification services are also fast, but can be expensive and do not work when phone lines are down. Nor do they work for unlisted numbers, call screening services, or cellular service, unless people sign up for notifications.
- Where a threat has a longer lead time, going door-to-door and manual telephone trees can be effective.

Just as important as issuing a warning is telling people what to do in case of an emergency. A warning program should have a public information aspect. Citizens should know the difference between a tornado warning (when they should seek shelter in a low spot), a flood warning (when they should stay out of low areas), and other appropriate warnings and responses.

StormReady

The National Weather Service established the StormReady program to help local governments improve the timeliness and effectiveness of hazardous weather related warnings for the public. To be officially StormReady, a community must:

- Establish a 24-hour warning point and emergency operations center,
- Have more than one way to receive severe weather warnings and forecasts and to alert the public,
- Create a system that monitors weather conditions locally,
- Promote the importance of public readiness through community seminars, and
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

Being designated a StormReady community by the National Weather Service is a good measure of a community's emergency warning program for weather hazards. It is also credited by the CRS.

Local Implementation

In coordination with established public safety warning protocols, the activated EOCs for Sacramento County and the City of Sacramento will manage the dissemination of timely and adequate warnings to threatened populations in the most direct and effective means possible. Depending upon the threat and time availability, the County and City EOCs will initiate alerts and warnings utilizing any of the following methods:

- Activation of the Emergency Alert System (EAS)
- Activation of the Telephonic Alert and Warning System (Everbridge and Reverse 911)
- Activation of the Emergency Digital Information System (EDIS)
- Activation of the California Law Enforcement Mutual Aid Radio System (CLEMARS)
- Media broadcast alerts.
- Commercial or public radio or TV stations
  - ✓ Radio: KFBK 1530 am, KSTE 650, KGBY, 92.5 FM
  - ✓ TV: KCRA Channel 3, www.KCRA.com; KXTV Channel 10; KOVR Channel 13; KTXL Channel 40
- NOAA Weather Radio
- www.saccounty.net; SacramentoReady.org websites
- 211/311 Sacramento

- CalTrans 511
- Telephone trees/mass telephone notifications
- Tone activated receivers in key facilities
- Fire and Law enforcement loudspeakers
- Outdoor warning sirens
- Mobile public address sirens/systems
- Door-to-door contact
- Vulnerable population databases
- Email notifications

Sacramento ALERT

The Sacramento County OES, in partnership with Yolo and Placer emergency agencies, use a state-of-the-art emergency alert system known as Sacramento Alert. The system provides information to residents about emergency events quickly and through a variety of communication methods.

The alert system currently includes all listed and unlisted landline telephone numbers in Yolo, Placer, and Sacramento counties that are serviced by AT&T and Verizon.

To ensure emergency notices are received quickly both at work and home, residents are encouraged to log onto the Sacramento Alert Self- Registration Portal and provide phone numbers for both home and work, including land and cell phone numbers, email addresses, TTY device information and instant messaging information.

Residents will only receive alerts that are critical and time-sensitive, including: flooding, levee failures, severe weather, disaster events, unexpected road closures, missing persons, and evacuations of buildings or neighborhoods in specific geographic locations.

The system, which uses Everbridge Alert and Notifications System, was made possible for all three counties by a grant from CAL OES and supported by CA Department of Water Resources, Flood Operations Center through the Sacramento County OES.

In addition, both Sacramento County and the City of Sacramento are StormReady certified.

CRS Credit

Community Rating System points are based on the number and types of warning media that can reach the community's flood prone population. Depending on the location, communities can receive credit for the telephone calling system and more points if there are additional measures, like telephone trees. Being designated as a StormReady community can provide additional points. These credits are in Activity 610 - Flood Warning Program and Response.

Response

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

- Activating the emergency operations center (emergency preparedness),
- Closing streets or bridges (police or public works),
- Shutting off power to threatened areas (utility company),
- Passing out sand and sandbags (public works),
- Holding children at school or releasing children from school (school superintendent),
- Opening evacuation shelters (the American Red Cross),
- Monitoring water levels (public works), and
- Establishing security and other protection measures (police).

An emergency action plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans are developed in coordination with the agencies or offices that are given various responsibilities.

A flood stage forecast map shows areas that will be under water at various flood stages. Different flood levels are shown as color coded areas, so the emergency manager can quickly see what will be affected. Emergency management staff can identify the number of properties flooded, which roads will be under water, which critical facilities will be affected, and who to warn. With this information, an advance plan can be prepared that shows problem sites and determines what resources will be needed to respond to the predicted flood level.

Emergency response plans should be updated annually to keep contact names and telephone numbers current and to ensure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and of changing conditions. The end result is a coordinated effort implemented by people who have experience working together so that available resources will be used in the most efficient manner possible.

Local Implementation

Sacramento County OES and City of Sacramento OEM have established response protocols to be followed for any given event. Response is provided cooperation with the County Sherriff, city police, and fire departments. The County and City EOPs address the planned response to emergency situations associated with natural disasters and emergencies in or affecting the area. The EOPs are intended to facilitate multi-agency and multi-jurisdictional coordination in emergency operations. They seek to mitigate the effects of hazards, prepare for measures to be taken which will preserve life and minimize damage, enhance response during emergencies and provide necessary assistance, and establish a recovery system to return the County the local jurisdictions to their normal state of affairs.

CRS Credit

The CRS program provides credit under Activity 610- Flood Warning for a warning system that effectively notifies residents of a flood and has procedures for testing and monitoring the system.

Evacuation and Shelter

According to Emergency Management: Principles and Practice, the principle of evacuation is to move citizens from a place of relative danger to a place of relative safety, via a route that does not pose significant danger. There are six key components to a successful evacuation:

- Adequate warning
- Adequate routes
- Proper timing to ensure the routes are clear
- Traffic control
- Knowledgeable travelers
- Care for special populations (e.g., the handicapped, prisoners, hospital patients, and schoolchildren)

Those who cannot get out of harm's way need shelter. Typically, the American Red Cross will staff a shelter and ensure that there is adequate food, bedding, and wash facilities. Shelter management is a specialized skill. Managers must deal with problems like scared children, families that want to bring in their pets, and the potential for an overcrowded facility.

Local Implementation

The County and City both maintain Evacuation Plans that outline strategies and protocols for medium to high-level (catastrophic) evacuation events in the County. These plans also include procedures for sheltering to provide people affected by a disaster with a safe, temporary place to be housed during or immediately after a disaster until they can either return to their homes or be relocated to other housing facilities. Highlights of these County/City plans are detailed below.

Sacramento County

Sacramento County's Evacuation Plan, 2018, is an annex to the County 2017 EOP. The purpose of the Evacuation Plan is to document agreed upon strategy for the County's response to emergencies that involve the evacuation of persons from an impacted area to a safe area. This involves coordination and support for the safe and effective evacuation of the general population and for those who need additional support to evacuate, such as health care facilities and schools. This plan also includes considerations for shelter-in-place options, in circumstances where evacuation may be a higher risk option. The County's Evacuation Plan identifies criteria and triggers for determining what level of evacuation is warranted; information on transportation and evacuation movement control; and roles and responsibilities of agencies/organizations supporting the evacuation.

City of Sacramento

The City EOP identifies roles and responsibilities for coordinating evacuation in the City. Evacuation routes are established for 20 areas within the City. The City Law Enforcement Branch has the responsibility to coordinate area evacuations. Wide-spread evacuations are coordinated with County OES and other local and regional agencies.

Rescue and Evacuation Planning

The City has also established guidelines that focus on public safety during a flood event as an amendment (Appendix K) to its floodplain ordinance. This includes City guidelines for public refuge areas and evacuation locations for rescue areas are based on potential flood depths from the time of levee failure.

Rescue and evacuation planning analysis and maps have been developed based on several levee break scenarios and are being used to support these public safety measures during a levee failure event and include development guidelines to address:

- Refuge and staging locations with exits (e.g., second floor areas with windows or balconies
- Exit locations when the way out is in an extraordinary location for persons with disabilities (e.g., a roof hatch)
- Evacuation points/routes for transport to safety

CRS Credit

Because it is primarily concerned with protecting insurable buildings, the CRS does not provide any special credit for evacuation or sheltering of people (minimal credit is given in Activity 510 - Floodplain Management for evacuation policies and procedures). It is assumed that the emergency response plan would include all necessary actions in response to a flood.

Post-Disaster Recovery and Mitigation

After a disaster, communities should undertake activities to protect public health and safety and facilitate recovery. Appropriate measures include:

- Patrolling evacuated areas to prevent looting,
- Providing safe drinking water,
- Monitoring for diseases,
- Vaccinating residents for tetanus and other diseases,
- Clearing streets, and
- Cleaning up debris and garbage.

Throughout the recovery phase, everyone wants to get "back to normal." The problem is that "normal" means the way they were before the disaster, exposed to repeated damage from future disasters. There should be an effort to help prepare people and property for the next disaster. Such an effort would include:

- Public information activities to advise residents about mitigation measures they can incorporate into their reconstruction work,
- Evaluating damaged public facilities to identify mitigation measures that can be included during repairs,
- Identifying other mitigation measures that can lessen the impact of the next disaster,
- Acquiring substantially or repeatedly damaged properties from willing sellers,
- Planning for long-term mitigation activities, and
- Applying for post-disaster mitigation funds.

Regulating Reconstruction

Requiring permits for building repairs and conducting inspections are vital activities to ensure that damaged structures are safe for people to reenter and repair. There is a special requirement to do this in floodplains, regardless of the type of disaster or the cause of damage. The NFIP requires that local officials enforce the substantial damage regulations. These rules require that if the cost to repair a building in the mapped floodplain equals or exceeds 50% of the building's market value, the building must be retrofitted to meet

the standards of a new building in the floodplain. In most cases, this means that a substantially damaged building must be elevated above the base flood elevation.

This requirement can be very difficult for understaffed and overworked offices following a disaster. However, if these activities are not carried out properly, not only does the community miss a tremendous opportunity to redevelop or clear out a hazardous area, it may be violating its obligations under the NFIP. In some areas, mutual aid agreements have been established so building inspectors from a community not affected by the disaster can work in the communities that were hit the hardest.

Local Implementation

Sacramento County and City of Sacramento EOPs have post-disaster recovery policies in place for the communities. The EOPs are intended to facilitate multi-agency and multi-jurisdictional coordination during emergencies including hazard events. Through it policies and procedures it seeks to mitigate the effects of hazards, prepare for measures to be taken which will preserve life and minimize damage, enhance response during emergencies and provide necessary assistance, and establish a recovery system in order to return the community to their normal state of affairs. The County and City recently updated their EOPs in 2017. Post disaster recovery procedures for all hazards, including flood, are addressed the EOPs and are detailed further in Section 4.4 of the Base Plan and the City's Annex to this LHMP.

CRS Credit

The CRS does credit post-disaster mitigation procedures if the policies and procedures are incorporated into a flood mitigation or multi-hazard plan through Activity 510 - Floodplain Management Planning.

Conclusions and Recommendations

- There are several threat recognitions systems that can provide the County and City with advance notice of an impending emergency.
- Sacramento County and the City of Sacramento depend on local media outlets, sirens, telephones and door-to-door notices to warn residents. These media should reach most people who need to know of a threat. Consideration should be given to reach special populations that may require additional or different methods.
- Emergency management guidance could be very helpful when things happen quickly and for hazards that have predictable impacts, such as flooding.
- Sacramento County and the City of Sacramento should update and exercise their EOPs on a regular basis.
- Sacramento County, the City of Sacramento, and County jurisdictions should continue to work together to protect people before and after a disaster including an outreach program to promote each community's warning system.

C.2.5. Flood Control Measures

Four general types of flood control projects are reviewed here: levees, reservoirs, diversions, and dredging. These projects have three advantages not provided by other mitigation measures:

- They can stop most flooding, protecting streets and landscaping in addition to buildings,

- Many projects can be built without disrupting citizens' homes and businesses, and
- They are constructed and maintained by a government agency, a more dependable long-term management arrangement than depending on many individual private property owners.

However, as shown below, structural measures can have shortcomings. The appropriateness of using flood control depends on individual project area circumstances.

Pros and Cons of Structural Flood Control Projects

- Advantages
  - ✓ They may provide the greatest amount of protection for land area used.
  - ✓ Because of land limitations, they may be the only practical solution in some circumstances.
  - ✓ They can incorporate other benefits into structural project design, such as water supply and recreational uses.
  - ✓ Regional detention may be more cost-efficient and effective than requiring numerous small detention basins.

- Disadvantages
  - ✓ They can disturb the land and disrupt the natural water flows, often destroying wildlife habitat.
  - ✓ They require regular maintenance, which if neglected can have disastrous consequences.
  - ✓ They are built to a certain flood protection level that can be exceeded by larger floods, causing extensive damage.
  - ✓ They can create a false sense of security, as people protected by a project often believe no flood can ever reach them.
  - ✓ Although it may be unintended, in many circumstances they promote more intensive land use and development in the floodplain.

Levees and Floodwalls

Probably the best known flood control measure is a barrier of earth (levee) or concrete (floodwall) erected between the watercourse and the property to be protected. Levees and floodwalls confine water to the stream channel by raising its banks. They must be well designed to account for large floods, underground seepage, pumping of internal drainage, and erosion and scour. Key considerations when evaluating the use of a levee include:

- Design and permitting costs,
- Right of way acquisition,
- Removal of fill to compensate for the floodwater storage that will be displaced by the levee,
- Internal drainage of surface flows from the area inside the levee,
- Cost of construction,
- Cost of maintenance,
- Mitigation of adverse impacts to wetlands and other habitats,
- Loss of river access and views, and
- Creating a false sense of security, because while levees may reduce flood damage for smaller more frequent rain events, they may also overtop or breach in extreme flood events and subsequently create more flood damage than would have occurred without the levee.

Levees placed along the river or stream edge can degrade the aquatic habitat and water quality of the stream. They also are more likely to push floodwater onto other properties upstream or downstream. To reduce environmental impacts and provide multiple use benefits, a setback levee is often the best project design. The area inside a setback levee can provide open space for recreational purposes and provide access sites to the river or stream.

Floodwalls perform like levees except they are vertical-sided structures that require less surface area for construction. Floodwalls are constructed of steel sheet pile or reinforced concrete, which makes the expense of installation cost prohibitive in many circumstances. Floodwalls also can degrade adjacent habitat and can displace erosive energy to unprotected areas of shoreline downstream.

Reservoirs and Detention

Reservoirs reduce flooding by temporarily storing flood waters behind dams or in storage or detention basins. Reservoirs lower flood heights by holding back, or detaining, runoff before it can flow downstream. Flood waters are detained until the flood has subsided, and then the water in the reservoir or detention basin is released or pumped out slowly at a rate that the river can accommodate downstream.

Reservoirs can be dry and remain idle until a large rain event occurs. Or they may be designed so that a lake or pond is created. The lake may provide recreational benefits or water supply (which could also help mitigate a drought).

Flood control reservoirs are most commonly built for one of two purposes. Large reservoirs are constructed to protect property from existing flood problems. Smaller reservoirs, or detention basins, are built to protect property from the stormwater runoff impacts of new development.

Figure C-12 Retention Pond

Retention pond

Regardless of size, reservoirs protect the development that is downstream from the reservoir site. Unlike levees and channel modifications, they do not have to be built close to or disrupt the area to be protected. Reservoirs are most efficient in deeper valleys where there is more room to store water, or on smaller rivers where there is less water to be stored.

In urban areas, some reservoirs are simply manmade holes, excavated to store floodwaters. Reservoirs in urban areas are typically constructed adjacent to streams (though usually outside of the floodplain). When built in the ground, there is no dam for these retention and detention basins and no dam failure hazard. Wet or dry basins can also serve multiple uses by doubling as parks or other open space uses.

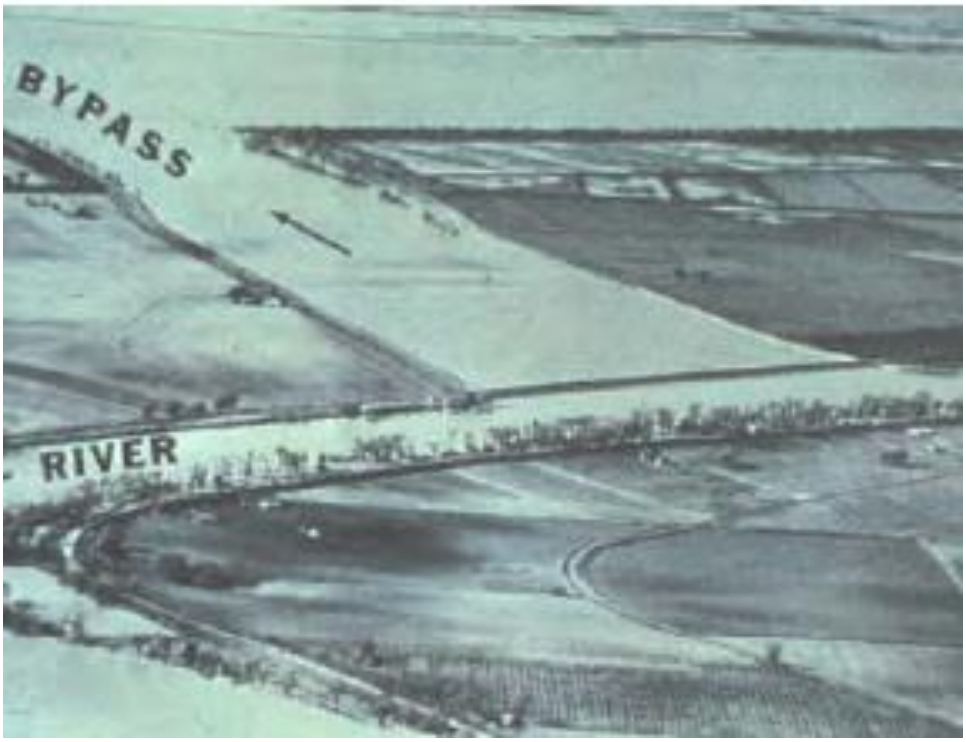
There are several considerations when evaluating the use of reservoirs and detention:

- There is the threat of flooding the protected area should the reservoir's dam fail,
- There is a constant expense for the management and maintenance of the facility,
- They may fail to prevent floods that exceed their design levels,
- Sediment deposition may occur and reduce the storage capacity over time,
- They can impact water quality as they are known to affect temperature, dissolved oxygen and nitrogen, and nutrient levels, and
- If not designed correctly, in-stream reservoirs may cause backwater flooding problems upstream

Diversion

A diversion is a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During floods, the floodwaters spill over to the diversion channel or tunnel, which carries the excess water to a receiving lake or river.

Figure C-13 Diversion



Diversions are limited by topography; they will not work in some areas. Unless the receiving water body is relatively close to the floodprone stream and the land in between is low and vacant, the cost of creating a diversion can be prohibitive.

Dredging

Dredging is often viewed as a form of conveyance improvement. However, it has the following problems:

- Given the large volume of water that comes downstream during a flood, removing a foot or two from the bottom of the channel will have little effect on flood heights.
- Dredging is often cost prohibitive because the dredged material must be disposed of somewhere.
- Unless in-stream or tributary erosion is corrected upstream, the dredged areas usually fill back in within a few years, and the process and the expense have to be repeated.
- If the channel has not been disturbed for many years, dredging will destroy the habitat that has developed.

Figure C-14 Dredging Activity

To protect the natural values of the stream, federal law requires a U.S. Army Corps of Engineers permit before dredging can proceed. This can be a lengthy process that requires a lot of advance planning and many safeguards to protect habitats, which adds to the cost of the project.

CRS Credit

Structural flood control projects that provide 100-year flood protection and that result in revisions to the Flood Insurance Rate Map are not credited by the CRS in order to avoid duplicating the larger premium reduction provided by removing properties from the mapped floodplain.

The CRS credits smaller flood control projects that meet the following criteria:

- They must provide protection to at least the 25-year flood,
- They must meet certain environmental protection criteria,
- They must meet federal, state and local regulations, such as the Corps of Engineers' 404 permit and California Division of Dam Safety for dam safety rules, and
- They must meet certain maintenance requirements.

These criteria ensure that credited projects are well-planned and permitted. Any of the measures reviewed in this section would be recognized under Activity 530 - Flood Protection, although it would be very hard to qualify a dredging project. Credit points are based on the type of project, how many buildings are protected, and the level of flood protection provided.

Local Implementation

Much of the City of Sacramento and areas of Sacramento County are dependent on levees and other flood control structures to prevent flooding as previously described in this LHMP. In the aftermath of the 1986 floods, several flood control projects were identified to address the flood risks in the Sacramento area. Some of these projects were designed to correct structural deficiencies observed during the flood, while other projects were added once the water had receded and revealed levee conditions. The 1997 flood event also highlighted additional deficiencies that are now being corrected to increase the level of community flood protection. Flood control projects continue in the Planning Area with numerous levee improvement projects underway to provide 100- or 200- year level of protection depending on the requirements.

Conclusions and Recommendations

- In coordination with California Department of Water Resources and the Sacramento Area Flood Control District (SAFCA), flood control and drainage facilities are being brought to current standards of flood protection and prevention.
- Sacramento County, the City of Sacramento, other cities, and special districts should continue to evaluate and implement countywide flood control and drainage improvement projects to reduce the potential from future flooding.

C.2.6. Public Information Measures

A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, and businesses about hazards and ways to protect people and property from these hazards. These activities can motivate people to take the steps necessary to protect themselves and others.

Information can bring about voluntary mitigation activities at little or no cost to the government. Property owners mitigated their flooding problems long before government funding programs existed. The typical approach to delivering information involves two levels of activity. The first is to broadcast a short and simple version of the message to everyone potentially affected. The second level provides more detailed information to those who respond and want to learn more.

This section starts with activities that reach out to people and tell them to be advised of the hazards and some of the things they can do. It then covers additional sources of information for those who want to learn more. It ends with a general public information strategy.

Outreach Projects

Outreach projects are the first step in the process of orienting property owners to the hazards they face and to the concept of property protection. They are designed to encourage people to seek out more information in order to take steps to protect themselves and their properties.

Research has shown that outreach projects work. However, awareness of the hazard is not enough; people need to be told what they can do about the hazard. Thus, projects should include information on safety, health and property protection measures. Research has also shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Community newsletters/direct mailings: One of the more effective types of outreach projects include mailings or distributions to everyone in the community. In the case of floods, they may be sent only to floodplain property owners.

News media: Local newspapers can be strong allies in efforts to inform the public. Press releases and story ideas may be all that's needed to gain their interest. After a flood in another community, people and the media become interested in their flood hazard and how to protect themselves and their property. Local radio stations and cable TV channels can also help. These media offer interview formats and cable TV may be willing to broadcast videos on the hazards.

Other approaches: Examples of other outreach projects include:

- Presentations at meetings of neighborhood, civic or business groups,
- Displays in public buildings or shopping malls,
- Signs in parks, along trails and on waterfronts that explain the natural features (such as the river) and their relation to the hazards (such as floods),
- Social Media broadcasts,
- Brochures available in municipal buildings and libraries, and
- Special meetings, workshops and seminars.

Local Implementation

Sacramento County and the City of Sacramento maintain websites that provides in-depth flood protection information. The County and City also provide direct mailings annually to residents, with a focus on repetitive loss areas, which include flyers on flood protection and property protection measures. The County and City also provides direct mailings on flood protection information to insurance brokers and realtors located throughout the community. In addition, the County's water resources and stormwater groups and the City's utility department also conduct and participate in a variety of public community events throughout the year such as community fairs, river cleanups, etc. and provide information to the public on stormwater management and flood protection measures. The County and City also have a variety of flood materials placed in public locations.

In addition, both the County and City have established Programs for Public Information (PPI) that are being implemented and contain a variety of focused flood outreach efforts as described further in Section 4.4 of the Base plan and the City's Annex to this LHMP.

CRS Credit

The Community Rating System provides credit for outreach projects which cover six flood-related topics. Credit is also available for producing flood response materials. Another way to achieve credit for outreach is for producing a PPI. A 40% bonus is applied to outreach credits which are included in a PPI.

Real Estate Disclosure

Many times after a flood or other natural disaster, people say they would have taken steps to protect themselves if they had known they had purchased a property exposed to a hazard. There are some federal and state requirements about such disclosures, but they have their limits.

Federal law: Federally regulated lending institutions must advise applicants for a mortgage or other loan that is to be secured by an insurable building whether the property is in a floodplain as shown on the Flood Insurance Rate Map. If so, flood insurance is required for buildings located within the floodplain if the mortgage or loan is federally insured. However, because this requirement has to be met only 10 days before closing, the applicant is often already committed to purchasing the property when he or she first learns of the flood hazard.

State law: State laws set standards for real estate sales and licensing of agents and brokers.

Local Implementation

Sacramento County and the City of Sacramento receive credit for providing for the local real estate agents disclosure of flood hazards to prospective buyers. Credit is also provided for state and community regulations requiring disclosure of flood hazards.

CRS Credit

Communities in areas that have additional disclosure requirements are eligible for five points under the "Other disclosure requirements" as well as 10 points for the "Disclosure of other hazards."

Libraries and Websites

The two previous activities tell people that they are exposed to a hazard. The next step is to provide information to those who want to know more. The community library and local websites are obvious places for residents to seek information on hazards, hazard protection, and protecting natural resources.

Books and pamphlets on hazard mitigation can be given to libraries, and many of these can be obtained for free from state and federal agencies. Libraries also have their own public information campaigns with displays, lectures and other projects, which can augment the activities of the local government. Today, websites are commonly used as research tools. They provide fast access to a wealth of public and private sites for information. Through links to other websites, there is almost no limit to the amount of up to date information that can be accessed on the Internet.

In addition to online floodplain maps, websites can link to information for homeowners on how to retrofit for tornadoes and floods or a website about floods for children. The "FEMA for Kids" website teaches children how to protect their home and what to have in a family disaster kit.

Local Implementation

Sacramento County and the City of Sacramento provide a variety of flood materials placed in public locations, including public buildings and public libraries. The County also has an extensive flood protection websites at: http://www.waterresources.saccounty.net/stormready/Pages/default.aspx. The City maintains a similar website at: http://www.cityofsacramento.org/Utilities/Education/Flood-Ready/.

CRS Credit

The Community Rating System provides credit for having a variety of flood references in the local public library and additional credits for similar material included on municipal websites (Activity 350 - Flood Protection Information).

Technical Assistance

Hazard Information

Many benefits stem from providing map information to inquirers. Residents and business owners that are aware of the potential hazards can take steps to avoid problems or reduce their exposure to flooding. Real estate agents and house hunters can find out if a property is floodprone and whether flood insurance may be required.

Communities can easily provide map information from FEMA's DFIRMs and Flood Insurance Studies. They may also assist residents in submitting requests for map amendments and revisions when they are needed to show that a building is located outside the mapped floodplain.

Some communities supplement what is shown on the DFIRM with information on additional hazards, flooding outside mapped areas and zoning. When the map information is provided, community staff can explain insurance, property protection measures and mitigation options that are available to property owners. They should also remind inquirers that being outside the mapped floodplain is no guarantee that a property will never get wet.

Property Protection Assistance

While general information provided by outreach projects or the library is beneficial, most property owners do not feel ready to retrofit their buildings without more specific guidance. Local building department staffs are experts in construction. They can provide free advice, not necessarily to design a protection measure, but to steer the owner onto the right track:

- Building or public works department staffs can provide the following types of assistance:
- Visit properties and offer protection suggestions,
- Recommend or identify qualified or licensed contractors,

- Inspect homes for anchoring of roofing and the home to the foundation,
- Provide advice on protecting windows and garage doors from high winds, and
- Explain when building permits are needed for home improvements.

There is a concern that a local official might provide the wrong information and the community would be sued if a project failed. To counter this, there are guidelines for local programs and training on how to identify the right measures. FEMA conducts a free week-long course at its Emergency Management Institute on property protection measures for flooding. FEMA and the Corps of Engineers periodically conduct one- or two-day retrofitting workshops.

Local Implementation

FEMA floodplain maps are available on local websites for both Sacramento County and the City of Sacramento. The County and City also respond to requests on whether a property is located in a Special Flood Hazard Area. The County and City also maintain elevation certificates for many existing home within or near the SFHA.

CRS Credit

The Community Rating System provides points for providing map information to inquirers. Points are available for providing one-on-one flood protection assistance to residents and businesses and for making site visits. Both services must be publicized.

Public Information Program Strategy

A public information program strategy is a document that receives CRS credit. It is a review of local conditions, local public information needs, and a recommended plan of activities. A strategy consists of the following parts, which are incorporated into this plan:

- The local flood hazard (discussed in Chapter 4)
- The property protection measures appropriate for the flood hazard (discussed in Chapters 4 and 5)
- Flood safety measures appropriate for the local situation (discussed in Chapters 4 and 5)
- The public information activities currently being implemented within the community, including those being carried out by non-government agencies (discussed in Chapter 4 and jurisdictional annexes)
- Goals for the community's public information program (discussed in Chapters 4 and 5)
- The outreach projects that will be done each year to reach the goals (discussed in Chapters 4 and 5)
- The process that will be followed to monitor and evaluate the projects (discussed in Chapter 7)

Figure C-15 illustrates several flood safety tips that can be used in an outreach campaign to better inform the public of the hazards associated with flooding.

Figure C-15 Flood Safety Tips for Outreach Campaign

Flood Safety

Pay attention to evacuation orders. Listen to local radio or TV stations for forecasts and emergency warnings. Know about evacuation routes and nearby shelters and have plans for all family members on how to evacuate and where to meet if you're split up during an emergency.

Do not drive through a flooded area. During a flood, more people drown in their cars than anywhere else. Don't drive around road barriers; the road or bridge may be washed out.

Do not walk through flowing water. Flash flooding is the leading cause of weather-related deaths in the U.S. Currents can be deceptive; 6 inches of moving water can knock you off your feet in a strong current. If you walk in standing water, use a stick to help you locate the ground.

Stay away from power lines and electrical wires. Electrical currents can travel through water. Report downed power lines to the police or sheriff by calling 911.

Have the power company turn off your electricity. Some appliances, like TV sets, keep electrical charges even after they've been unplugged. Don't use appliances or motors that have gotten wet unless they have been taken apart, cleaned and dried.

Look before you step. After a flood, the ground and floors are covered with debris like broken bottles and nails. Floors and stairs that are covered with mud can also be slippery.

Be alert for gas leaks. Use a flashlight to inspect damage. Don't smoke or use candles, lanterns, or open flames unless you know the gas has been shut off and the area has been ventilated.

Look out for animals that may have been flooded out of their homes and who may seek shelter in yours. Use a pole or stick to turn things over and scare away small animals.

Look before you step. After a flood, the ground and floors are covered with debris. Floors and stairs that have been covered with mud will be very slippery.

Carbon monoxide exhaust kills. Use a generator or other gasoline-powered machine outdoors. The same goes for camping stoves. Charcoal fumes are especially deadly – cook with charcoal outdoors.

Clean everything that got wet in the flood. Floodwaters have picked up sewage and chemicals from roads, farms, factories, and storage buildings. Spoiled food, and flooded cosmetics and medicines can be health hazards. When in doubt, throw it out.

Take care of yourself. Recovering from a flood is a big job. It is tough on both the body and the spirit and the effects a disaster has on you and your family may last a long time.

CRS Credit

The CRS provides up to 350 points for a Program for Public Information (PPI).

Conclusions and Recommendations

- There are many ways that public information can be used so that people and businesses will be more aware of the hazards they face and how they can protect themselves.
- Libraries and websites are currently being used as public information tools in Sacramento County and the City of Sacramento.
- The most important topics to cover in public information activities are:
  - ✓ Safety precautions for all types of hazards, but especially floods, earthquakes, thunderstorms, winter storms, wildfires, and tornadoes.
  - ✓ Knowing where emergency evacuation shelters are in town.

- ✓ Flood protection measures, including rules for new construction and insurance.
- ✓ Keeping drainage ways clear and protection from local drainage problems.
- ✓ Family and emergency preparedness measures.
- ✓ What the County and cities are doing and sources of assistance.
- ✓ Protecting water quality and wetlands and the benefits of open space.

- The most appropriate ways to spread this information are:
  - ✓ Websites and social media
  - ✓ Mailings to everyone, in utility bills or otherwise
  - ✓ News releases or newspaper articles
  - ✓ Newsletters
  - ✓ Displays, particularly at special events
  - ✓ Handouts, flyers and other materials, which can be distributed at special events and presentations
- County and City staff should continue to reach out to residents, civic organizations and other organizations to help spread the word about flood hazards, flood protection, and safety measures.

Appendix D Adoption Resolution

Note to Reviewers: When this plan has been reviewed and approved pending adoption by FEMA Region IX, the adoption resolutions will be signed by the participating jurisdictions and added to this appendix. Two model resolutions are provided below. The first sample resolution is for the County and incorporated communities; the second is for participating districts.

Sample Resolution: Sacramento County and incorporated communities

Resolution # _____

Adopting the Sacramento County Local Hazard Mitigation Plan Update

WHEREAS, The (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards; and

WHEREAS, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

WHEREAS, the (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) fully participated in the FEMA-prescribed mitigation planning process to prepare this local hazard mitigation plan; and

WHEREAS, the California Office of Emergency Services and Federal Emergency Management Agency, Region IX officials have reviewed the Sacramento County Local Hazard Mitigation Plan and approve it contingent upon this official adoption of the participating governing body; and

WHEREAS, the (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Sacramento County Local Hazard Mitigation Plan by reference into the Safety Element of the General Plan in accordance with the requirements of AB 2140; and

WHEREAS, adoption by the governing body for the (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Local Hazard Mitigation Plan; and

WHEREAS, adoption of this legitimizes the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

NOW, THEREFORE, BE IT RESOLVED that the (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) adopts the Sacramento County Local Hazard Mitigation Plan as an official plan; and

BE IT RESOLVED, that the (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) adopts the Sacramento County Local Hazard Mitigation Plan by reference into the safety element of their general plan in accordance with the requirements of AB 2140; and

BE IT FURTHER RESOLVED, the (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) will submit this adoption resolution to the California Office of Emergency Services and FEMA Region IX officials to enable the plan's final approval in accordance with the requirements of the Disaster Mitigation Act of 2000 and to establish conformance with the requirement of AB 2140.

Passed:_____
(date)

_____
Certifying Official

Sample Resolution: Special Districts in Sacramento County

Resolution # _____

Adopting the Sacramento County Local Hazard Mitigation Plan Update

Whereas, (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

Whereas, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, (Name of Government/District/Organization) fully participated in the FEMA-prescribed mitigation planning process to prepare this local hazard mitigation plan; and

Whereas, the California Office of Emergency Services and Federal Emergency Management Agency, Region IX officials have reviewed the Sacramento County Local Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governing body;

Whereas, the (Name of Government/District/Organization) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Sacramento County Local Hazard Mitigation Plan;

Whereas, adoption by the governing body for the (Name of Government/District/Organization), demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Local Hazard Mitigation Plan.

Whereas, adoption of this legitimizes the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the (Name of Government/District/Organization) adopts the Sacramento County Local Hazard Mitigation Plan as an official plan; and

Be it further resolved, (Name of Government/District/Organization) will submit this adoption resolution to the California Office of Emergency Services and FEMA Region IX officials to enable the plan's final approval in accordance with the requirements of the Disaster Mitigation Act of 2000.

Passed:_____
(date)

_____
Certifying Official

Appendix E Threatened and Endangered Species

Table E–1 Special Status Species in Sacramento County

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
Animals – Amphibians					
Ambystoma californiense	California tiger salamander	Threatened	Threatened	WL	–
Spea hammondii	western spadefoot	None	None	SSC	–
Animals – Birds					
Accipiter cooperii	Cooper's hawk	None	None	WL	–
Aquila chrysaetos	golden eagle	None	None	FP ; WL	–
Buteo regalis	ferruginous hawk	None	None	WL	–
Buteo swainsoni	Swainson's hawk	None	Threatened	–	–
Circus hudsonius	northern harrier	None	None	SSC	–
Elanus leucurus	white–tailed kite	None	None	FP	–
Haliaeetus leucocephalus	bald eagle	Delisted	Endangered	FP	–
Eremophila alpestris actia	California horned lark	None	None	WL	–
Branta hutchinsii leucopareia	cackling (=Aleutian Canada) goose	Delisted	None	WL	–
Chaetura vauxi	Vaux's swift	None	None	SSC	–
Ardea alba	great egret	None	None	–	–
Ardea herodias	great blue heron	None	None	–	–
Botaurus lentiginosus	American bittern	None	None	–	–
Egretta thula	snowy egret	None	None	–	–
Ixobrychus exilis	least bittern	None	None	SSC	–
Nycticorax nycticorax	black–crowned night heron	None	None	–	–
Cardinalis cardinalis	northern cardinal	None	None	WL	–
Charadrius montanus	mountain plover	None	None	SSC	–
Pica nuttalli	yellow–billed magpie	None	None	–	–
Coccyzus americanus occidentalis	western yellow–billed cuckoo	Threatened	Endangered	–	–
Falco columbarius	merlin	None	None	WL	–
Falco mexicanus	prairie falcon	None	None	WL	–
Falco peregrinus anatum	American peregrine falcon	Delisted	Delisted	FP	–
Spinus lawrencei	Lawrence's goldfinch	None	None	–	–
Antigone canadensis canadensis	lesser sandhill crane	None	None	SSC	–
Antigone canadensis tabida	greater sandhill crane	None	Threatened	FP	–
Progne subis	purple martin	None	None	SSC	–

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
Riparia riparia	bank swallow	None	Threatened	–	–
Agelaius tricolor	tricolored blackbird	None	Threatened	SSC	–
Xanthocephalus xanthocephalus	yellow–headed blackbird	None	None	SSC	–
Icteria virens	yellow–breasted chat	None	None	SSC	–
Lanius ludovicianus	loggerhead shrike	None	None	SSC	–
Chlidonias niger	black tern	None	None	SSC	–
Sternula antillarum browni	California least tern	Endangered	Endangered	FP	–
Pandion haliaetus	osprey	None	None	WL	–
Baeolophus inornatus	oak titmouse	None	None	–	–
Geothlypis trichas sinuosa	saltmarsh common yellowthroat	None	None	SSC	–
Setophaga petechia	yellow warbler	None	None	SSC	–
Ammodramus savannarum	grasshopper sparrow	None	None	SSC	–
Melospiza melodia	song sparrow (–inModesto–in population)	None	None	SSC	–
Melospiza melodia maxillaris	Suisun song sparrow	None	None	SSC	–
Spizella breweri	Brewer's sparrow	None	None	–	–
Phalacrocorax auritus	double–crested cormorant	None	None	WL	–
Melanerpes lewis	Lewis' woodpecker	None	None	–	–
Laterallus jamaicensis coturniculus	California black rail	None	Threatened	FP	–
Numenius americanus	long–billed curlew	None	None	WL	–
Asio otus	long–eared owl	None	None	SSC	–
Athene cunicularia	burrowing owl	None	None	SSC	–
Plegadis chihi	white–faced ibis	None	None	WL	–
Selasphorus rufus	rufous hummingbird	None	None	–	–
Empidonax traillii	willow flycatcher	None	Endangered	–	–
Vireo bellii pusillus	least Bell's vireo	Endangered	Endangered	–	–
Animals – Crustaceans					
Branchinecta lynchi	vernal pool fairy shrimp	Threatened	None	–	–
Branchinecta mesovallensis	midvalley fairy shrimp	None	None	–	–
Dumontia oregonensis	hairy water flea	None	None	–	–
Linderiella occidentalis	California linderiella	None	None	–	–
Lepidurus packardi	vernal pool tadpole shrimp	Endangered	None	–	–
Animals – Fish					
Acipenser medirostris	green sturgeon	Threatened	None	SSC	–
Acipenser transmontanus	white sturgeon	None	None	SSC	–

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
Archoplites interruptus	Sacramento perch	None	None	SSC	–
Cottus gulosus	riffle sculpin	None	None	SSC	–
Lavinia exilicauda exilicauda	Sacramento hitch	None	None	SSC	–
Mylopharodon conocephalus	hardhead	None	None	SSC	–
Pogonichthys macrolepidotus	Sacramento splittail	None	None	SSC	–
Hysterocarpus traskii traskii	Sacramento–San Joaquin tule perch	None	None	–	–
Hypomesus transpacificus	Delta smelt	Threatened	Endangered	–	–
Spirinchus thaleichthys	longfin smelt	Candidate	Threatened	–	–
Entosphenus tridentatus	Pacific lamprey	None	None	SSC	–
Lampetra ayresii	western river lamprey	None	None	SSC	–
Oncorhynchus mykiss irideus pop. 11	steelhead – Central Valley DPS	Threatened	None	–	–
Oncorhynchus mykiss irideus pop. 8	steelhead – central California coast DPS	Threatened	None	–	–
Oncorhynchus tshawytscha pop. 13	chinook salmon – Central Valley fall / late fall–run ESU	None	None	SSC	–
Oncorhynchus tshawytscha pop. 30	chinook salmon – upper Klamath and Trinity Rivers ESU	Candidate	Candidate Endangered	SSC	–
Oncorhynchus tshawytscha pop. 6	chinook salmon – Central Valley spring–run ESU	Threatened	Threatened	–	–
Oncorhynchus tshawytscha pop. 7	chinook salmon – Sacramento River winter–run ESU	Endangered	Endangered	–	–
Animals – Insects					
Andrena blennospermatis	Blennosperma vernal pool andrenid bee	None	None	–	–
Andrena subapasta	An andrenid bee	None	None	–	–
Anthicus sacramento	Sacramento anthicid beetle	None	None	–	–
Bombus crotchii	Crotch bumble bee	None	Candidate Endangered	–	–
Metapogon hurdi	Hurd's metapogon robberfly	None	None	–	–
Cicindela hirticollis abrupta	Sacramento Valley tiger beetle	None	None	–	–
Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Threatened	None	–	–
Hydrochara rickseckeri	Ricksecker's water scavenger beetle	None	None	–	–
Animals – Mammals					
Vulpes vulpes patwin	Sacramento Valley red fox	None	None	–	–
Reithrodontomys raviventris	salt–marsh harvest mouse	Endangered	Endangered	FP	–

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
Taxidea taxus	American badger	None	None	SSC	–
Antrozous pallidus	pallid bat	None	None	SSC	–
Lasionycteris noctivagans	silver–haired bat	None	None	–	–
Lasiurus blossevillii	western red bat	None	None	SSC	–
Lasiurus cinereus	hoary bat	None	None	–	–
Myotis ciliolabrum	western small–footed myotis	None	None	–	–
Myotis lucifugus	little brown bat	None	None	–	–
Myotis yumanensis	Yuma myotis	None	None	–	–
Animals – Mollusks					
Margaritifera falcata	western pearlshell	None	None	–	–
Gonidea angulata	western ridged mussel	None	None	–	–
Animals – Reptiles					
Emys marmorata	western pond turtle	None	None	SSC	–
Thamnophis gigas	giant gartersnake	Threatened	Threatened	–	–
Phrynosoma blainvillii	coast horned lizard	None	None	SSC	–
Community – Terrestrial					
–	Coastal and Valley Freshwater Marsh	Coastal and Valley Freshwater Marsh	None	None	–
–	Coastal Brackish Marsh	Coastal Brackish Marsh	None	None	–
–	Elderberry Savanna	Elderberry Savanna	None	None	–
–	Great Valley Mixed Riparian Forest	Great Valley Mixed Riparian Forest	None	None	–
–	Great Valley Valley Oak Riparian Forest	Great Valley Valley Oak Riparian Forest	None	None	–
–	Northern Claypan Vernal Pool	Northern Claypan Vernal Pool	None	None	–
–	Northern Hardpan Vernal Pool	Northern Hardpan Vernal Pool	None	None	–
–	Valley Needlegrass Grassland	Valley Needlegrass Grassland	None	None	–
–	Valley Oak Woodland	Valley Oak Woodland	None	None	–

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
Plants – Vascular					
Sagittaria sanfordii	Sanford's arrowhead	None	None	–	1B.2
Cicuta maculata var. bolanderi	Bolander's water–hemlock	None	None	–	2B.1
Eryngium pinnatisectum	Tuolumne button–celery	None	None	–	1B.2
Lilaeopsis masonii	Mason's lilaeopsis	None	Rare	–	1B.1
Centromadia parryi ssp. rudis	Parry's rough tarplant	None	None	–	4.2
Hesperevax caulescens	hogwallow starfish	None	None	–	4.2
Lasthenia chrysantha	alkali–sink goldfields	None	None	–	1B.1
Lasthenia ferrisiae	Ferris' goldfields	None	None	–	4.2
Senecio hydrophiloides	sweet marsh ragwort	None	None	–	4.2
Symphyotrichum lentum	Suisun Marsh aster	None	None	–	1B.2
Cryptantha hooveri	Hoover's cryptantha	None	None	–	1A
Lepidium latipes var. heckardii	Heckard's pepper–grass	None	None	–	1B.2
Brasenia schreberi	watershield	None	None	–	2B.3
Downingia pusilla	dwarf downingia	None	None	–	2B.2
Legenere limosa	legenere	None	None	–	1B.1
Extriplex joaquinana	San Joaquin spearscale	None	None	–	1B.2
Cuscuta obtusiflora var. glandulosa	Peruvian dodder	None	None	–	2B.2
Carex comosa	bristly sedge	None	None	–	2B.1
Lathyrus jepsonii var. jepsonii	Delta tule pea	None	None	–	1B.2
Trifolium hydrophilum	saline clover	None	None	–	1B.2
Juncus leiospermus var. ahartii	Ahart's dwarf rush	None	None	–	1B.2
Scutellaria galericulata	marsh skullcap	None	None	–	2B.2
Scutellaria lateriflora	side–flowering skullcap	None	None	–	2B.2
Fritillaria agrestis	stinkbells	None	None	–	4.2
Hibiscus lasiocarpos var. occidentalis	woolly rose–mallow	None	None	–	1B.2
Clarkia biloba ssp. brandegeeae	Brandegee's clarkia	None	None	–	4.2
Oenothera deltoides ssp. howellii	Antioch Dunes evening–primrose	Endangered	Endangered	–	1B.1
Chloropyron molle ssp. molle	soft salty bird's–beak	Endangered	Rare	–	1B.2
Gratiola heterosepala	Boggs Lake hedge–hyssop	None	Endangered	–	1B.2
Orcuttia tenuis	slender Orcutt grass	Threatened	Endangered	–	1B.1
Orcuttia viscida	Sacramento Orcutt grass	Endangered	Endangered	–	1B.1
Navarretia eriocephala	hoary navarretia	None	None	–	4.3
Navarretia myersii ssp. myersii	pincushion navarretia	None	None	–	1B.1

Scientific Name	Common Name	Federal Status	State Status	CDFW Status	CA Rare Plant Rank
Ranunculus lobbii	Lobb's aquatic buttercup	None	None	–	4.2
Limosella australis	Delta mudwort	None	None	–	2B.1
Brodiaea rosea ssp. vallicola	valley brodiaea	None	None	–	4.2

Sources: California Natural Diversity Database BIOS Viewer Tool

Federal Status

Endangered: The classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

Threatened: The classification provided to an animal or plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Proposed Endangered: The classification provided to an animal or plant that is proposed for federal listing as Endangered in the Federal Register under Section 4 of the Endangered Species Act.

Proposed Threatened: The classification provided to an animal or plant that is proposed for federal listing as Threatened in the Federal Register under Section 4 of the Endangered Species Act.

Candidate: The classification provided to an animal or plant that has been studied by the United States Fish and Wildlife Service, and the Service has concluded that it should be proposed for addition to the Federal Endangered and Threatened species list.

None: The plant or animal has no federal status.

Delisted: The plant or animal was previously listed as Endangered or Threatened, but is no longer listed on the Federal Endangered and Threatened species list.

CDFW Status

FP: Fully Protected: This classification was the State of California's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction.

SSC: Species of Special Concern: To this end, the Department has designated certain vertebrate species as "Species of Special Concern" because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of designating species as "Species of Special Concern" is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their long–term viability.

WL: Watch List: Species that were previously designated as "Species of Special Concern" but no longer merit that status, or which do not yet meet SSC criteria, but for which there is concern and a need for additional information to clarify status.

CA Rare Plant Rank

1A: Plants presumed extinct in California and rare/extinct elsewhere

1B.1: Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California

1B.2: Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in California

1B.3: Plants rare, threatened, or endangered in California and elsewhere; not very threatened in California

2A: Plants presumed extirpated in California, but more common elsewhere

2B.1: Plants rare, threatened, or endangered in California, but more common elsewhere; seriously threatened in California

2B.2: Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in California

2B.3: Plants rare, threatened, or endangered in California, but more common elsewhere; not very threatened in California

3.1: Plants about which we need more information; seriously threatened in California

3.2: Plants about which we need more information; fairly threatened in California

3.3: Plants about which we need more information; not very threatened in California

4.1: Plants of limited distribution; seriously threatened in California

4.2: Plants of limited distribution; fairly threatened in California

4.3: Plants of limited distribution; not very threatened in California

Appendix F Critical Facilities

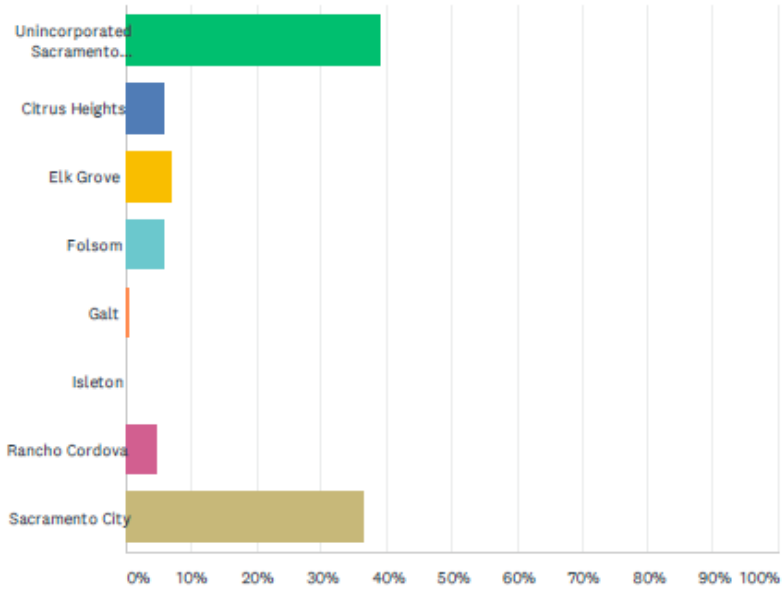
See attached document.

Appendix G Survey

2021 Local Hazard Mitigation Plan Update

Q1 Where Do You Live

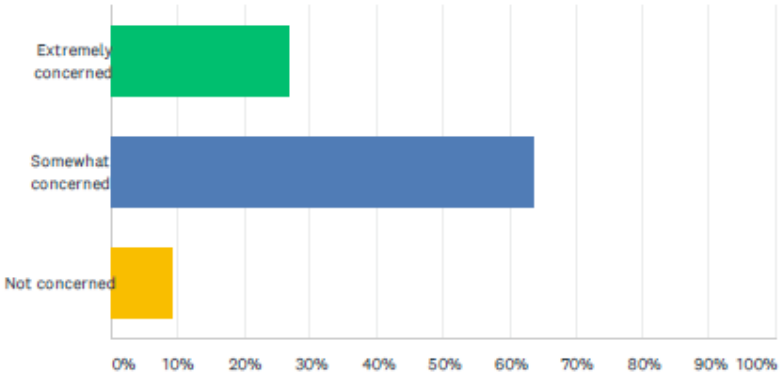
Answered: 169 Skipped: 22



ANSWER CHOICES	RESPONSES	
Unincorporated Sacramento County	39.05%	66
Citrus Heights	5.92%	10
Elk Grove	7.10%	12
Folsom	5.92%	10
Galt	0.59%	1
Isleton	0.00%	0
Rancho Cordova	4.73%	8
Sacramento City	36.69%	62
TOTAL		169

Q2 How concerned are you about the possibility of the Sacramento County community being impacted by a natural disaster?

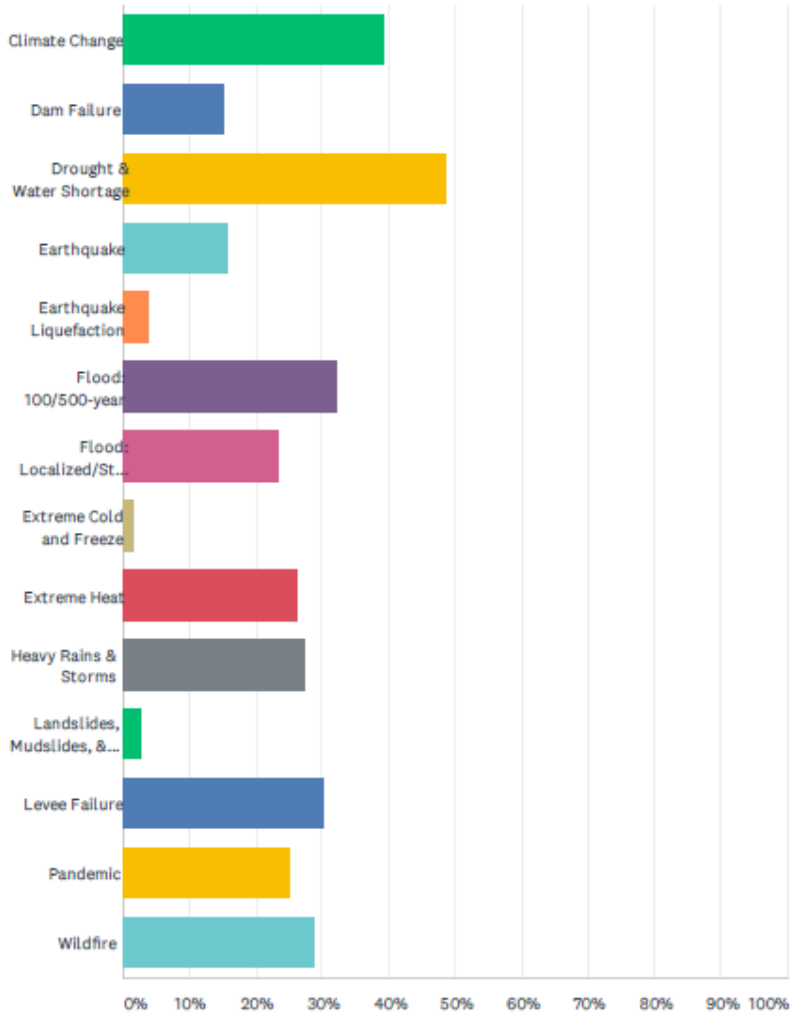
Answered: 190 Skipped: 1



ANSWER CHOICES	RESPONSES	
Extremely concerned	26.84%	51
Somewhat concerned	63.68%	121
Not concerned	9.47%	18
TOTAL		190

Q3 Please select the top three (3) hazards you think are the highest threat to your community.

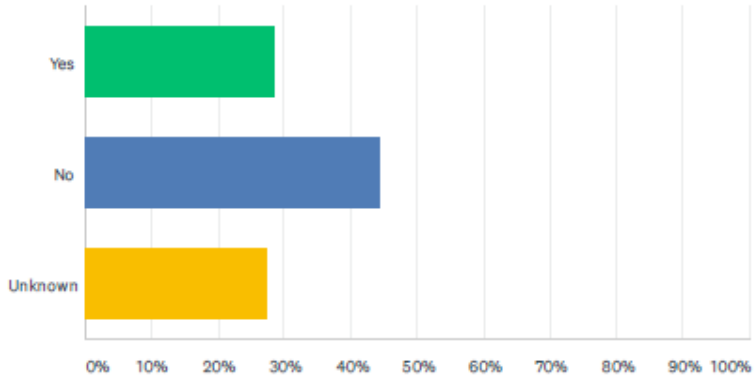
Answered: 183 Skipped: 8



ANSWER CHOICES	RESPONSES	
Climate Change	39.34%	72
Dam Failure	15.30%	28
Drought & Water Shortage	48.63%	89
Earthquake	15.85%	29
Earthquake Liquefaction	3.83%	7
Flood: 100/500-year	32.24%	59
Flood: Localized/Stormwater	23.50%	43
Extreme Cold and Freeze	1.64%	3
Extreme Heat	26.23%	48
Heavy Rains & Storms	27.32%	50
Landslides, Mudslides, & Debris	2.73%	5
Levee Failure	30.05%	55
Pandemic	25.14%	46
Wildfire	28.96%	53
Total Respondents: 183		

Q4 Is your home or business located in a FEMA designated floodplain?

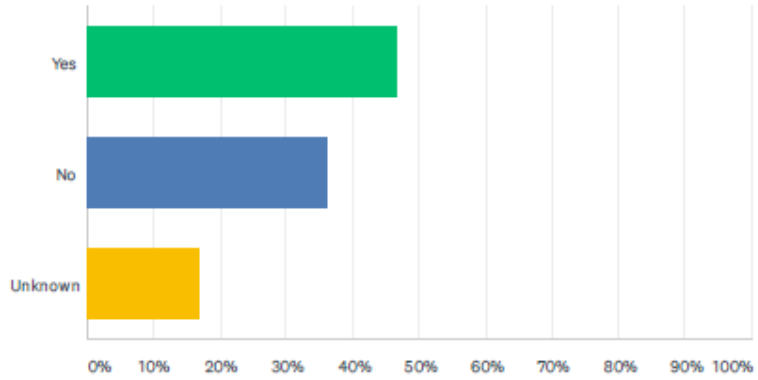
Answered: 183 Skipped: 8



ANSWER CHOICES	RESPONSES	
Yes	28.42%	52
No	44.26%	81
Unknown	27.32%	50
TOTAL		183

Q5 Is your home located in an area protected by a levee?

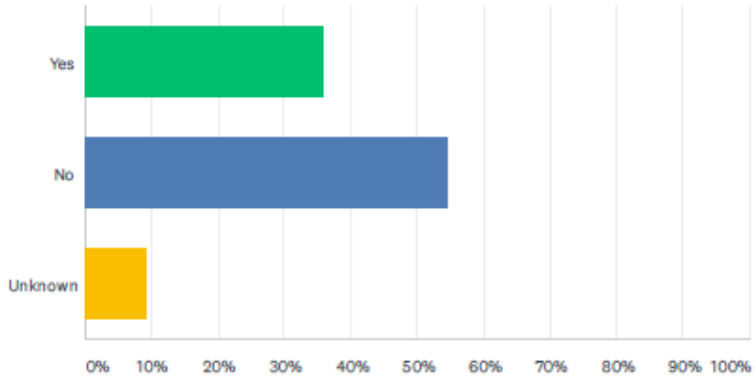
Answered: 182 Skipped: 9



ANSWER CHOICES	RESPONSES	
Yes	46.70%	85
No	36.26%	66
Unknown	17.03%	31
TOTAL		182

Q6 Do you have flood insurance?

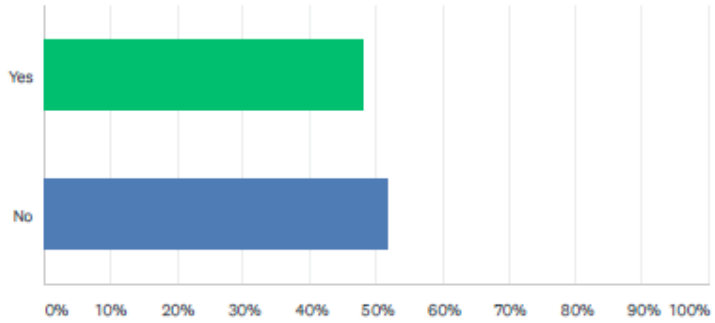
Answered: 181 Skipped: 10



ANSWER CHOICES	RESPONSES	
Yes	35.91%	65
No	54.70%	99
Unknown	9.39%	17
TOTAL		181

Q7 Have you ever experienced or been impacted by a natural disaster?

Answered: 181 Skipped: 10



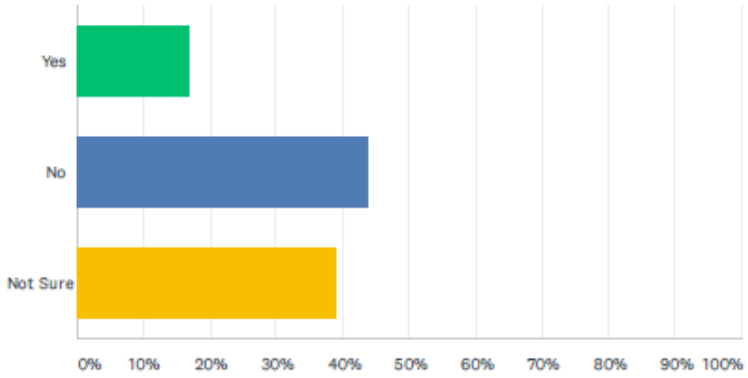
ANSWER CHOICES	RESPONSES	
Yes	48.07%	87
No	51.93%	94
TOTAL		181

Q8 Please describe the type of hazard and if it affected your home or business.

Answered: 75 Skipped: 116

Q9 Are communities doing enough to inform the public about the dangers of the hazards affecting Sacramento County listed in question 3?

Answered: 171 Skipped: 20



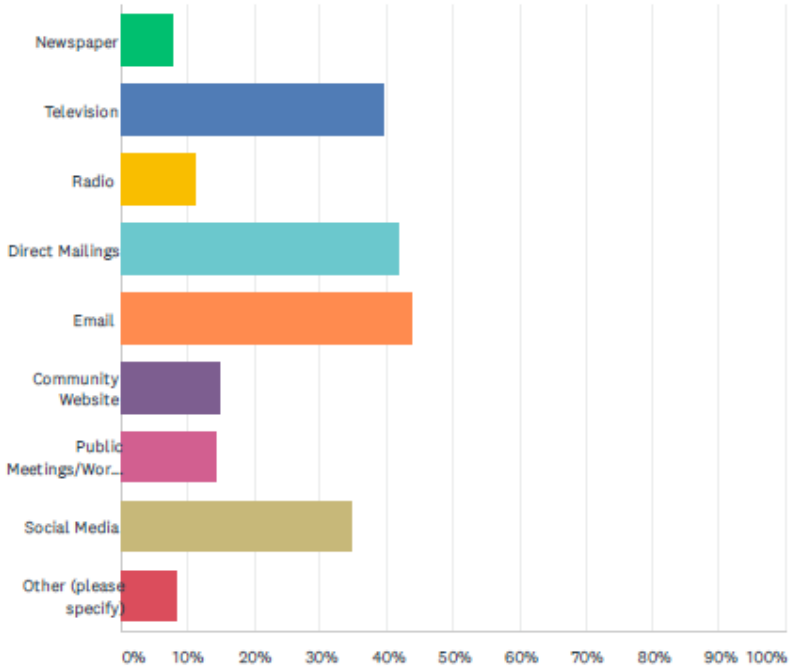
ANSWER CHOICES	RESPONSES	
Yes	16.96%	29
No	43.86%	75
Not Sure	39.18%	67
TOTAL		171

Q10 What can communities do to improve your knowledge of the risks associated with these hazards?

Answered: 112 Skipped: 79

Q11 In your opinion, what are the two (2) most effective ways for you to receive information on disaster preparedness, and how to make your home and neighborhood more disaster resistant.

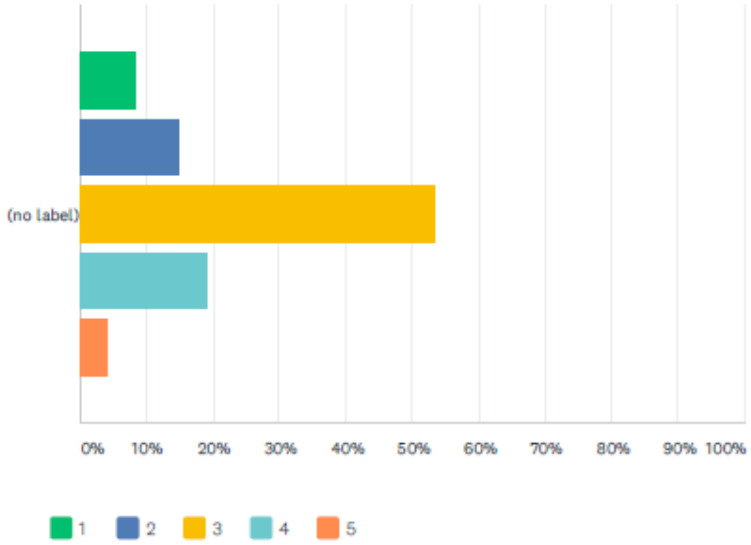
Answered: 167 Skipped: 24



ANSWER CHOICES	RESPONSES	
Newspaper	7.78%	13
Television	39.52%	66
Radio	11.38%	19
Direct Mailings	41.92%	70
Email	43.71%	73
Community Website	14.97%	25
Public Meetings/Workshops	14.37%	24
Social Media	34.73%	58
Other (please specify)	8.38%	14
Total Respondents: 167		

Q12 On a scale of 1 to 5 (5 being most prepared), please tell us how prepared you feel you and your household are for the possible impacts of natural hazard events if one occurs within Sacramento County.

Answered: 167 Skipped: 24



	1	2	3	4	5	TOTAL	WEIGHTED AVERAGE
(no label)	8.38% 14	14.97% 25	53.29% 89	19.16% 32	4.19% 7	167	2.96

Q13 Are there any risk reduction methods you think should be considered to reduce hazard-related losses?

Answered: 111 Skipped: 80

Appendix H RLAA and CRS Annual Reports

See attached pdf.

Department of Water Resources
Floodplain Management Section

Annual Progress Report
On the Repetitive Loss Area Analysis
Element Of The Community Rating System

September 2021

Prepared by Ramon Cooks
with George Booth

EXECUTIVE SUMMARY

A repetitive loss property, by FEMA definition, is one that has two or more flood insurance claims (exceeding the deductible) in a ten-year period. Repetitive flood damage claims is costly to the flood insurance program and a matter of interest to Congress as they seek to make the program financially sustainable. The Floodplain Management Section of the County Department of Water Resources outreaches annually seeking property owners who will allow staff to help them to reduce flood risk by various mitigation measures.

The Community Rating System (CRS) is a voluntary incentive-based program allowing reduced flood insurance cost. It encourages community floodplain management activities that improve flood risk reduction. The Program for Public Information (PPI) and the Repetitive Loss Area Analysis (RLAA) are useful documents to direct continued progress in two important floodplain management activities. These are critical to maintaining the County's CRS rating.

FEMA encourages communities to broaden the outreach to the so-called repetitive loss areas. While it is understood that many structures within such an area have never suffered flood damage, it is also understood that some have but are not listed on the data from FEMA. The mitigation outreach is appropriately presented to all addresses in each if the areas.

The unincorporated County has 30 repetitive loss areas with 108 repetitive unmitigated flood loss structures, as listed by FEMA as of May 31, 2018. However, included in the list there are 3 houses that have been mitigated, thus the current number of unmitigated repetitive loss structures is 105. Considering that some of the structures are multi-unit residential, it is appropriate to say that there are 139 homes on the repetitive flood loss list.

The Federal Hazard Mitigation Act allows FEMA grant monies to be available to states after experiencing Presidential Disaster Declarations. In recent years, California has suffered several natural disasters such as flood, fires, and mudflow. The Department of Water Resources Floodplain Management Section annually reaches out to property owners and is happy to seek FEMA grants to assist with the cost of mitigation.

Successes include FEMA recognition of 42 mitigated repetitive loss structures and there are 3 more that will be added to the mitigated list today and several more that will be added in coming years.

UPDATE TO THE EXISTING REPORT

The storm events of January and February 2017 damaged some structures twice. For those who filed two insurance claims, they were added to the FEMA repetitive loss list. The two areas where this apparently occurred were "Cripple Creek" at Deveron Way and "Beach-Stone Lake" at Point Pleasant; thus, we added Areas 29 and 30 to the RLAA.

There is FEMA grant money available to mitigate natural hazards, such as raising houses that are prone to flooding. Staff did outreach seeking those who might be interested and has applied for numerous grants. In coming years, there should be dozens of houses raised so that the floor is safely above the flood hazard elevation.

This update is available to the media and the public, including to all properties (owners and residents) in all of the repetitive loss areas, and can be found at www.StormReady.org under the Local Hazard Mitigation Plan.

The original RLAA was established in 2015. The RLAA is an Appendix within the Local Hazard Mitigation Plan.

REVIEW OF MITIGATION MEASURES

Each Area has a section entitled Future Mitigation Measures. The following is a table of the mitigation measures, implementation, and any recommended changes for RLAA Areas 1 through 30 herein reviewed for this annual report.

The repetitive flood loss area analysis and mitigation measures will be examined as part of the Local Hazard Mitigation Plan update slated for late 2021.

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
AREA 1 DRY CREEK WATERSHED	The County continues to search for additional funding for acquisition of additional properties in Dry Creek Floodway for demolition to restores the natural floodplain. The County further continues to encourage homeowners to raise their structures above the flood hazard.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant	• Three locations expressed interest in home elevation (Grant #4240): Cherry Lane, K Street, and 6th Street. Water Resources through HMGP home elevations (2017) have slated these properties as potential projects for the FEMA Grant funded mitigation program. Water Resources are in contact with the homeowners regarding their potential program involvement. • Dry Creek Road structure constructed in about 1963 is an extreme repetitive loss property. Interest expressed in mitigating the flood risk by relocating the building on to higher ground on the property or a buy out in cooperation with the County Park Department's Dry Creek Parkway Corridor Project.	There were 2 houses elevated in 2021 using HMGP grants. There is 1 home on a pending grant application. There is one acquisition on a pending FMA grant application.
AREA 2 LAGUNA CREEK (INTER-BASIN TRANSFER) GERBER CREEK	The County continues to search for additional funding for acquisition of additional properties in this floodplain area. As part of the Vineyard Springs Comprehensive Plan, there are efforts to reduce this flood risk, but construction will require several years to complete.	Questions should be forwarded to the Water Resources Floodplain Management Section	2021-2025	State and/or Federal Grant	Basin at Southgate site is being constructed, next piece is the permanent basin at Triangle Aggregate.	The Southgate Soccer Field Basin is under construction; FEMA CLOMR is submitted; need basin at Triangle.

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
AREA 3 LOCAL DRAINAGE (ANDREW ALAN LANE)	The overland release must be inspected periodically and kept clear. The County does periodic outreach to ten properties in Area 3. The local flooding problem was mitigated by a project constructed under the direction of the County. There is no remaining construction action necessary. The overland release must be kept clear and functioning.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		Routine maintenance	There remains a flood hazard, but the overland release constructed circa 1998 seems to have helped significantly.
AREA 4 NORTH AVENUE (EAST OF MISSION AVENUE) CHICKEN RANCH SLOUGH FLOODPLAIN	No flood control projects are planned for this area.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	FEMA grant	The Floodplain Management Section is happy to apply for FEMA grants for raising houses.	Annual outreach suggesting mitigation such as raising houses.
AREA 5 TWIN CITIES ROAD LOWER COSUMNES RIVER / Franklin Pond	The Franklin Pond Area floods when the Cosumnes River is high combined with local rural drainage shed areas. Some homes in this area flooded twice in 2017.	Questions should be forwarded to the Water Resources Floodplain Management Section	2021-2025	FEMA grant	Sacramento County experienced a series of Atmospheric Rivers and storm systems starting January 3, 2017 through January 24, 2017. Water from storm systems, king tides, releases, and runoff into the watershed influenced Area 5. These events added two properties along Twin Cities Road to the Repetitive Lost List.	This RL Area is expanded due to houses that flooded twice in 2017 (Lambert Rd and Hein Rd).

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
AREA 6 BROOKTREE CREEK – SOUTH OF MADISON AVENUE TO WEST OF DEWEY AVENUE	No flood control projects are planned for this area.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	FEMA Grant for house lifting or the Stormwater Utility for projects	No action	The County further continues to encourage homeowners to raise their structures above the flood hazard.
AREA 7 MORRISON CREEK (FRUITRIDGE & HEDGE)	The flood control channel and weir at the Aspen 6/Vineyard 1 aggregate strip mine, upstream of Jackson Highway controls the flooding; however, the FEMA map is yet to be corrected.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		The miners are to pursue FEMA floodplain mapping since the mines relocated the floodway and improved flood control	The weir constructed by the aggregate miners is fixed in place by Agreement.
AREA 8 COSUMNES RIVER	During the 2017 January – February storm events a RLP experience flooding in both January and February. The County continues to search for additional funding for elevating homes. The County further continues to encourage homeowners to raise their structures above the flood hazard.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	FEMA grants	The Floodplain Management Section is happy to apply for FEMA grants for raising houses.	Annual outreach suggesting mitigation such as raising houses.
AREA A9 SOUTH BRANCH OF ARCADE CREEK	The County continues to encourage homeowners to raise their structures above the flood hazard.	Questions should be forwarded to the Water Resources Floodplain Management Section	2019	State and/or Federal Grant	Gum Ranch detention basin is constructed, west of Kenneth Avenue.	Two owners on the east side of Kenneth Avenue were on FEMA grant HMGP 4240-027 but both decided not to proceed with raising their houses.

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
AREA A10 STRONG RANCH SLOUGH	No flood control projects are planned for this area.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		The Floodplain Management Section is happy to apply for FEMA grants for raising houses.	Annual outreach suggesting mitigation such as raising houses.
AREA A11 LINDA CEEK	No flood control projects are planned for this area.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		The Floodplain Management Section is happy to apply for FEMA grants for raising houses.	Annual outreach suggesting mitigation such as raising houses.
AREA A12 GRAND ISLAND ROAD & VIERRA'S RESORT	During the 2017 January – February storm events added a property at W Walker Landing Road to the Repetitive Loss List. The County continues to search for additional funding for home elevations and further continues to encourage homeowners to raise their structures above the flood hazard.	Questions should be forwarded to the Water Resources Floodplain Management Section	2021-2025	State and/or Federal Grant	The Floodplain Management Section is happy to apply for FEMA grants for raising houses.	One home was raised in 2021, using FEMA HMGP 4240-027 grant.
AREA 13 BADGER CREEK (WILTON) LOCAL FLOOD HAZARD	No flood control projects are planned for this area.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant	The Floodplain Management Section is happy to apply for FEMA grants for raising houses.	Annual outreach suggesting mitigation such as raising houses.

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
AREA 14 ARCADE CREEK	No flood control projects are planned for this area.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant	The Floodplain Management Section is happy to apply for FEMA grants for raising houses.	Annual outreach suggesting mitigation such as raising houses.
AREA 15 DILLARD ROAD & BERRY RD (WILTON) LOCAL FLOOD HAZARD	This is outside of the urban services area. There is no local funding for improvement of the capacity of the inverted siphon crossing under the Folsom South Canal.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant.	Review the severity of flooding and determine best mitigation measure, then apply for FEMA grant is appropriate.	Annual outreach suggesting mitigation such as raising houses.
AREA 16 ROBLA CREEK	SAFCA improved the conveyance at the west end of this area (about 2002).	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant, such as FEMA grants for home elevation	The Floodplain Management Section is happy to apply for FEMA grants for raising houses.	Annual outreach suggesting mitigation such as raising houses.

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
AREA 17 GARDEN HIGHWAY (HOMES ON THE RIVER SIDE OF THE LEVEE)	During the 2017 January – February storm events added two properties at Garden Highway to the Repetitive Loss List, which the County disputes since flood levels did not exceed finished floor elevations. County requested additional information of damage type from FEMA to clarify why this property was added to Repetitive Loss List. The County continues to search for additional funding for land acquisition and home elevations. The Federal and State governments have taken a strong interest in the Natomas area and have starting funding projects to strengthen and build setback levees protecting the area. Additionally, the Federal and State governments' area conducting off-site projects to decrease flood stages in the Sacramento River. Lastly, the County further continues to encourage homeowners to raise their structures above the flood hazard.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant.	Complete NFIP Worksheet AW-501 to have the two properties added in 2017 to remove because flooding did not reach finished floors. (denied 2019) Two locations expressed interest in home elevation (Grant #4240). Both on Garden Hwy. Water Resources through HMGP home elevations (2017) have slated these properties as potential projects for the program. Water Resources are in contact with the Homeowners regarding their potential program involvement.	Both homeowners dropped out of the grant funded house elevation program, thus their homes remain at risk of flooding. It appears that a few houses on Garden Hwy flooded twice in 2017. Continue offering to apply for FEMA grants to assist in house elevation.
AREA 18 LEONA CIRCLE IN THE NATOMAS AREA (LOCAL FLOODPLAIN)	Unfortunately, this area is outside of the urban services area (Stormwater Utility).	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant.	Annual outreach offers technical assistance.	Continue outreach.

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
AREA 19 TANGERINE AVENUE AT PERMSIMMON AVENUE	SAFCA constructed a peak flow detention basin (side channel weir) on the north side of Florin Creek, north of this RL Area.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		The drainage study for the SAFCA flood control project does not extend to this RL Area, thus additional analysis would be necessary to determine the extent to which that project helps here. Notes in 2000-2003 indicate that this RL Area is very localized at the parcel(s) only.	Continuous annual outreach offers to help these property owners. No reports for 18-years maybe the issue was solved by the owners.
AREA 20 TREEHOUSE LANE	The County continues to search for additional funding for acquisition of flood prone properties. The County further continues to encourage homeowners to raise their structures above the flood hazard.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		There was a minor drainage improvement project constructed in about 1997.	Continuous annual outreach offers to help these property owners. No reports are recorded for the past 16-years.
AREA 21 RIO LINDA DRY CREEK	There is no flood control project to reduce the flood hazard here. There are several houses that would benefit from being raised. Also the floodplain mapping upstream of Hazel Avenue needs a new study as the FEMA mapping effort seems to have missed a local crossing.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant.	The Floodplain Management Section is happy to apply for FEMA grants for raising houses.	Annual outreach suggesting mitigation such as raising houses.
AREA 22 NORTH NATOMAS EAST MAIN DRAIN CANAL (NEMDC TRIBUTARIES)	Folsom Dam improvements will reduce American River backwater to the pump station (located 0.3 mi SW of W. Ascot Ave/ W. 6th St) constructed in the late 1990s.	Questions should be forwarded to the Water Resources Floodplain	none		The pump station helps quite significantly. The Floodplain Management staff is willing to submit grant applications should anyone qualify for a house elevation project.	Continue to learn if there remains an issue here.

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
		Management Section				
AREA 23 MORRISON CREEK FEMA FLOODPLAIN (BETWEEN JACKSON HWY AND MAYHEW)	The County continues to search for additional funding for acquisition of additional properties in Morrison Creek floodplain for demolition to restores the natural floodplain. The County further continues to encourage homeowners to raise their structures above the flood hazard. Further, a weir along Morrison Creek is planned to be constructed upstream of highway 16 at an aggregate mine that should control flooding and help reduce some of the structural flooding that has been experienced in the past. Flooding could still be experienced in existing and future mining areas that are below the flow line of the creek.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		The miners are to pursue FEMA floodplain mapping since the mines relocated the floodway and improved flood control.	Continue outreach to learn if there remains an issue here.
AREA 24 ARCADE CREEK AT PARK ROAD	There is no project to control flooding on Arcade Creek.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		There have been no calls from owners in this RL Area since 1995	Continue outreach to learn if there remains an issue here.

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
AREA 25 MADISON AVENUE AT ROLLINGWOOD	There were some flooding issues here in the mid to late 1990s after which some work was recommended.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		There have been no calls from owners in this RL Area since they flooded in mid 1990s.	No action needed
AREA 26 STRONG RANCH SLOUGH	Strong Ranch Slough drains to the D-05 pump station. Projects since 1997 have optimized the sluice gate and the pumps to the greatest extent practical. There are no other projects to control flooding on Strong Ranch Slough. This RL Area is primarily slab on grade residential structures in peril when the slough overflows its banks.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant.	Woodside Condominiums was considering mitigation. The Floodplain Manager applied for two large FEMA HMGP grants but the HOA voted 'No' meaning that they do not want to raise the 17 repetitive flood loss buildings (totaling 90 condo. Units).	No further action for Woodside. There are flood victims on the north side of Northrop, though the flooding is shallow and it is not known if they would qualify for FEMA grant to raise.
AREA 27 BROOKTREE CREEK AUBURN BLVD AT ROSEBUD LANE	The County continues to encourage homeowners to raise their structures above the flood hazard. Auburn Villa Mobilehome/RV Park is in the RL Area. Mostly RVs in the lower area. There is apparently a duplex (status unknown) in the lower flood prone area.	Questions should be forwarded to the Water Resources Floodplain Management Section	none	State and/or Federal Grant.	Continue to learn more about the legacy mobilehome park and how they intend to protect their residents from flooding.	Follow up with the owners and their engineer to determine what plans they have to mitigate
AREA 28 VERDE CRUZ CREEK	The information reported to the County from the homeowners would not rise to the level of prioritizing any improvements here.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		Nothing to report	No other changes

Area	Future Mitigation Measures	County point of contact	Timeline	Potential Funding	Implementation	Status Notes 2021 (G.Booth)
AREA 29 CRIPPLE CREEK AT DEVERON WAY	There does not appear to be anything to do here.	Questions should be forwarded to the Water Resources Floodplain Management Section	none		The County might have done some work 20(+) years ago.	Damages in 1995 were primarily an overland release problem, solvable by the homeowners.
AREA 30 BEACH-STONE LAKE POINT PLEASANT	This is an area for which the SCWA has collected funds to mitigate an existing flooding problem which allegedly occurred upon completion of the final north Delta reclamation districts, circa 1920.	Questions should be forwarded to the Water Resources Floodplain Management Section	2021-2026	BSL Funds 314A and 315X with FEMA grants	Prepare elevation certificates, raise houses, or fill basements or add vents to mitigate flood risk.	Much outreach working with property owners to mitigate flood risk property by property.

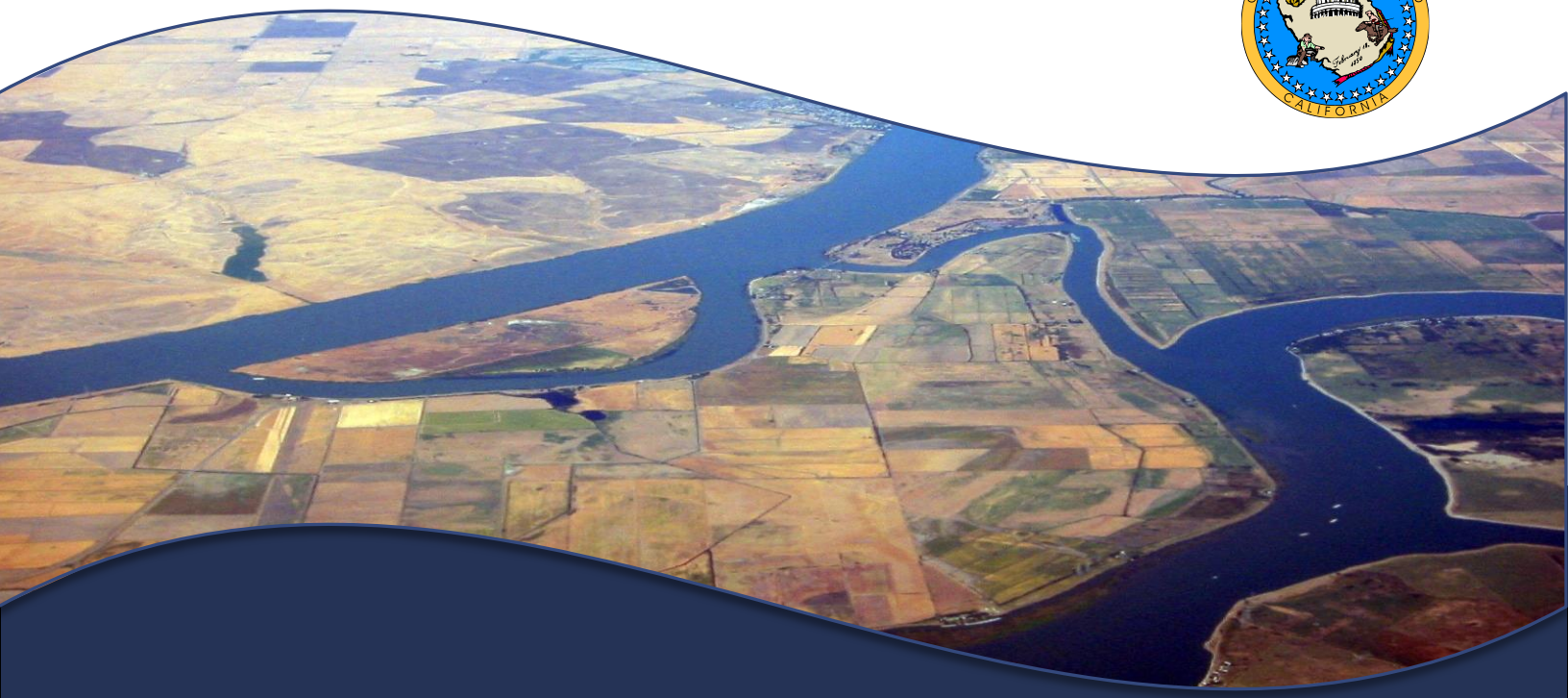
Appendix I Watershed Management Plan

The Watershed Management Plan is included on the following pages.

WATERSHED MANAGEMENT PLAN

2021

SACRAMENTO COUNTY



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PURPOSE AND OVERVIEW

This Watershed Management Plan describes the regulatory framework, planning and coordination to reduce flooding caused by development on a watershed basis in Sacramento County. Development, consisting of buildings, parking lots, streets, gutters, drainage pipes and channels create impervious surfaces and speed up the flow of runoff that result in increases in storm runoff volumes and peak discharges. The impact of proposed development on existing development and hydraulic conveyance systems should always be evaluated.

Sacramento County lies mostly in the trough of the Sacramento Valley in the northern portion of the Central Valley of California. The county is bound on the east by the Sierra Nevada foothills and extends to the southwest into the Sacramento Delta. The county totals 994 square miles and has seven incorporated cities. There are seven incorporated cities in the County of Sacramento including:

- Citrus Heights
- Elk Grove
- Folsom
- Galt
- Isleton
- Ranch Cordova
- Sacramento

The total population of Sacramento County (2020) is 1,555,365.

Jurisdiction	Total Population
Citrus Heights	87,811
Elk Grove	176,154
Folsom	81,610
Galt	25,849
Isleton	828
Rancho Cordova	78,381
Sacramento	510,931
Unincorporated County	593,801
Total	**1,555,365**

Source: California Department of Finance, 2020 E-1 Report

Additionally, there are three adjacent counties, Placer County, El Dorado County and Sutter County, that have creek watersheds draining into Sacramento County and to the Sacramento River Delta.

The purpose of this plan is to provide an understanding of the region's watershed behaviors to base future decisions on that will reduce the increased flooding from development on a watershed-wide basis.

This plan will:

- Evaluate future conditions
- Identify wetlands and natural areas
- Address the protection of natural channels
- Provided a dedicated funding source for implementing the plan

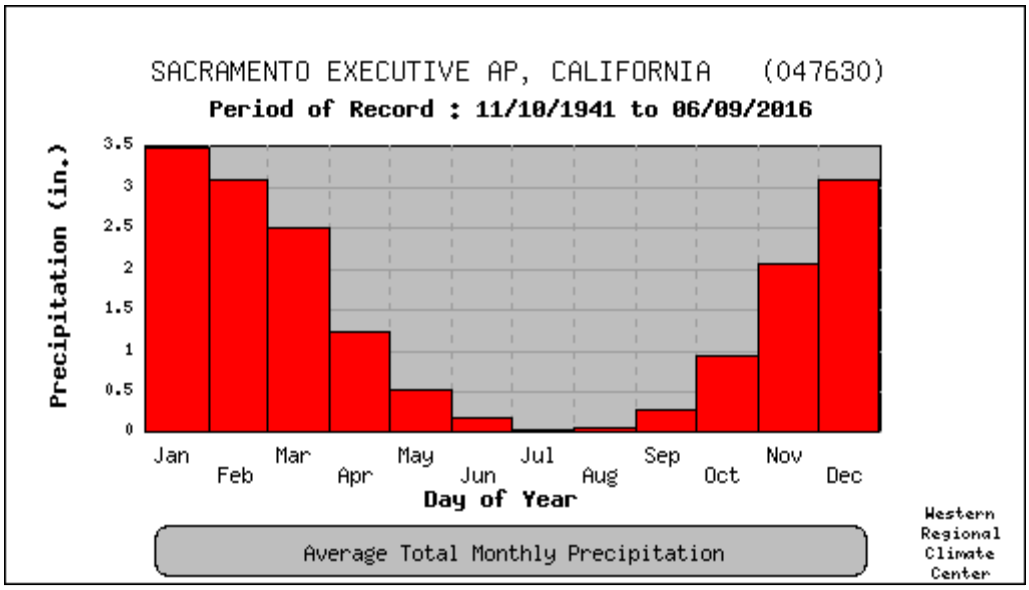
Sacramento County Flood Insurance Rate Maps were first issued March 15, 1979 and the county has continuously been a community in good standing with the National Flood Insurance Program (NFIP). Each city has a Federal Emergency Management Agency (FEMA) NFIP community number and an independent relationship with the NFIP.

The FEMA Community Rating System (CRS), under the Insurance Services Office recommends watershed management planning that is not limited to corporate boundaries. Under CRS Activity 450, a participating community may receive points toward improved rating and lowered flood insurance premiums for preparing a plan such as this and updating that plan every five years.

CONDITIONS

PRECIPITATION

The County experiences most precipitation between November and April. Essentially all of the precipitation that occurs in the area is rain. Based on data gathered at Sacramento FAA Airport between 1941 and 2021, average annual rainfall is approximately 17.63 inches, but can range from wet to dry years. Between 1941 and 2021, recorded annual rainfall ranged from a low of 5.81 inches in 2013 to a high of 33.44 inches in 1983 (Western Regional Climate Center 2021).



Source: Western Regional Climate Center 2021

SOIL TYPE

The prevalent soil in Sacramento County is Soil Conservation Service Type D, tightly bound and low permeability. Summertime humidity is quite low but the winter is more humid with lower temperatures (40 to 60 degrees Fahrenheit). Freezing conditions are rare, but there are often extended periods of fog. Consequently, soil remains quite moist throughout the rainy season. Therefore, land development, in general, has a greater effect on peak flow timing due to routing (gutters, pipes, channels) than volume increases due to increased impervious area (paving and rooftops). Flooding has been a major concern in this county since before the Gold Rush.

FUTURE CONDITIONS

According to the City of Sacramento's General Plan 2035 and Cal-Adapt (climate change scenario planning tool developed by the California Energy Commission) average temperatures in the Sacramento region are projected to rise between four and six degrees by 2100, based on low and high emissions scenarios, respectively (Cal-Adapt 2013). Cal-Adapt uses a method to downscale global climate model data to local and regional resolution under two emissions scenarios; the A-2 scenario represents a business-as-usual future emissions scenario, and the B-1 scenario represents a lower GHG emissions future.

The increase in average temperature is expected to have the following effects:

- **Sea level rise.** Rising sea levels are expected due to temperature increases that cause ocean water to expand, Arctic and glacial ice to melt, and increased amounts of snowpack runoff to enter the sea. California's ocean surface temperature patterns have been warmer than normal for the past

decade, a condition known as Pacific Decadal Oscillation. California sea level appears to have risen by about seven inches over the 20th century and is predicted to rise up to 55 inches by the end of the 21st century. Sacramento's location (70 miles inland coast) limits the most significant effects from sea level rise. However, rising sea levels may lead to levee failures in the Delta causing infrastructure damage, flooding, and saltwater intrusion into groundwater aquifers that may affect Sacramento region groundwater sources. It is also possible that sea level rise could reduce the effectiveness of Delta and nearby Delta levees or increase flood levels in tidally affected reaches of the Sacramento River, if storm flow and tide conditions coincide. An influx of saltwater would degrade California's inland estuaries, wetlands, and groundwater aquifers. Saltwater intrusion could threaten the quality and reliability of California's biggest fresh water supply that is pumped from the southern edge of the Sacramento/San Joaquin River Delta (City of Sacramento 2011).

- **Changes to precipitation patterns.** Precipitation levels are difficult to predict compared to other indicators of climate change. Annual rain and snowfall patterns vary widely from year to year, especially in California. Generally, higher temperatures increase evaporation and decrease snowpack, resulting in a drier climate. A majority of scientific models have shown that northern California precipitation is expected to decrease after 2030. But, more precipitation is expected to fall as rain rather than as snow. According to DWR, the Sacramento region has actually seen an increase in annual precipitation of about one inch over the last century. DWR research from 1901 to 2000 shows that the Sacramento River system runoff volume has remained stable on an annual basis, but there has been a 9 percent reduction in runoff from April through July. This is likely the result of increased winter rainfall and less snowpack storage. DWR anticipates that over the next century the Sacramento region will likely experience a slight increase in annual precipitation, with larger and more intense storms resulting in flood conditions, and longer drought periods. However, according to Cal-Adapt, the Sacramento region is projected to experience a slight decrease in annual precipitation levels (rain and snow) by 2090. It is expected that there will be less snowfall in the Sierra Nevada and the elevations at which snow falls will rise. Coincidentally, there will be less snowpack water storage to supply runoff water in the warmer months. Already it has been documented that California's snow line is rising (City of Sacramento 2011).

- **Increased frequency of extreme events such as heat waves, drought, and storm events.** Extreme heat waves are expected to increase in number by ten times in the Sacramento region and could become an annual event by 2100. Sacramento could experience up to 100 additional days per year with temperatures above 95°F and by 2090, the average July temperature could reach over 104°F. Changes to air and land temperatures will have an impact on the timing, amount, type, and location of precipitation and runoff in the Sacramento and American Rivers watersheds. This will impact the quantity of water supplies, the management of those quantities, the quality of the source

water, and the demand for treated drinking water. DWR has identified anticipated changes to the source water conditions in the watershed that will likely impact the quality of the source waters, including more intense storm events, longer drought periods, reduced snowpack at lower elevations, and earlier spring runoff. Extreme weather is expected to become more common throughout California. More extreme storm events are expected to increase water runoff to streams and rivers during the winter months, heightening flood risks. (City of Sacramento 2011).

These changing conditions are expected to affect our region in the following ways:

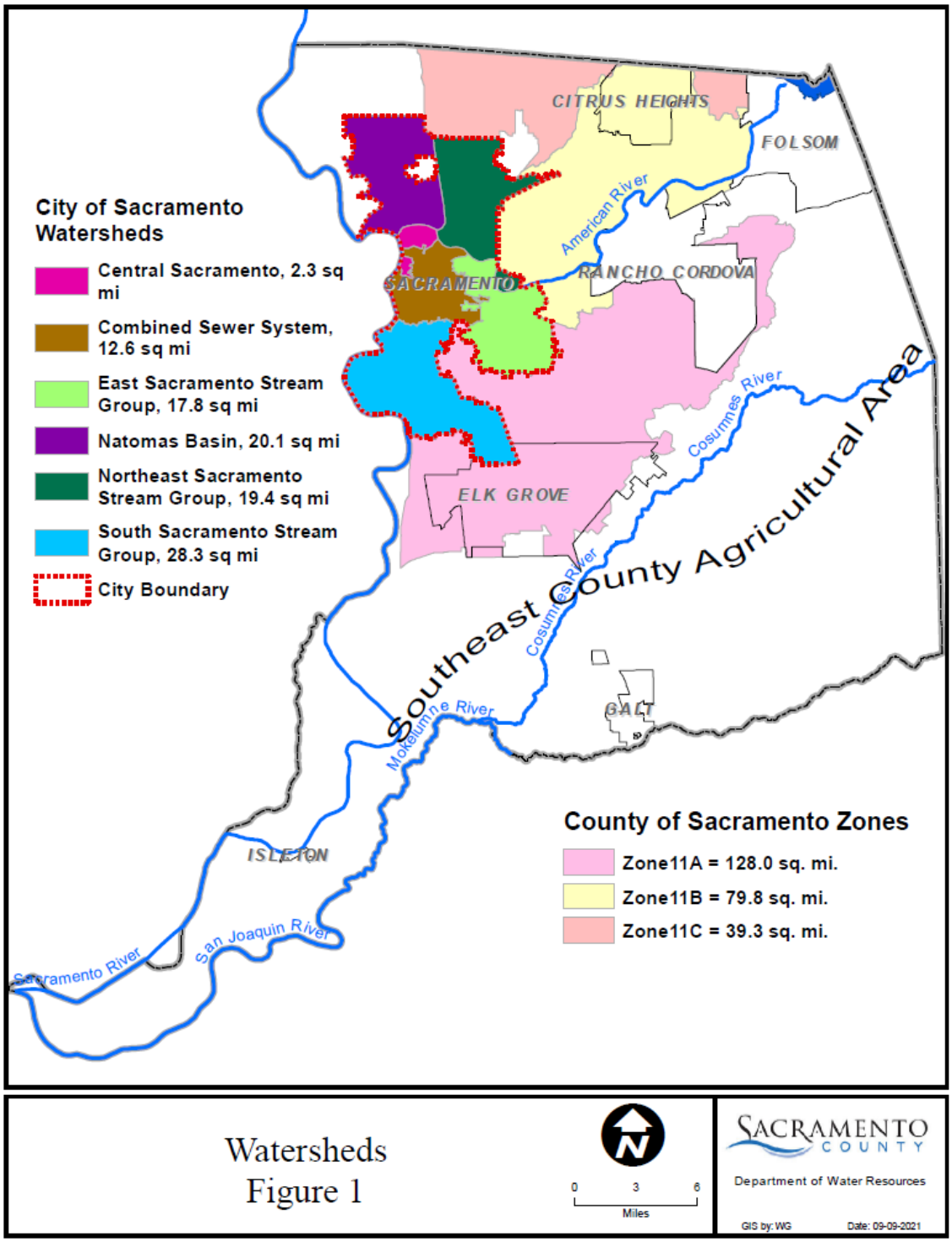
- **Impacts to biological resources:** Habitats that currently support local wildlife are expected to change, forcing plants and animals to either adapt to the new environment or move to more hospitable areas. Some species will be able to adapt to changing habitats by shifting their range or altitudes in order to adjust to rising temperatures. Others, however, might not be able to adapt fast enough to keep pace with the rate of climate change. For some species, climate change may allow them to increase the range of habitat where they can live; however, where plants and animals need to move to survive they may find wildlife corridors blocked or competition from other species (City of Sacramento 2011).
- **Increased risk of flood events:** Warmer ocean surface temperatures have caused warmer and wetter conditions in the Sierra Nevada, increasing flood risk. When the Sacramento or American Rivers are already at peak capacity, additional flows from increased snowpack runoff or storm intensity could cause flooding. During the last 50 years peak flow patterns have increased in the Sacramento River, making floods more likely in the future, especially if there is an increase in intense storms (City of Sacramento 2011).

WATERSHEDS

The urban and urbanizing areas of the County, including the Cities of Rancho Cordova, Elk Grove and Citrus Heights, are divided into three zones of the Sacramento County Water Agency, a statutorily created district operating under the authority of and pursuant to the provisions of the Sacramento County Water Agency Act (West's California Codes, Water Code Appendix, Chapter 66, commencing at Section 66-1, et seq.; Deering's California Codes, Water, Uncodified Acts, Act 6730a). These zones are identified on Figure 1 as 11A, 11B, and 11C, as shown on Figure 1.

The City of Sacramento is made up of two major waterways. The confluence of these two major waterways, the Sacramento River and American River, is within the City. The City also encompasses several other streams, creeks, and associated watersheds. The majority of these watersheds drain into the City from the County of Sacramento. The major drainage watersheds in the City can be divided into six groups and geographic areas. These areas are identified on Figure 1 as Natomas Basin, Northeast Sacramento Stream Group, East Sacramento Stream Group, South Sacramento Stream Group, Combined System, and Central Sacramento.

Figure 1: Watershed Boundaries with Calculated Areas



DRY CREEK AND NEMDC AND TRIBUTARIES (ZONE 11C)

The drainage master planning in the Dry Creek and Steelhead Creek (Natomas East Main Drainage Canal, NEMDC) tributary watersheds (Zone 11C) are fully master planned for pending development. These areas are generally large lot agricultural-residential parcels with roadside ditches and culvert crossings. There are two large developments being proposed known as Elverta Specific Plan, and South Placer Vineyard (the latter being in Placer County). The urban area known as Antelope was constructed in the late 1980s and early 1990s and is 86.4% developed and was fully master planned.

WATERSHEDS IN THE DRY CREEK STREAM GROUP

Dry Creek - 4138 acres in Sacramento County draining to the lower NEMDC, then to the American River, there are 48,966 acres upstream in Placer County. The Dry Creek study, dated 1992, was approved by both counties. There is a current effort in Placer County to update the hydrology study for Dry Creek and its tributaries. The two counties have enjoyed a good working relationship and technical cooperative partnership.

Basin A - A tributary to Antelope Creek draining toward Placer County and into Dry Creek. It was part of the Antelope community development master planning in the early 1990's and is fully developed.

Magpie Creek - 3789 acre watershed draining to the former McClellan Air Force Base (now a business park) and is master planned through the Base property and into the City of Sacramento. There is a 2008 study by West Yost that when constructed would serve to reduce flood risk to OptiSolar and adjacent buildings. There is no opportunity for major infill upstream of the McClellan Business Park.

Robla Creek - 5141 acre watershed in the county before it enters the City of Sacramento toward the confluence with Dry Creek and the NEMDC. It is 99.8% developed.

Linda Creek and Tributaries - 3580 acre watershed in Orangevale area draining to the City of Roseville which is a tributary to Dry Creek ultimately draining back to Elverta and Rio Linda in Sacramento County. The Linda Creek watershed is 99.5% developed.

Sierra Creek - 1743 acre watershed draining to Dry Creek in the Antelope community.

The Natomas East Main Drainage Canal (NEMDC) - Also known as Steelhead Creek has a backwater floodplain along the east side. The zoning in the eastern area is generally agricultural residences. American River backwater into the NEMDC is controlled by Pump Station Number D-15, which serves to reduce the base flood elevation upstream. There is a volume concern and there is a mitigation fee component of Zone 11C. No filling is allowed in the NEMDC backwater floodway area unless compensatory excavation is demonstrated. A fee is collected under the Sacramento County Water Agency

Code for the future addition of a pump at this pump station. Currently, floors are set based on a one pump failed scenario which generally provides an extra one foot of freeboard in the backwater area.

NEMDC Tributary 1 flows to the NEMDC and conveys flows from southwest Placer County. There are 1526 acres in Placer County and 865 acres in Sacramento County. South Placer Vineyard Development will pay the Pump Station D-15 mitigation fee.

NEMDC Tributary 2 is a 2744 acre watershed area with no planned infill development, except the Elverta Specific Plan, which will attenuate peak flow and volume impacts with large detention basins.

NEMDC Tributary 3 is a 1567 acre watershed area with no planned infill development, except the Elverta Specific Plan.

East Natomas is an 1816 acre watershed area with no planned infill development.

DRAINAGE STUDIES FOR ZONE 11C (DEVELOPING AREAS, AND AREAS IN NEED OF IMPROVEMENT)

NEMDC Tributaries - Drainage study was developed by Borcalli & Associates in 1994. It is being used by Water Resources to condition development. The precipitation data and land use are still appropriate, as well as the hydrology (HEC-1). The hydraulic model is updated from HEC-2 to HEC-RAS as appropriate.

Elverta Specific Plan - An approved drainage master plan that would include peak flow detention to minimize the impact to Tributaries 1 and 2.

- The Elverta Specific Plan Drainage Master Plan revision was prepared in 2011 by MacKay & Somps Engineers.

Dry Creek Watershed Flood Control Plan - Sponsored by both Placer County Flood Control District and the Sacramento County Water Agency and has been in use since 1992. It is currently being updated by Placer County. It is being used by both Placer County and Water Resources to condition development.

Robla/Magpie Creeks Drainage Study - Developed by Borcalli & Associates for SAFCA, and the City and County of Sacramento in 1998, and updated by Mead & Hunt Engineers in 2007. It is being used by Water Resources to condition development.

Robla and Magpie Creek Diversion Levee CLOMR - Developed by Ensign & Buckley on April 2002.

McClellan Park Magpie Creek Floodplain Improvements - Includes hydrologic and hydraulic modeling for Magpie Creek developed by West Yost in 2011 to revise FEMA floodplain from AO zone to AE zone in area of Idzorek Street. The CLOMR has been approved by FEMA in 2009.

South Placer Vineyard - Drainage study for the County of Placer.

Linda Creek Hydrology - Prepared by Nolte Associates, Inc. (the study contractor) for the Federal Emergency Management Agency (FEMA) under Contract No.EMS-2000-CO-0057 Order No. T002 and completed in September 2004. Both Placer and Sacramento Counties served as a Cooperating Technical Partners (CTP's) for this study.

NATURAL STREAMS GROUP AND TRIBUTARIES (ZONE 11B)

Drainage master planning in the natural streams and areas, draining to the American River (Zone 11B), is deemed 100% master planned. The 'natural streams' are protected by the county zoning code. These natural streams are generally lined with established oak and other vegetation serving as habitat and shade canopy. The county opposes disruption to these sensitive areas encompassing most of the Zone 11B creeks and primary tributaries.

WATERSHEDS IN THE NATURAL STREAM GROUP (ZONE 11B)

American River - 100% master planned and controlled by state and federal regulators. Folsom Dam and a system of certified levees control the flows in this river. Any proposed land development in the lower reach of this 2100 square mile watershed could not have any significant impact on peak flow. RBF Consulting prepared for Sacramento Area Flood Control Agency and the City and County of Sacramento a study and letter of map revision submitted to and approved by FEMA in 2010. MBK Engineers submitted an updated hydrology and hydraulic analysis for the process to certify the levees along the River. This new base flood profile will be mapped with the forthcoming FEMA map revision.

Arcade Creek – 6,508 acre watershed is 98.2% developed with only 54 acres of infill area remaining. There is no valid location for peak flow detention; however, as redevelopment occurs there will be opportunities for installation of stormwater quality treatment devices. Modeling on Arcade Creek was by County Water Resources staff (in 1995-98 and upstream of Auburn Blvd in 2007) and the resulting profile is used where it is higher than recorded high water and FEMA flood insurance study. An additional modeling effort conducted by County Water Resources staff was submitted to FEMA in 2015. The modeling showed 100-year water surface elevations that are significantly higher than the FEMA base flood elevations. **Arcade Creek South Branch** – 1,657 acre watershed in which lies the approved (104 acre) Gum Ranch Specific Plan, which is slated for a peak flow detention basin when the project is constructed by the development interests. The Gum Ranch hydrology study used in the project environmental impact report is deemed current. Upon completion of Gum Ranch development, this watershed will be about 99% developed.

Brooktree Creek - City of Citrus Heights, is 97.8% developed.

Mariposa Creek - City of Citrus Heights, is 97.2% developed.

Carmichael Creek – 2,725 acre watershed draining to the American River. The watershed is 96.8% developed.

Chicken Ranch Slough – 3,722 acre watershed draining to the American river via Pump Station D-05. The watershed is 98.9% developed.

Cripple Creek – 4,327 acre watershed in Citrus Heights draining to Arcade Creek. The watershed is 98.5% developed.

Diablo Creek - 9,48 acre watershed draining to Arcade Creek and is 95.5% developed.

Fair Oaks Stream Group – Comprised of several smaller watersheds draining to the American River totaling 7819 acres and is 97.8% developed.

Manlove Creek – 1,893 acre watershed is 99.9% developed.

Kohler Creek - Also known also as Date Creek, is a 694 acre watershed draining to Arcade creek and is 97.1% developed.

Minnesota Creek – 1,095 acre watershed draining to the American River and is 95.7% developed.

Strong Ranch Slough – 4,573 acre watershed draining to the American River via Pump Station D-05. The shed is 99.3% developed.

Sunrise Creek – The watershed is entirely in the City of Citrus Heights and is 96.1% developed.

Verde Cruz Creek – 1,226 acre watershed draining to Arcade Creek and is 97.3% developed.

Alder Creek– 7,226 acre watershed draining to Lake Natomas reservoir on the American River. There is no need for flood flow or volume detention since the flow is to a federally operated reservoir. There will be hydromodification attenuation basins as well as low impact development measures. A detailed drainage study for Glenborough/Easton Development, dated 2013, was approved for environmental review, additional analysis is needed before the project can proceed to design.

Buffalo Creek – 9,167 acre watershed draining to the American River. The Westborough Drainage Master Plan accounts for the area known as Aerojet which is slated for development. There will be peak flow detention in order to not exacerbate the downstream floodplain. The drainage master plan will be incorporated in the environmental impact report for the forthcoming project.

Mayhew Channel – 2,861 acre watershed draining to the American River. The shed is 96.6% developed.

Boyd Channel - Also known as Boyd Station Channel the 2201 acre watershed drains to the American River and is 95.9% developed.

Cordova/Coloma Stream Group – Comprised of several smaller shed areas draining to the American River totaling 1,728 acres and is 92.6% developed. This is in the City of Rancho Cordova.

DRAINAGE STUDIES FOR ZONE 11B (INFILL DEVELOPMENT AND CAPITAL IMPROVEMENT)

The following is a list of current drainage master plans including existing condition and fully development condition hydrology.

Chicken Ranch Slough - Drainage Master Plan was first developed by Water Resources staff in 1991 to identify solutions to flooding problems. Several large public meetings were held. A lack of consensus on an overall solution resulted in only one part of a recommended plan being implemented – revised channel maintenance procedures. Residences with low finish floor elevations were identified for elevating but home owners were not interested. The HEC-1 and HEC-2 models developed in the study were used as best available information until they were updated by staff in 2006 with SacCalc and HEC-RAS models.

Strong Ranch Slough/Sierra Branch - A drainage study was developed by David Ford Engineers for Water Resources in 2006 to analyze flood control alternatives. Staff expanded on the modeling in 2007 and developed a website and flood warning system for the area. The models are used by staff to analyze capital improvement projects.

D-05 - Drainage pump station that serves Strong Ranch and Chicken Ranch Sloughs. A 2003 Corps of Engineers Feasibility Study identified doubling the capacity of the D-05 pump station as the only feasible solution to reducing flooding in the area. There is no cost-effective solution that provides 100-year protection. A project to perform needed maintenance to the pump motor wiring resulted in a significant increase in motor horsepower and capacity to four of the six pumps. The benefit of the increased capacity is currently being modeled.

Arcade Creek - Water Resources commissioned a drainage study at Auburn Boulevard at the City of Sacramento Border in 2003 by a consultant to determine the level of protection for the Evergreen Estates floodwall. The county applied for and received provisional accreditation of this levee in 2009, but has not submitted the required levee analysis needed to certify the levees. The County submitted as flood study to FEMA in 2015 that included reaches of Arcade and Cripple creeks. The modeling showed 100-year water surface elevations that are significantly higher than the FEMA base flood elevations. The study is under review by FEMA and is currently used for floodplain management.

South Branch Arcade Creek - Drainage studies were performed as referenced in the approved environmental impact reports for the Gum Ranch and Sheltonham developments. Hydrologic models were developed to analyze development impacts and mitigation measures.

Glenborough, Easton, Westborough - Drainage studies were developed associated with the proposed redevelopment of a portion of the GenCorp- Aerojet site in the Alder Creek and Buffalo Creek watersheds. These studies developed hydrologic and hydraulic modeling to determine development impacts and mitigation measures. Current study, by MacKay and Somps is dated 2013 and is being used for environmental review of the project.

Mayhew Drain Levee LOMR - Letter of Map Revision for Mayhew Drain was prepared by RBF Consulting in January 2010 to reflect improvements done by SAFCA, and the ACOE.

American River - American River Letter of Map Revision for American River was prepared by RBF Consulting, LOMR approved by FEMA 2010, mapping 145,000 cfs flow from Folsom Dam as the base flood.

MORRISON CREEK STREAM GROUP (ZONE 11A)

The Morrison Creek Stream Group may be deemed 100% master planned for peak flow, volume, and stormwater pollution prevention. The majority of growth in Sacramento County will occur in this area. Consequently, a great deal of effort has been put forth to master plan the necessary trunk drainage improvements. Ongoing master planning is occurring in the unincorporated County in association with the Vineyard Springs Comprehensive Plan, North Vineyard Station Specific Plan, West Jackson Master Plan, Mather South Community Master Plan, Newbridge Specific Plan, and Jackson Township Comprehensive Plan.

Many of the creeks in this watershed have reaches of natural bed and bank and are home for a variety of plant and animal species. These areas are treated with care and any hydraulic improvements would be only under strict guidance of the state and federal regulators under the Clean Water Act, Endangered Species Act and the California Environmental Quality Act. Thus, permits for creek corridor improvement projects will careful consideration of the habitat value and may include construction of naturalized side slopes, ponds, pools, and native landscaping.

Stormwater pollution prevention during construction and post development storm pollutant discharge treatment are always required. Additional measures are taken, where applicable, to assure minimal hydro-fluvial geomorphology impact due to proposed development by attenuating peak flow and volume.

Elder Creek – 7632 acres, 100% developed condition master planned for the approved North Vineyard Station and Florin Vineyard Specific plans. Master planning is ongoing in the Aspen 8 & 9 mining area, and the Jackson Township Comprehensive Plan area.

Elk Grove Creek- 4019 acres, 100% developed condition master planned for the East Elk Grove Specific Plan, City of Elk Grove.

Florin Creek – 2857 acres, 100% developed condition master planned for the proposed Florin Vineyard Specific Plan. The South Sacramento Stream Group project includes flood protection projects along Florin Creek consisting of channel improvements and construction of a flood control basin which was completed in 2016.

Gerber Creek – 2579 acres, 100% developed condition master planned for the approved North Vineyard Station Specific Plan and the approved Vineyard Springs Specific Plan. The latter is superseded by the North Vineyard Station Drainage Master Plan dated 2004 and subsequent revisions to the modeling to incorporate development planning for the Wildhawk North project. Construction of channel improvements began in 2016 in the upper reaches of Geber Creek in association with North Vineyard Station planned development.

Laguna Creek - Headwaters in the City of Rancho Cordova is 100% master planned for the proposed Suncreek Specific Plan. Laguna Creek between the cities of Elk Grove and Rancho Cordova is fully master-planned in the Vineyard Springs Specific Plan approved documents. The primary flood control facility is the Triangle Rock aggregate pit which mitigates the loss of floodplain due to mining activities south of Florin Road. This facility will helps control flood flows that jump from the Laguna Creek to Gerber Creek watershed at the CCTRR railroad embankment. Another detention basin planned just upstream of the railroad embankment will, in combination with the Triangle Rock Basin, fully mitigate cutting off the inter-basin transfer of flows from Laguna Creek to Elder Creek. The total Laguna Creek watershed is 21176 acres draining from just upstream of the City of Rancho Cordova's eastern boundary, through the planned development area over the Folsom South Canal, through Mather Field and preserve areas to the Vineyard Springs development area and into the City of Elk Grove ultimately discharging to Beach Stone Lakes. Elk Grove has modeled the creek up to the northern city boundary (Calvine Road) and County Water Resources has modeled the creek from the top of the shed to Calvine Road. All models are existing condition and developed condition. The study by Wood Rodgers dated 2006 and the study by MacKay & Somps dated 2009 are superseded by the 2015 LOMR model by West Yost.

Laguna Creek and Tributary 1 in the City of Elk Grove was modeled with the 2009 submitted FEMA letter of map revision.

There was a 2020 conditional letter of map amendment submittal to FEMA for upper Laguna Creek flood control at the Southgate Soccer Field Basin Site at Carmencita and the Triangle Aggregate Basin Site north west of Florin Road and Sunrise Blvd.

Morrison Creek – 34592 acres, Upper Morrison Creek is 100% master planned as part of developments in the City of Rancho Cordova. Middle Morrison Creek flood control is occurring at the Aspen 6 aggregate mine where there is a constructed weir. Lower Morrison Creek is in the City of Sacramento and has been fully studied by the Corps of Engineers who are designing a floodwall project. The large Jackson Highway Master Plan area encompasses much of the Morrison Creek watershed immediately upstream of the City of Sacramento. The hydrology study dated 2009 by Wood Rodgers will be succeeded by studies being prepared for the West Jackson Highway Master Plan which encompasses a large area of the Morrison Creek watershed in the county.

Strawberry Creek and Jacinto Creek– Total 5588 acres partially in cities of Elk Grove and Sacramento is almost fully developed and master planned with several flood control and storm water quality detention basins. The study by/for Water Resources 1993 is deemed current.

Unionhouse Creek – 2193 acres tributary to Strawberry Creek and Morrison Creek is 100% master planned for the proposed Florin Vineyard Specific Plan. The developed condition drainage study by Civil Solutions dated 2007 is deemed current.

Whitehouse Creek – 100% master planned and developed in City of Elk Grove.

The South Sacramento Streams Project promoted by Sacramento Area Flood Control Agency with CA Department of Water Resources and the City of Sacramento will control flooding on Elder Creek, Unionhouse Creek, Florin Creek, and Morrison Creek west of Highway 99. The project consisted of levee improvements starting south of the town of Freeport and running easterly into the urbanized areas of the City of Sacramento. The project also included channel improvements along Florin and Unionhouse creeks.

Whitehouse Creek and Elk Grove Creek are tributaries to Laguna Creek which drains to the City of Sacramento then to the Beach Stone Lake Preserve

Strawberry Creek is tributary to Unionhouse Creek draining into the City of Sacramento and the South Sacramento Streams Group flood control project, then to the Beach Stone Lake Preserve.

Beach Stone Lake Tributaries drain the western half of the City of Elk Grove toward the Beach Stone Lake Preserve.

Mitigation of impacts to the Beach Stone Lake floodplain is discussed later in this document.

DRAINAGE STUDIES FOR ZONE 11A (DEVELOPING AREAS)

The following lists the current drainage master plans including existing condition and fully development condition hydrology.

Vineyard Springs Comprehensive Plan - The drainage plan for this planning area was developed by the Spink Corporation in 1999, and updated by Water Resources staff in 2003 and 2007. It was first adopted by the Sacramento County Board of Supervisors in 2003 and most recently in 2007. The plan, along with updates to the design and FEMA model are being used by Water Resources to condition development.

North Vineyard Station Specific Plan - The drainage plan for this planning area was developed by Borcalli & Associates in 2001 and updated by MacKay & Somps Engineers in 2006. It was approved by the Board of Supervisors in 2006. The modeling is going through updates as needed as new information is available, but the plan and revised modeling are being used by Water Resources to condition development.

Florin Vineyard Gap Community Plan - The drainage plan for this planning area was approved by Water Resources in 2007. The modeling is going through updates as needed as new information is available, but the drainage plan and revised modeling are being used by Water Resources to condition development.

Strawberry/Jacinto Creek Drainage Master Plan - This drainage master plan was developed by Water Resources staff in 1993. It was used to regulate pending development in the watersheds at the time, and is still used to condition development. The precipitation data is still appropriate, as well as the hydrology (HEC-1). The hydraulic model is updated from HEC-2 to HEC-RAS as necessary. The land use plan for the remaining undeveloped areas in the watershed is still appropriate.

Lower Laguna Creek Drainage Master Plan - This drainage master plan was developed by Water Resources staff in 1996. It was used to regulate pending development in the watersheds at the time, and is still used to condition development. The precipitation data is still appropriate, as well as the hydrology (HEC-1). The hydraulic model is updated from HEC-2 to HEC-RAS as necessary. The land use plan for the remaining undeveloped areas in the watershed is still appropriate.

Whitehouse Creek Drainage Study - This drainage study was first developed by Water Resources staff in 1996 and updated in 2006. It is being used by Water Resources to condition development.

Upper Morrison Creek - The Rio del Oro, Anatolia, and Sunridge drainage master plans in the City of Rancho Cordova serve to attenuate peak flow at the constraints crossing the Folsom South Canal.

Beach Stone Lake - Zone 11A watersheds converge to Morrison Creek, Laguna Creek which flow though the cities of Sacramento and Elk Grove, respectively, and ultimately to the preserve area known as Beach Stone Lake. In the Zone 11A program, is an impact fee that is collected, and separately accounted, for Beach Stone Lake mitigation. The Beach Stone Lakes Cumulative Impact Analysis dated September 1992 by Ensign and Buckley Consulting Engineers for Sacramento County used the DWR NETWORK unsteady-state hydraulic model to analyze the floodplain and the impacts of Zone 11A development. Subsequently, the Elliott Ranch South floodplain encroachment was presented in the Final Supplemental Environmental Impact Report for Elliott Ranch South General Plan Amendment (County Control Number 98-0617, dated July 1999, and an analysis of the impact of developing Shed B through the East Franklin Specific Plan and Laguna Ridge, in the City of Elk Grove was presented in those EIRs. This model is the current analysis of development impact to Beach Stone Lake.

Arboretum-Waegell Specific Plan - This specific plan for 1,350 acres enclosed by Sunrise Blvd, Jackson Road, and Grant Line Road was prepared by Wood Rodgers on March 24, 2010.

DRAINAGE STUDIES FOR ZONE 11A (CITY OF ELK GROVE)

Laguna Creek and Tributaries (including Elk Grove Creek and Whitehouse Creek)

- Laguna Creek Watershed Management Action Plan, Carmel Brown, CKB Environmental Consulting, Inc., Greg Suba, Environmental Education Services, EDAW, Inc. and Geosyntec Consultants, September 2008.
- Drainage Study for Elk Grove Creek, MacKay & Somps, May 24, 2007.
- Drainage Study for Vintara Park, MacKay & Somps, December 5, 2005.
- East Area Storm Drainage Master Plan Revised Draft Version, Harris & Associates, November 18, 2005.
- Sacramento County Laguna Creek LOMR Hydrologic Data, July 2005.
- Laguna Creek Feasibility Study Final Report, Quincy Engineering, Inc., June 13, 2005.
- Laguna Creek Hydrologic and Hydraulic Analysis, David Ford Consulting Engineers, March 2005.
- Technical Memorandum, Drainage Analysis for Fieldstone Unit 3 and Waterman Ranch Detention Basin within East Elk Grove Specific Plan, Watermark Engineering, Inc., February 10, 2006.
- Upper Laguna Creek Drainage Master Plan, Status Report, Sacramento County Water Resources Division, September 1997.
- East Elk Grove Specific Plan, Preliminary Technical Studies Report, MacKay & Somps, March 1994.
- Laguna Creek Watershed Analysis, David Ford Consulting Engineers, Inc. December 15, 2005.

- Hydrologic and Hydraulic Analysis to Assess Existing Condition for Flood Plain Extents for Whitehouse Creek and Unnamed Tributary to Whitehouse Creek, David Ford Consulting Engineers, Inc, September 2009.
- Storm Drainage Master Plan for Field Stone South, Mackay and Somps, April 6, 2006, revised May 10, 2006.
- Drainage Study for Old Town Mixed Use, RFE Engineers, Inc., revised October, 2006.
- Shops at Calvine, Storm Drainage Study and Plan prepared for Armstrong Development Properties, Inc. Jacobs, June 25, 2009.
- Drainage and Hydraulic Analysis Report Bond Road Widening Project, Engeo Incorporated, September 2, 2004.
- Drainage Report for the bond Road widening Project, David Evans and Associates, January 2007.
- Preliminary Drainage Report for the Bradshaw Widening Project, David Evans and Associates, May 2007.
- Seasons Hydrologic and Hydraulic Study, TSD Engineering, Inc., October 22, 2007, revised January 8, 2008.

Grant Line Channel

- Elk Grove Regional Park and Emerald Lakes Golf Course Storage Capacities, Letter from Psomas to City of Elk Grove, June 2005.
- Grant Line Channel and Pump Station D-39 Hydrologic and Hydraulic Analysis, PSOMAS, March 2005.

Laguna West Lakes

- Design Report, Laguna Creek Unit No.4 Hydrology Study, The Spink Corporation, July 1990.

Lakeside

- Design Report, Lakeside Development Hydrology Study, The Spink Corporation, July 1991.

Sheds A&B

- Drainage Master Plan for Laguna Ridge Specific Plan prepared for the Hodgson Company, updated and revised by WOOD Rodgers, July 2002.
- Laguna Ridge Specific Plan Supplemental Master Drainage Plan for Local Drainage Shed B, Wood Rodgers, May 2005.
- Laguna Ridge Specific Plan Storm Drainage CIP, Wood Rodgers, February 2005.
- East Franklin Interim Drainage Facility Analysis, Wood Rodgers, August 20, 2003.

Shed C

- Laguna Ridge Specific Plan Supplemental Drainage Plan for Local Drainage Shed C, Wood Rodgers, October 2005.
- Master Drainage Plan for Elk Grove Promenade, Local Drainage Area Shed C, Wood Rodgers, October 2005.

Strawberry Creek

- Strawberry and Jacinto Creeks, Drainage Master Plan, Draft Report, County of Sacramento Water Resources Division, July 1993.
- Storm Drainage Master Plan Report, Upper Reach of Middle Branch of Strawberry Creek, Elk Grove/West Vineyard Area, MacKay & Somps, February 5, 1992.

Miscellaneous

- Elk Grove General Plan adopted by the City Council November 19, 2003 and reflecting Amendments through January 5, 2005.
- Draft Laguna West Levee Certification Study, City of Elk Grove and Wallace Kuhl, 2011.

NORTHEAST SACRAMENTO STREAM GROUP

The Northeast Sacramento Stream Group contains 15 internal drainage basins. The existing drainage system serving this area is comprised of storm drains and open drainage channels. Runoff within the watershed is conveyed to sumps through the existing drainage system.

WATERSHEDS IN THE NORTHEAST SACRAMENTO STREAM GROUP

- American River
- Natomas East Main Drainage Canal (NEMDC, a.k.a. Steelhead Creek)
- Dry Creek
- Rio Linda Creek
- Robla Creek
- Magpie Creek Diversion
- Upper Magpie Creek
- Don Julio Creek
- Lower Magpie Creek (a.k.a. Historic Magpie Creek)
- Arcade Creek
- Hagginwood Creek

- Icehouse Ditch
- Sears Ditch
- Chicken Ranch/Strong Ranch Slough (D-05)

DRAINAGE STUDIES IN THE NORTHEAST SACRAMENTO STREAM GROUP

- Basin 83 Master Plan – June 1992
- Basin 95 Master Plan – June 2004
- Basin 109 Master Plan – June 2004
- Basin 117 Master Plan – February 1998
- Basin 144 Master Plan – February 2001
- Basin 151 Master Plan – April 1996
- Basin 152 Master Plan – September 2016
- Basin 153 Master Plan – April 1992
- Basin 157 Master Plan – September 2007
- Basin 158 Master Plan – September 1997
- Magpie Creek Diversion Drainage Study – Brown & Caldwell - May 1985
- Magpie Creek Floodplain Analysis – David Ford – November 2001
- Historic Magpie Creek Memo and Magpie Creek Supplemental Analysis – David Ford –August 2003 & June 2005
- Robla and Magpie Creek Diversion Levee CLOMR, Ensign & Buckley – April 2002
- Magpie Creek 100-year and 200-year Floodplain Mapping – June 2016
- Arcade Creek Watershed Plan – June 2003

EAST SACRAMENTO STREAM GROUP

The East Sacramento Stream Group contains 31 internal drainage basins (City of Sacramento). The existing drainage system serving this area is comprised of storm drains and open drainage channels. Runoff within the watershed is conveyed to sumps through the existing drainage system.

WATERSHEDS IN THE EAST SACRAMENTO STREAM GROUP

- American River
- Morrison Creek
- Sacramento State Ditch
- PG&E Ditch
- Procter Gamble Ditch
- Florin Creek

- Lake House Acres Creek

DRAINAGE STUDIES IN THE EAST SACRAMENTO STREAM GROUP

- Basin 5 Master Plan – June 1996
- Basin 8 Master Plan – June 1996
- Basin 10 Master Plan - February 2000
- Basin 19 Master Plan – June 1996
- Basin 31 Master Plan – May 1999
- Basin 37 Master Plan – April 1996
- Basin 43 Master Plan – April 1996
- Basin 51 Master Plan – August 2006
- Basin 96 Master Plan – June 1996
- Basin 101 Master Plan – June 1996
- Basin 113 Master Plan – May 1999
- Basin 155 Master Plan – October 1997
- Basin G209 Master Plan – February 1997
- Basins G248 Master Plan Drainage Study - January 1998
- Basins G249 Master Plan Drainage Study - January 1998
- Basin G258 North Master Plan – June 2003
- Aspen Basins Drainage Study

SOUTH SACRAMENTO STREAM GROUP

The South Sacramento Stream Group contains 49 internal drainage basins. The existing drainage system serving this area is comprised of storm drains and open drainage channels. Runoff within the watershed is conveyed to sumps through the existing drainage system.

WATERSHEDS IN THE SOUTH SACRAMENTO STREAM GROUP

- Sacramento River
- South Sacramento Drainage Canal
- Willow Slough
- Anderson Slough
- Morrison Creek
- Elder Creek

- Florin Creek
- Unionhouse Creek
- Strawberry Creek
- Laguna Creek
- Jacinto Creek
- Pocket Canal

DRAINAGE STUDIES IN THE SOUTH SACRAMENTO STREAM GROUP

- Sacramento River & Morrison Creek Letter of Map Revision – Wood Rodgers – November 2006
- Morrison Creek Letter of Map Revision – Wood Rodgers – September 2009
- South Sacramento Streams Group Letter of Map Revision – Wood Rodgers – May 2014
- 200-year South Sacramento Streams Group Floodplain Mapping – June 2014 Laguna Creek 200-year and 500-year Floodplain Mapping – June 2016
- Basin 22 Master Plan – November 2003
- Delta Shores Drainage Study
- Basin 23 Master Plan – September 2000
- Basin 25 Master Plan – February 2007
- Basin 26 Master Plan – September 2000
- Basin 35 Master Plan – November 2004
- Basin 54 Master Plan – April 2008
- Basin 108 Master Plan – November 2003
- Basin 67 Master Plan – April 1998
- Basin 68 Master Plan – April 1998
- Basin 69 Master Plan – April 1998
- Basin 115 Master Plan – July 2006
- Basin 139 Master Plan – April 1998
- Basin G252 Master Plan - March 2000
- Basins G269 South Master Plan – November 1996
- Basins G273 Master Plan – November 1996
- Basin 147 Master Plan – December 2019

CENTRAL SACRAMENTO

The Central Sacramento contains 4 internal drainage basins. The existing drainage system serving this area is comprised of storm drains and open drainage channels. Runoff within the watershed is conveyed to sumps through the existing drainage system.

WATERSHEDS IN CENTRAL SACRAMENTO

- American River
- Sacramento River

DRAINAGE STUDIES IN CENTRAL SACRAMENTO

- Basin 52 Master Plan – 2017
- Railyards Development Drainage Study

COMBINED SEWER SYSTEM

The City of Sacramento owns and operates a combined sewer system (CSS) that conveys residential and commercial wastewater and storm water runoff from approximately 11.7 square miles in downtown Sacramento, East Sacramento, Oak Park, and the Land Park area. There are 5.8 square miles of separated areas of the City north, east, and south of the CSS that contribute sanitary flows to the CSS. The CSS serves approximately 205,000 people. The CSS includes four key facilities to manage the collected flow: Sumps 1/1A, Sumps 2/2A, Pioneer Reservoir, and the Combined Wastewater Treatment Plant (CWTP). Sumps 1/1A and 2/2A pump up to 60 million gallons per day (mgd) of flows to the Sacramento Regional County Sanitation District's Regional Wastewater Treatment Plant (SRWTP). Pioneer Reservoir and CWTP provide additional storage and, when needed, primary treatment, and disinfection of combined sewage prior to discharge to the Sacramento River.

WATERSHEDS IN THE COMBINED SYSTEM

- American River
- Sacramento River

DRAINAGE STUDIES IN THE COMBINED SYSTEM

- Combined Sewer System Improvement Plan – July 1995
- Combined Sewer System Improvement Plan Update Report - December 2015

NATOMAS BASIN (COUNTY OF SACRAMENTO)

Located in the northwestern corner of Sacramento County is Natomas Basin Reclamation District 1000. 53,548 acres includes areas of Sutter County, the City of Sacramento, and Unincorporated Sacramento County. 26,449 acres of this reclamation district area is in Sacramento County. Sacramento Area Flood Control Agency with the State of California and the Corps of Engineers is constructing a massive levee improvement project to bring the levees protecting the basin up to FEMA standards and 200-year level of protection (0.5% annual recurrence). The US Army Corps of Engineers lifted their previous certification of this levee system and FEMA remapped the area as an AE flood zone effective December 8, 2008. Building permits will no longer be issued after that date awaiting reaccreditation of the levees and revised

flood insurance rate maps. In 2014, SAFCA, the City of Sacramento and the County requested FEMA remap the Natomas Basin into the Zone A99 floodplain citing the progress made to improve the levees and in securing federal authorization for the project. In 2015, FEMA remapped the entire basin into the Zone A99 floodplain and reincorporated the underlying Zone A floodplain that existed before the remap in 2008. In 2016, the City of Sacramento and Sutter and Sacramento counties contracted to have West Yost study and determine the 100-year and 200-year internal floodplain elevations in the Natomas Basin. The key source of floodwater within the Natomas Basin occurs when the river system spills over a low-hardened section of the northeast levee during very large storms events. Internal drainage canals and pumps to the river system are operated by Reclamation District 1000. Developments are conditioned to attenuate discharge flows to predevelopment levels in areas where Reclamation District 1000 (RD1000) pumps are not being improved.

There is industrial development in the unincorporated county in the Natomas area all draining to reclamation district channels and pump plants. The unincorporated portion of the Natomas area is 87.5% agricultural and 5% developed and 7.5% developing. The 2,000 acre Metro Air Park is currently under development and attenuates its peak flow discharge to the RD1000 channels and pumps. The 6,000 acre North Precinct Plan area is currently under design and will include internal levees and control peak discharge to the RD1000 channel and pumps.

This is the very bottom of the 2100 square mile American River watershed and nearly the bottom of the 27,000 square mile Sacramento River watershed so discharge from RD1000 would not exacerbate peak flow in the river.

NATOMAS BASIN (CITY OF SACRAMENTO)

Southern portions of the Natomas Basin are located in the City of Sacramento. As mentioned above, the Natomas interior drainage canals drain the Natomas Basin. Developments in the area are conditioned to attenuate discharge flows to predevelopment levels using a 2016 unified model. The unified model is maintained by RD1000. The portion of the Natomas Basin that is within the City of Sacramento is mostly built out. Currently, development is underway in the Panhandle and Greenbriar.

Within the City of Sacramento, Drainage Master Plans (internal drainage) have been prepared for the entire area of Natomas located north of I-80 and west of Natomas East Main Drainage Canal. This area was, until recently, a "greenfield" area, served only by natural, primitive, rural, and agricultural drainage systems. The master-planned drainage systems for this area have been installed, and continue to be installed, concurrent with, or just ahead of, urban development.

WATERSHEDS IN THE NATOMAS BASIN (CITY OF SACRAMENTO)

- Sacramento River
- Natomas East Main Drainage Canal (NEMDC, a.k.a. Steelhead Creek)
- East Canal
- West Canal
- Main Canal
- San Juan Ditch
- Bannon Creek

Reclamation District 1000 is preparing an internal drainage study to demonstrate the residual floodplain after the levee system is certified. This study began in 2021.

DRAINAGE STUDIES IN THE NATOMAS BASIN (CITY OF SACRAMENTO)

- 200-year Natomas Basin Interior Drainage Study - May 12, 2016
- Basin 11 Master Plan - December 1997
- Basin 12 Master Plan – March 1999
- Basin 13 Master Plan - August 2001
- Basin 14 Master Plan – August 1997
- Basin 15 Master Plan – December 1997
- Basin 16 Master Plan – December 1997
- Basin 17A and 17B Master Plan – June 1997
- Basin 18 Master Plan - June 1997
- Basin 19 Master Plan - December 1997
- Basin 20 Master Plan – November 1993
- Basin 61 Master Plan – August 2001
- Basin 62 Master Plan – January 2004
- Basin 64 Master Plan – September 2006
- Basin G206 Master Plan – December 1999
- Basin G207 Master Plan – April 2006
- Basin G208 Master Plan – July 1999
- Basin 129 Master Plan -January 2021

SOUTH COUNTY AGRICULTURAL AREA

The Southeastern part of the County is primarily zoned large lot agricultural with a population of 23,509 at an average density of 39 people per square miles. This area is controlled as agricultural land by the County General Plan. The FEMA special flood hazard designation encumbers 31% of the land in this area. The FEMA flood insurance studies and California Department of Water Resources advisory floodplain study suffice to protect the modest amount of expected construction in this area.

Within this area is a proposed specific plan named Cordova Hills. This specific plan area mainly drains to Coyote Creek and Deer Creek. Impacts to these two creeks are being identified through master planning and FEMA mapping.

Cosumnes River is a wild and scenic river with agricultural levees and no flood control. The floodplain assumes levee breaches and is quite wide. The zoning within the floodplain area is large lot agricultural.

Beach Stone Lake floodplain is caused by Laguna and Morrison Creek watershed, Cosumnes River and backwater from the Delta. This expansive floodplain area is zoned large lot agricultural.

The Delta area is protected by levees that were first built during the Gold Rush era and have been subsequently improved by various state and federal programs. The Delta is an integral feature in the state water project providing water to the greater central and southern California agricultural and urban areas. The state and federal governments are working on long term solutions to problems in the delta concerning flood control, habitat, water quality and water supply. The communities of Walnut Grove, Locke, Courtland, Hood, and Freeport in the unincorporated county and incorporated City of Isleton lie in areas of flood risk should there be levee failure on various Delta islands. Internal drainage is managed by Reclamation Districts who are also charged with maintenance of the levee systems. There about 86,000 acres in the FEMA floodplain in the Delta due to levee that are not accredited of which about 35,000 acres were added to the SFHA due to de-accreditation as mapped by FEMA in 2012. With the exception of the towns listed above, the Delta is large lot agricultural zoning.

DRAINAGE STUDIES FOR SOUTH COUNTY AGRICULTURAL AREAS

Upper Cosumnes River Flood Mapping Study - Hydrologic and hydraulic modeling was performed in 2008 by Civil Engineering Solutions, Inc. to update and revise the existing Zone A of the Flood Insurance Rate Map. The total study reach is approximately 9.8 miles from the upstream side of Dillard Road Bridge to approximately one mile upstream of Michigan Bar Road Bridge. FEMA incorporated the revised flood data into a physical map revision effective July 19, 2018.

Dry Creek Watershed Update Plan - This drainage study was prepared by Civil Solutions in April 2011.

Easton Drainage Master Plan - Alder Creek and Buffalo Creek Sheds - 1,400 acre Specific Plan located in Rancho Cordova between Sunrise Blvd, Jackson Road, and Grantline Road was prepared by McKay & Somps in March 2010. A detailed drainage study for the Glenborough/Easton Development was approved for environmental review in 2013, additional analysis is needed before the project can proceed to design.

Cordova Hills Drainage Master Plan - 2,668 acre Specific Plan area is located between Grant Line Road and Scott/Stonehouse Road and south of White Rock Road. The study was prepared by McKay & Somps in March 2011 and is being updated pending comment from Sacramento County.

LIMITED LAND USE AREAS (COUNTY OF SACRAMENTO)

There are large areas of the County that are excluded from the Watershed Management Plan and CRS Activity 450 because of their land use and lack of impact to urban and urbanizing watersheds. Natomas is surrounded by levees and all of the stormwater is pumped from the basin to the river. The south county agricultural areas are zoned large lot agriculture and there is an extremely small level of proposed development.

ORIGINATING OUTSIDE SACRAMENTO COUNTY

The three counties with watersheds draining into Sacramento County are Placer, El Dorado, and Amador counties.

PLACER COUNTY

Dry Creek is the main creek entering Sacramento County from Placer County. It is a master planned creek described later in this report in Zone 11C Drainage Master Plans, and Watershed Agreements. The upper portions of the NEMDC and tributaries drain from Placer County. They are also described in Zone 11C.

EL DORADO COUNTY

Most of the area draining into Sacramento County from El Dorado County is undeveloped. Within that, however, is El Dorado Hills, an 18-square mile residential/commercial master planned community that was developed periodically between 1962 and recent years. It drains into Carson Creek, a tributary to Deer Creek, which feeds into the Cosumnes River and has had negligible impact on Sacramento County. This area is included in the South County Agricultural Area.

AMADOR COUNTY

About 11 square miles of undeveloped (agricultural) watershed drains either directly into, or to Arkansas Creek and then into, the Cosumnes River. This area is included in the South County Agricultural Area.

WETLANDS AND NATURAL AREAS

All grading projects of more than 5-acres in size must obtain a Clean Water Act Section 401 Certification from the State. All work in or near waters of the State and water of the U.S. must obtain permits from Fish and Game and/or Corps of Engineers.

It is noted in the City of Sacramento General Plan that grasslands throughout much of Sacramento historically supported vernal pools and seasonal wetlands. However, much of this habitat has been lost with development. The largest remaining concentration of vernal pool and seasonal wetland habitat is in North Sacramento and Natomas, though significant areas also occur in the Airport-Meadowview and south Sacramento areas and in undeveloped areas.

Vernal pools are ephemeral wetlands that form in shallow depressions underlain by a substrate near the surface that restricts the percolation of water. These depressions fill with rainwater during the fall and winter and can remain inundated until spring or early summer, sometimes filling and emptying numerous times during the rainy season. A flowering community, dominated by characteristic wetland plants, differentiates vernal pools from other seasonal wetlands. Vernal pool plant species likely to occur within the area include the winged water-starwort (Callitriche marginata), annual hairgrass (Deschampsia danthonioides), horned downingia (Downingia ornatissima), coyote thistle (Eryngium vaseyi), bractless hedge-hyssop (Gratiola ebracteata), slender popcorn flower (Plagiobothrys stipitatus), spine-fruit butter-cup (Ranunculus bonariensis), and purslane speedwell (Veronica peregrina).

COUNTY OF SACRAMENTO WETLANDS AND NATURAL AREAS

Careful consideration of endangered species and their habitat is an integral part of all projects in the County. Further, the County General Plan addresses open space under the Conservation Element September 26, 2017 and as later amended. The County Planning Department addresses open space during public outreach and the preferred land use is incorporated in the DMP.

Biological Protection Programs

Many development project applications are evaluated by the Planning and Environmental Review section for impacts to species or habitat protected under the California Environmental Quality Act (CEQA). When such impacts are assessed on a project, project proponents are required to preserve a specified acreage of land possessing equal or better habitat values to mitigate for those impacts. The County provides alternatives for achieving habitat mitigation through the following programs. Click on the links for more information.

Swainson's Hawk Impact Mitigation Program. When Swainson's hawk habitat is impacted as the result of proposed development projects, project approval is conditioned on preservation of land to mitigate for those impacts. The County developed a program that allows projects with less than 40 acres of impact to instead pay into a fund to purchase mitigation land or easements. This alternative is

more reasonable for projects with smaller impacts.
https://planning.saccounty.net/EnvironmentalDocuments/Pages/SwainsonsHawkOrdinance.aspx

South Sacramento Habitat Conservation Plan (in progress). Final SSHCP chapters and appendices were released for public review on May 11, 2018. The County of Sacramento and our partners (City of Rancho Cordova, City of Galt, Sacramento County Water Agency, Sacramento Regional County Sanitation District, and the Capital Southeast Connector JPA) are currently engaged in a collaborative effort with state and federal regulatory agencies to complete the South Sacramento Habitat Conservation Plan. For more information please visit the South Sacramento Habitat Conservation Plan website at http://www.southsachcp.com/.

[ref. Biological Protection Programs (saccounty.net)]

South Sacramento County

PROJECT SUMMARY

Sacramento County led local efforts to adopt the South Sacramento Habitat Conservation Plan (SSHCP or Plan). The SSHCP encompasses a 317,000 acre area in south Sacramento County and streamlines federal and state permitting for development and infrastructure projects while conserving habitat. An interconnected regional preserve system of over 36,000 acres – roughly 1.2 times the total size of San Francisco - will be created over the next 50 years to protect twenty-eight plant and wildlife species and their natural habitats. The Plan is the first in the nation to include Clean Water Act (CWA) permits issued by the Army Corps of Engineers (USACE) and Endangered Species Act (ESA) permits issued by the U.S. Fish and Wildlife Service (USFWS). Instead of permitting through several separate state and federal agencies, most actions in the Plan area can be permitted through the County Office of Planning and Environmental Review.

The Plan Area is located in the southern portion of Sacramento County. It is divided into two components: inside and outside the Urban Development Area (UDA). All proposed urbanization and some preserves will occur inside the UDA. Most preservation will occur outside of the UDA and help to protect agricultural lands as well as habitat.

SSHCP Covered Activities may be carried out by the Permittee Agencies or by Third Party Project Proponents. The Conservation Strategy and process for Covered Activity project authorization is described in the SSHCP and associated permits. In all cases, language in the permit(s) prevail when different than the SSHCP. The Plan will be made consistent with the permit conditions and language.

The County of Sacramento, newly-formed South Sacramento Conservation Agency, and our partners are currently engaged in a collaborative effort with state and federal regulatory agencies to implement the South Sacramento Habitat Conservation Plan. For more information please visit the South Sacramento Habitat Conservation Plan website at http://www.southsachcp.com/.

[ref. South Sacramento Habitat Conservation Plan (saccounty.net)]

CITY OF SACRAMENTO WETLANDS AND NATURAL AREAS

The City has two land use zones, which are used to preserve open space. The first is Open Space, which means land and water essentially without improvements and used for public recreation, enjoyment or scenic beauty, conservation or use of natural resources, production of food or fiber, light and air or an environmental amenity. The second is the American River Parkway- Flood zone (ARP-F), which is an open space zone, which constitutes a designated floodway likely to be inundated by a flood having a one percent per annum chance of occurrence or greater. The ARP-F zone is intended to protect the natural features of property within the floodplain of the American River to prevent erosion and siltation and to preserve valuable open space in accordance with the provisions of the general plan.

MITIGATION ACTIVITIES

The mitigation activities outlined in this plan focus on future peak flows and volumes so that they do not increase over present values. The region deploys different forms of mitigation, but the mitigation tool is regulatory standard. Each community has adopted and enforces standards to insure future development will not impact current 10-year, 100-year, and 200-year peak flows.

Additionally, the management of the Sacramento region's watershed is heavily directed by regulatory standards that pertain to its major flood control systems. These systems are governed by project partnership agreements, the Urban Level of Flood Protection Plan, Executive Order 13690 and the Federal Flood Risk Management Standard, and eventually the American River Common Features General Reevaluation Report. These standards are designed to reduce the impacts of future flood events and preserve current levels of flood protection. Because of these regulations, the region's desired level of protection for its flood control systems is a minimum of 200-year level of protection or protection from 0.5 percent annual chance flood event.

Below is a detailed description of the mitigation activities that are currently in place in the Sacramento region.

STORMWATER AND WATERSHED MANAGEMENT

Regional Stormwater and Watersheds Management Standards

- The *Sacramento City/County Drainage Manual*, Volume 2: Hydrology Standards, 2006 [www.saccounty.net -search: volume 2 hydrology standards]

The *Sacramento City/County Drainage Manual*, Volume 2: Hydrology Standards, was developed jointly by the Sacramento County Water Resources Division and the City of Sacramento Department of Utilities Division of Engineering Services. This volume presents the accepted methods for estimating surface water runoff peak flows and volumes for the analysis and design of drainage facilities in the City and County of Sacramento.

- Stormwater Quality Design Manual, 2018 [www.saccounty.net -search: stormwater quality design. https://www.beriverfriendly.net/newdevelopment/stormwaterqualitydesignmanual/
  The *Stormwater Quality Design Manual for the Sacramento Region* outlines planning tools and requirements to reduce urban runoff pollution to the maximum extent practicable from new development and redevelopment projects.

COUNTY OF SACRAMENTO MANAGEMENT STANDARDS

- Improvement Standards, 2018 [www.saccounty.net -search: improvement standards] https://engineering.saccounty.net/Pages/ImprovementStandards.aspx
- Floodplain Management Ordinance, 2017, County Zoning Code [www.saccounty.net -search: floodplain management ordinance] https://waterresources.saccounty.net/Pages/County-Codes-and-Ordinances.aspx
- County of Sacramento General Plan, 2011, and the California Central Valley Flood Protection Criteria were added to the Safety Element in 2017.
- Sacramento County Code, latest codes and supplements [www.saccounty.net -search: county code]
- Local Floodplain Management Plan, is in the Local Hazard Mitigation Plan [www.saccounty.net -search: hazard mitigation plan]
- Title 1 and 2 of the Sacramento County Water Agency Code 2004 and the Zone 11 Fee Plan, 2015 [www.saccounty.net -search: zone 11]

CITY OF SACRAMENTO MANAGEMENT STANDARDS

- City of Sacramento Design and Procedures Manual and Improvement Standards, 2018
- Onsite Design Manual, 2020
- Floodplain Management Regulations, City Code Chapter 15 Buildings and Construction, 2017
- Comprehensive Flood Management Plan, 2016
- City of Sacramento General Plan, 2035

COMMUNITY RATING SYSTEM ACTIVITIES

SACRAMENTO COUNTY CRS ACTIVITY 450 – PREREQUISITE

One of the prerequisites to be a Class 4 CRS community or higher is that the community manage runoff from all storms up to and including the 100-year storm (Activity 211.c(b)(ii)). Drainage planning in the County is directed by General Plan Policies, the County Zoning Code including the Floodplain Management Ordinance, and Improvement Standards. Together, these requirements ensure development is protected from flood damage and increased runoff is appropriately mitigated. Additionally, hydrology standards have been adopted by the County for use in drainage planning and design.

Stormwater and Floodplain Management Planning has been County policy since March 9, 1993 with Board of Supervisors adoption of floodplain management policies, and subsequently incorporated into the County's General Plan, adopted December 15, 1993, and amended November 9, 2011. These policies are intended to minimize the loss of life, injury, and property damage due to flood hazards and to strengthen regional flood protection and flood preparedness.

http://www.per.saccounty.net/PlansandProjectsIn-Progress/Pages/GeneralPlan.aspx

The following is clipped from the Safety Element of the County General Plan:

[ref. S A F E T Y E L E M E N T (saccounty.net)]

Historically, Sacramento County was much more vulnerable to riverine flooding before the extensive system of dams, levees, overflow weirs, drainage pumping plants, and flood control bypass channels were constructed on the American and Sacramento Rivers and their tributary creeks and drainages. Due to existing infrastructure as well as ongoing maintenance and improvements, Sacramento County is reasonably safe from catastrophic flooding. In fact, the County is ranked among the nation's best on the FEMA Community Rating System (CRS). In 2017, the County was raised from a Class 3 to a Class 2, becoming one of only six Class 2 communities nationwide. Participation in this program, as well as its rise from Class 9 rating in 1992 to Class 2 in 2017, shows that flood protection and floodplain management is very important to the leadership of the County. Nevertheless, the County has flood emergency plans in case of local or regional flooding. There are some areas of the County which may still experience localized flooding. In areas of localized flooding, the risk is reduced by more stringent development standards pursuant to the County Floodplain Management Ordinance. While the probability of catastrophic flooding may be small, the damage potential is high. Sacramento Area Flood Control Agency continues to work diligently to make further improvements to the river flood control systems. Projects that are anticipated to be completed within the planning horizon of this General Plan will continue the County's efforts toward more effective flood protection. These projects include the

raising of Folsom Dam and its dikes, spillway improvements to Folsom Dam, and improvements to various levee systems within the County. The ultimate goal is to improve flood protection along the American River to the California Department of Water Resources' 200-year flood protection standard. (Updated 2016)

Policies in this section address flood avoidance and emergency response, interagency coordination, location and design of public facilities, location and design of new development, floodplain fill, levee protection and the requirements of drainage plans. The policies required by Senate Bill-5 (Machado, 2007) on floodplain management are found in the Conservation Element, the Safety Element and the Safety Element Background document. Conservation Element policies CO-30 & CO-105a stress the importance of preserving natural drainage. Safety Element policies SA6a-c and SA-37 emphasize the importance of interagency coordination for maintenance of facilities and for emergency response. Policies SA-18a and b require levee setbacks that will allow regular maintenance or emergency repair. A key requirement of Senate Bill-5 is addressed in SA-22a which differentiates between flood-protection standards for project sites that are subject to the Urban Level of Flood Protection (ULOP) requiring 200-year flood protection, and project sites that are subject to the 100-year FEMA flood standard. (Added 2016)

The text and policies of this General Plan use the following definitions for classifying and managing areas subject to flooding. (Added 2016)

The Safety Element Background document contains data required by Senate Bill-5 primarily in the form of mapped data. (Added 2016) Any development located within the Central Valley Flood Protection Board's jurisdiction is required to apply for a permit from the CVFPB per the California Code of Regulations, Title 23 Waters, Division 1, Article 3, Section 6. Their authority extends over (a) the levee section, (b) the waterward area between project levees, (c) a 10-foot-wide strip adjacent to the landward levee toe, (d) within 30 feet of the top of the banks of unleveed project channels, (e) within Designated Floodways adopted by the CVFPB, and (f) activities outside of these limits which could adversely affect the flood control projects. (Added 2011)

Additional floodplain information may be obtained by contacting the Sacramento County Department of Water Resources. The Sacramento County Floodplain Management Ordinance contains additional information regarding safety and development in or near designated floodplains. Historical data on flooding, including locally prepared maps of areas that are subject to flooding, areas that are vulnerable to flooding after wildfires, and sites that have been repeatedly damaged by flooding is available in the Safety Element Background document and the Sacramento County Local Hazard Mitigation Plan. (Added 2011)

SA-5 A comprehensive drainage plan for major planning efforts shall be prepared for streams and their tributaries prior to any development within the 100-year floodplain and/or the 200-year floodplain in areas subject to the Urban Level of Flood Protection, defined by full watershed development without channel modifications. The plan shall:

a. Determine the elevation of the future 100-year flood and/or the 200-year flood in areas subject to the Urban Level of Flood Protection, associated with planned and full development of the watershed;
b. Determine the boundaries of the future 100-year floodplain and/or the 200-year floodplain in areas subject to the Urban Level of Flood Protection, for both flood elevations (planned and full development) based on minimum 2-foot contour intervals;
c. Assess the feasibility of gravity drainage into the existing flowline of the stream;
d. Assess the feasibility of alternative means of drainage into the stream;
e. Identify potential locations for sedimentation ponds and other stormwater treatment facilities;
f. Determine practical channel improvements and/or detention basins to provide the flood control needs of the proposed development;
g. Determine the location and extent of marsh, vernal pool and riparian habitat;
h. Develop measures for protecting and mitigating natural habitat;
i. Develop measures for protecting and mitigating for federal and state listed endangered species;
j. Develop and ensure implementation of measures that would reduce vector larvae;
k. Identify appropriate plant species to be included as part of the natural features of the comprehensive drainage plan. (Modified 2016)

SA-6. The County will coordinate with the City of Sacramento, the Army Corps of Engineers, the Sacramento Area Flood Control Agency, and other Federal, State and local governments and agencies to develop a plan to finance, develop and construct flood control project improvements to reduce flooding potential in Sacramento County. The construction of flood control projects along the Sacramento and American Rivers and the immediate connection of local streams to these rivers shall be included in these projects. Such projects should provide 200-year flood protection.

SA-6a. The County will continue to coordinate with parties responsible for flood management facilities and structures (e.g., pump stations, levees, canals, channels, and dams) to provide proper maintenance and/or improvements. (Added 2016)

SA-6b. The County will continue to coordinate with relevant organizations and agencies (e.g., Federal Emergency Management Agency (FEMA) and State of California Department of Water Resources (CADWR)) when updating floodplain mapping, flood management plans, local hazard mitigation plans, and other emergency response plans to consider the impacts of urbanization and climate change on long-term flood safety and flood event probabilities. (Added 2016) SA-6c. The County will continue to coordinate with local, regional, state, and federal agencies to maintain an adequate flood management information base, prepare risk assessments, and identify strategies to mitigate flooding impacts. (Added 2016)

SA-7. In accordance with the County Floodplain Management Ordinance, the County shall locate, when feasible, new essential public facilities outside of flood hazard zones1 , including hospitals and health care facilities, emergency shelters, fire stations, emergency command centers, and emergency communications facilities; or identify construction methods or other methods to minimize damage if these facilities are located in flood hazard zones.

SA-8. Maintain the structural and operational integrity of essential public facilities during flooding.

SA-9. New and modified bridge structures should minimize any increase in water surface elevations of the 100-year floodplain, or the 200-year floodplain in areas subject to the Urban Level of Flood Protection. (Modified 2016)

SA-10. Fill within the 100-year floodplain of creeks outside of the Urban Service Boundary is permissible to accommodate structures (e.g., residential, commercial, accessory) and septic systems, and only when the Board of Supervisors finds that the fill will not impede water flows or storm runoff capacity. Such development shall not cause an increase in base flood elevation of the 100-year floodplain exceeding 0.10 feet, unless analysis clearly indicated that the physical and/or economic use of adjacent property within the floodplain will not be adversely affected. A permit is required if the fill is within the jurisdiction of the Central Valley Flood Protection Board.

SA-11. The County shall implement the improvement of natural drainage channels and certain floodplains for urbanized or urbanizing portions of the County to reduce local flooding. Such improvements shall comply with the General Plan policies contained in the Conservation Element, Urban Streams, and Channel Modification Section.

SA-12. The County shall continue local efforts that encourage implementation of the Federal Flood Insurance Program.

SA-13. Where new upstream development in Sacramento County will increase or potentially impact runoff onto parcels downstream in a neighboring jurisdiction, such as the City of Sacramento, Sacramento County will coordinate with the appropriate neighboring jurisdiction to mitigate such impacts.

SA-14. The County shall require, when deemed to be physically or ecologically necessary, all new urban development and redevelopment projects to incorporate runoff control measures to minimize peak flows of runoff and/or assist in financing or otherwise implementing Comprehensive Drainage Plans.

SA-15. The County shall regulate, through zoning and other ordinances, land use and development in all areas subject to potential flooding and prohibit urban uses on unprotected flood land.

SA-16. Deny creation of parcels that do not have buildable areas outside the 100-year floodplain, or the 200-year floodplain in areas subject to the Urban Level of Flood Protection, unless otherwise allowed in the Floodplain Management Ordinance. (Modified 2016)

SA-17. For residential zoning, the area outside the 100-year floodplain, or the 200-year floodplain in areas subject to the Urban Level of Flood Protection, must be contiguous or reasonably situated to provide buildable area for a residence and associated structures. Examples of structures include swimming pools, sheds, barns, detached garages, and other outbuildings that are normally associated with residential development. There may be exceptions (such as the Delta area) as allowed in the Floodplain Management Ordinance. (Modified 2016)

SA-18. Vehicular access to the buildable area of newly created parcels must be at or above the 10-year flood elevation. Exceptions may be made when the existing public street from which access is obtained is below the 10-year flood elevation. There may be exceptions (such as the Delta area) as allowed in the Floodplain Management Ordinance.

SA-18a. Provide unobstructed access to levees on county-owned lands, whenever practicable, for maintenance and emergencies. Require setbacks and easements to provide access to levees from private property. (Added 2016)

SA-18b. Urban flood control levees should have adequate setbacks consistent with local, regional, State, and federal design and management standards. (Added 2016)

SA-19. Creation of lots that require watercourse crossings for single lots, or that will likely encourage watercourse crossings to be built by property owners (lots with useable area on both sides of a watercourse) will not be allowed unless a detailed hydraulic study is approved by Water Resources and there is found to be no adverse impact in accordance with the County Floodplain Management Ordinance

SA-20. Levees for the purpose of floodplain reclamation for development shall be strongly discouraged. Floodplain restoration shall be encouraged to provide flood protection and enhancement and protection of a riparian ecosystem.

SA-21. If levee construction is approved to reclaim floodplain for new development, 200- year flood protection is required.

SA-22. Areas within a 100-year floodplain, or within the 200-year floodplain in areas subject to the Urban Level of Flood Protection, shall not be up-zoned to a more intensive use unless and until a Master Drainage Plan is prepared that identifies areas of the floodplain that may be developed. (Modified 2016)

SA-22a. Sacramento County will evaluate development projects and all new construction located within a defined Flood Hazard Zone (FHZ) to determine whether the 200-year Urban Level of Flood Protection or 100-year FEMA flood protection applies, and whether the proposed development or new construction is consistent with that standard. Prior to approval of development projects or new construction subject to either standard, the appropriate authority must make specific finding(s) related to the following:

a. Urban Level of Flood Protection standard (200-year) applies to projects in a Flood Hazard Zone that meet certain criteria, developed by the State of California Department of Water Resources, related to urbanization, watershed size and potential flood depth.

b. Federal Emergency Management Agency (FEMA) standard of protection (100- year) applies to projects in a Special Flood Hazard Area that are not subject to the Urban Level of Flood Protection. (Added 2016)

SA-22b. New development shall be elevated as required by the applicable flood standards (100-year, or 200-year in areas subject to the Urban Level of Flood Protection) and should be constructed to be resistant to flood damage consistent with the Floodplain Management Ordinance. (Added 2016)

From the Agricultural Element of the County's General Plan (Amended December 17, 2019)

AG-29. The County shall minimize flood risks to agricultural lands resulting from new urban developments by:

- Requiring that such developments incorporate adequate runoff control structures and/or
- Assisting implementing comprehensive drainage management plans to mitigate increased risks of farmland flooding resulting from such developments.

Implementation Measure:
A. Require as a condition for project approval that developments in newly urbanizing areas of the County either:

- Incorporate runoff control measures adequate to contain the additional runoff from a 24-hour storm event with a 100-year recurrence interval that the project site would generate after it is developed, relative to the runoff from such a storm generated by the site before development, or
- Conform to applicable standard conditions implementing comprehensive flood management plans.

Floodplain Management Ordinance Requirements:

The current Sacramento County Floodplain Management Ordinance is dated 2017, found online at www.StormReady.org (search floodplain management ordinance).

906-06 (H) No new construction or substantial improvements or development may occur without the approval of the Floodplain Administrator and without demonstrating that the cumulative effect of the proposed development when combined with all other existing and anticipated development will not have adverse impacts to downstream, upstream, or adjacent properties, and the FEMA mapping requirements of section 905-08 are met.

Improvement Standards requirements:

http://www.engineering.saccounty.net/Pages/ImprovementStandards.aspx

9-1.G- All new structures shall be protected from the 100-year (1-%) flood event. Certified pad elevations shall be set at least one and two tenths foot (1.2') above all sources of 100-year flooding.

9-1.H- The design of a new storm drain system shall include consideration of the downstream creek or storm drain. The consulting engineer shall show that the existing storm water system can convey the proposed drainage without adverse flooding, erosion or other water quality impacts to upstream, downstream or adjacent facilities or areas; or that such facilities or areas are being improved or protected to the point where the drainage can be conveyed without adverse impacts.

SacCalc is freeware developed by the Sacramento County Department of Water Resources and is available by searching SacCalc at www.saccodwr.org. SacCalc is a Windows platform for the Sacramento hydrology preprocessor and is used with Army Corps of Engineers HEC-1 program to analyze the 100-year storm. Hydraulics is calculated using Army Corps of Engineers HEC-RAS, UNET, or other appropriate software. There is no limitation on how large or small the project is nor where it is located within a drainage shed area. All projects must account for their impacts and mitigate as appropriate.

COUNTY CRS ACTIVITY 450- CREDIT CRITERIA

Another prerequisites to be a Class 4 CRS community or higher is to obtain 90 points (before the impact adjustment map) for meeting all the credit criteria for the Watershed Management Plan activity.

- Analyze and mitigate up to and including 100-yr event -
  Sacramento County requires analysis of pipe flow using the Nolte curves established in mid 1960s. This equates to about 2-5 year return frequency though the 100-year runoff for every development project to ensure no adverse impact. Open channel flow typically requires analysis of the 10-year and 100-year. New development on virgin streams typically requires a broader analysis to ensure no adverse impact to hydro-fluvial-geomorphology (erosion, deposition and habitat value)
- Management future peak flow and volumes –
  Sacramento County does not necessarily require peak flow detention at the end of every storm drain pipe. Flood control is better achieved as a larger master plan often including side channel detention with a weir that spills water when necessary. End of pipe basins are often used for stormwater quality and hydro-modification mitigation (first flush storm through 10 year storm events).
- Manage runoff from all storms up to and including 25 year event -
  Sacramento County requires management of runoff from the first flush storm through the 100-yr storm. This is true for a small in-fill project or a large master plan community.
- Projects identify and avoid or mitigate existing wetlands and other natural open spaces -

The first place a developer will go upon conceiving their proposed project, with their consultant's wetland report in hand, is the US Army Corps of Engineers for consultation.

- Setback development from existing natural streams and minimize impact to those natural functions- The County learned long ago not to crowd the natural streams. Newer developments leave ample room for the stream
- Channel improvement projects should use natural or "soft" approaches
  Early development of Sacramento County used concrete lining of urban streams. The County drainage staff realizes that the maintenance of such facilities is problematic water undermines an edge or corner of a concrete panel tossing it into the channel. The newer approach is to leave the channel natural or to improve it so that it is 'more natural' as is the case on Elder Creek in the North Vineyard Station community.

This Watershed Management Plan is updated in coordination with the Local Hazard Mitigation Plan, in a collaborative manner with the cities in Sacramento County.

Sacramento County Water Agency Zone 11 Trunk Drainage Fee Program

Sacramento County and the Cities of Elk Grove, Rancho Cordova and Citrus Heights are located within Zone 11 of the Sacramento County Water Agency Zone 11 programs. Zone 11 is subdivided by regional watershed areas 11A (draining to Morrison Creek / Beach Stone Lakes), 11B (draining to American River), and 11C (draining to Dry Creek / Natomas East Main Drainage Canal). The Zone 11 drainage impact fees pay for the installation and improvement of trunk drainage systems. The Sacramento County Water Agency is a separate subdivision of the state enveloping the cities of Citrus Heights, Rancho Cordova, and Elk Grove.

The Stormwater Utility was established in 1995 over an area of the Water Agency known as Zone 12. This program funds drainage maintenance and capital improvements in the urban areas of unincorporated Sacramento County and the cities of Citrus Heights, Rancho Cordova, and Elk Grove.

Activity 450 of the Community Rating System calls for certain prerequisites listed and responded to below:

a. *"The community must have adopted a watershed management master plan for one or more of the watersheds that drain into the community, and the plan must identify the natural drainage system and constructed channels."*

Sacramento County has adopted the following Drainage Master Plans (DMP) associated with watersheds, or particular development projects. The Zone 11 and watershed is indicated in parenthesis:

- Vineyard Springs Comprehensive Plan (Zone 11A, upper Laguna Creek and upper Gerber Creek)

- North Vineyard Station Specific Plan (Zone 11A, Elder and Gerber Creeks)
- Florin Vineyard Gap Community Plan (Zone 11A, Morrison, Florin, Elder, Gerber, Unionhouse)
- Dry Creek Watershed Flood Control Plan (Zone 11C, Rio Linda)
- Strawberry/Jacinto Creek Drainage Master Plan (Zone 11A)
- Lower Laguna Creek Drainage Master Plan (Zone 11A)
- Whitehouse Creek Drainage Study (Zone 11A)
- Robla/Magpie Creeks Drainage Study (Zone 11C)
- Chicken Ranch Slough (Zone 11B)
- Strong Ranch Slough/Sierra Branch Drainage Study (Zone 11B)
- Natomas East Main Drain (NEMDC) Tributaries (Zone 11C)
- West Galt Drainage Study
- East Elk Grove (Zone 11A, Laguna Creek and Elk Grove Creek)
- East Franklin Drainage Master Plan (Zone 11A, Beach-Stone Lakes)
- Metro Air Park Master Drainage Study (Natomas Basin)
- Easton / Glenborough Specific Plan (Alder Creek)
- Sunridge Specific Plan (the upper reaches of Morrison and Laguna Creeks), part of the Sunrise-Douglas Comprehensive Plan (Zone 11A)
- Elverta Specific Plan Drainage Master Plan (Zone 11C, NEMDC tributaries)
- Arcade Creek Map Revision (Zone 11B)
- Cordova Hills Specific Plan Drainage Study (Deer Creek)
- Mather South Specific Plan Drainage Study (Zone 11A, Morrison Creek)
- Newbridge Specific Plan Drainage Study (Zone 11A, Morrison Creek, Laguna Creek)
- Jackson Township Specific Plan Drainage Report (Zone 11A, Morrison Creek, Elder Creek and Laguna Creek)
- West Jackson Highway Specific Plan Area Master Drainage Plan (Zone 11A, Morrison Creek)
- Natomas North Precinct Master Drainage Plan (Natomas Basin)

COOPERATION BETWEEN AGENCIES

Additional watershed management plans are being planned and will be coordinated by the Sacramento Area Flood Control Agency (SAFCA) to regulate drainage through State and Federal flood control projects. SAFCA will assist in the development of watershed management plans associated with SAFCA sponsored flood control projects along Arcade Creek, Dry Creek (North), and the Morrison Creek Stream Group.

a. The following drainage master plans have been adopted (with the County as one of the local agencies) in projects with the US Army Corps of Engineers, the cities and Sacramento Area Flood Control Agency:
   - South Sacramento County Steams Flood Control
   - North Sacramento County Streams Accreditation
   - American River Common Features
   - Natomas Levee Improvement Project
   - Arcade Creek Flood Insurance Study

b. *"The community must have adopted regulatory standards that are based on the plan and receive credit under SMR in Section 452.a"*

Each DMP must be consistent with Sacramento County General Plan Policies and Improvement Standards, and 1996 Hydrology Standards. The countywide policies are described in the document and further described in the Multi-Hazard Mitigation Plan. Drainage analysis is required for every project. Each DMP is incorporated in the Environmental Impact Report and the subsequent Mitigation and Monitoring Report Program (MMRP). The MMRP gives mitigation (e.g. construct channel improvements consistent with DMP) and timelines (e.g. prior to building Permits) and entity responsible for overseeing implementation (e.g. improvement plans shall be consistent with DMP and shall be approved by Sacramento County Department of Water Resources). The implementation of the DMP and MMRP becomes a condition of approval of the project.

c. *"The plan's regulatory standards manage future peak flows so that they do not increase over present values."*

Sacramento County has constructed many detention basins and is in the process of developing many more.

New development must show that any impacts are mitigated prior to the Sacramento County Board of Supervisors adoption of an EIR for the development to proceed. Each creek or watershed is unique, and is analyzed accordingly. Depending on the location in the watershed, the state of existing drainage facilities and/or existing residences, and downstream hydraulic conditions, the mitigation measures for impacts of development could range from no increase in flows (and/or volumes) for the 2- through 500-year event, or no measures at all. If management of peak flows runoff was not necessary, then the comprehensive drainage master plan established that existing structures and/or storm drain systems were not affected by the increase in peak flow. Typically however, DMP's result in detention that provides no increase in peak flows for the 10-year (because it could impact existing storm drain outfalls) and 100-year (because it could affect residential finish-floor elevations). This usually results in mitigation of the 10- through 100-year events.

d. *"The plan's regulatory standards require management of runoff from all storms up to and including the 25-year event."*

Watershed areas that have already been urbanized must abide by the County stormwater permit issued by the state Water Board. Policies are being developed regarding low impact development and hydro-modification measures that will protect stream systems by controlling discharges from developed areas to pre-development flow rates up to the 10-year event. Development will be required to incorporate follow the process and standards described in the Sacramento Stormwater Quality Partnership Hydromodification Management Plan in order to implement the hydromodification management in accordance with the stormwater permit.

For developing areas, depending on the location in the watershed, the state of existing drainage facilities and/or existing residences, and downstream hydraulic conditions, the mitigation measures for impacts of development could range from no increase in flows (and/or volumes) for the 2- through 500-year event or no measures at all. Typically, however, drainage master plans (DMP) result in detention that provides no increase in peak flows for the 10-year (because it could impact existing storm drain outfalls) and 100-year (because it could affect residential finish-floor elevations). This usually results in mitigation of the 10- through 100-year events.

COUNTY WATERSHED MASTER PLAN (WMP)

The CRS credit criteria for Activity 450 and County policies and standards require certain analyses in planning for new development. Activities defining this watershed management plan are listed and responded to below:

a. Up to and including 100-yr event (Activity 452.b (1) credit criteria.

All drainage master plans and drainage studies in the County consider storms from return frequencies ranging up to the 1% annual probability storm (100-year event) and include mitigation for more frequent events as required. The 10-year water surface elevation or hydraulic grade line are required to evaluate a development project's compliance with improvement standards. Additionally, some studies are required to demonstrate a project is protected from the 200-year storm event.

b. Management of future peak flows and volumes (Activity 452.b (1) credit criteria).

All drainage master plans must consider future condition hydraulic impacts and projects in the watershed must take appropriate mitigation actions. General Plan Policy SA-14 requires projects to incorporate

runoff measures to reduce flooding. Project impacts and mitigation measures are included in the environmental document and projects are appropriately conditioned during the entitlement process.

Managing peak flow and water surface elevation upstream and downstream, through a range of model storms include the 100-year, are the typical measure of flood mitigation. Volume is controlled when necessary for mitigation under the California Environmental Quality Act. Examples when volume mitigation is important is a system that drains to a pond due to pumping or a hydraulic constraint. There may be environmental concerns to mitigate volume even to the extent of summertime irrigation runoff depending on the habitat needs of the receiving waters.

c. The plan manages runoff from all storms up to and including the 25-year event (Activity 452.b (4) credit criteria).

The Sacramento County's Hydrology Standards are available online at www.saccodwr.org. Drainage master plans must consider effect of design storms ranging in duration from 6-hour to 10-day and frequency from 2-year to 500-year. The critical duration is defined for each project and used for the design of the channel and/or detention basin.

The 10-day hydrograph is used for modeling volume impacts while the 1-day hydrograph is used for peak flow.

d. Plan identifies existing wetlands and/or other natural open space to be preserved from development to provide natural attenuation, retention, or detention of runoff.

Projects involving the discharge of fill material into the waters of the United States and wetlands must obtain a Clean Water Act Section 401 certificate from the state. All work in or near waters of the state and waters of the US must obtain permits from Fish and Game and/or the Corps of Engineers. Careful consideration of endangered species and their habitat is an integral part of all projects in the county. Further, the County General Plan addresses open space under the conservation element. The County Planning Department addresses open space during public outreach and the preferred land use is incorporated in the DMP.

There are approved Habitat Conservation Plans for Natomas and South Sacramento County and several wetland preserve areas.

e. Prohibiting development, alteration, or modification of existing natural channels.

Natural Stream are to be protected and wherever practical restored to natural stream functions. Stream courses provide necessary drainage for stormwater runoff, open space, aesthetic value, public linear

recreation, and natural beneficial ecological functions. In the early days of land development in Sacramento County, some streams (sloughs) were concrete lined. This was later deemed inappropriate and the County determined to protect the remaining natural streams.

The Natural Streams Combining Zoning District, as shown on the Comprehensive Zoning Plan, is used to regulate building permits and land development to protect and preserve the natural character and amenities of the designated streams. The Natural Streams are listed in Chapter 4, Section 4.5 of the Sacramento County Zoning Code, as follows:

- Arcade Creek from Fair Oaks Blvd to Greenback Lane
- Arcade Creek South Branch from Fair Oaks Blvd to 1100 feet east of Kenneth Avenue
- Brooktree Creek from the confluence with Arcade Creek to Auburn Blvd
- Carmichael Creek from Ancil Hoffman Park to Walnut Road
- Chicken Ranch Slough from Cottage Way to 350 feet west of Garfield Avenue
- Coyle Creek from 400 feet south of the confluence with Brooktree Creek to Madison Avenue*
- Cripple Creek from Kenneth Avenue to 400 feet north of Central Avenue
- Kohler Creek from the confluence with Arcade Creek to Madison Avenue
- Linda Creek length within Sacramento County (Orangevale)
- Minnesota Creek from the American River to 550 feet north of Olive Street
- Strong Ranch Slough from Arden Way to 800 feet east of Walnut Avenue
- Verde Cruz Creek from its confluence with Arcade Creek to 1800 feet west of Dewey Drive

*Note - Any of the listed reaches that are in land use authority of an incorporated city will not be subject to these regulations but will be bound by regulations of that city.

f. Requiring that channel improvement projects use natural or "soft" approaches.

Land Use Adjacent to Creeks and Streams

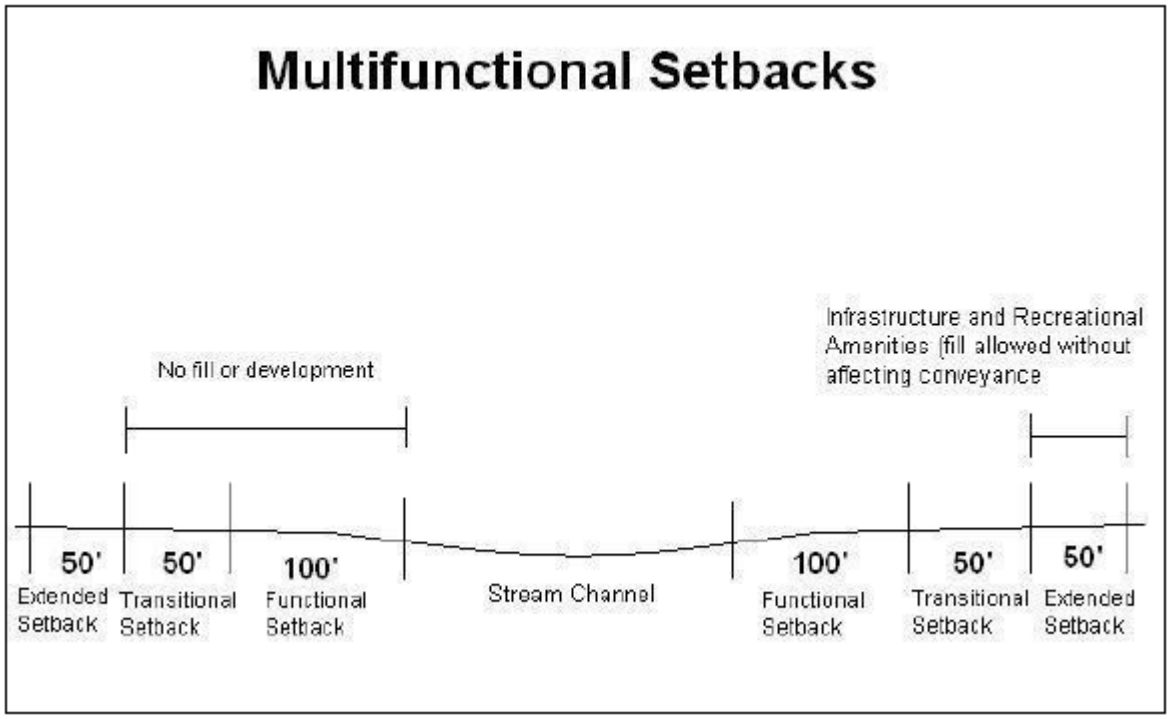
Pursuant to the guidance of the Conservation Element of the Sacramento County General Plan, land development adjacent to creeks and streams are to be consistent with natural values. Natural creeks and streams have many beneficial functions and serve to convey flood water safely when properly preserved. Natural meander should be allowed and the natural function of the floodplain shall be managed in a matter that respects both the value of habitat and flood conveyance. Preserving existing natural streams; examples being Arcade Creek, Dry Creek, and Laguna Creek, has proven to be a sustainable approach. On occasion, improving natural creek channels; examples being Elder Creek and Gerber Creek, can add long term riparian habitat value and function while minimizing annual maintenance cost. Design and maintenance of creeks and stream should (with reference Conservation Element in the Zoning Code):

- Include consideration of low flow needed to maintain summertime habitat (CO-109)

- Be analyzed using a range of Manning's 'n' values, up to an appropriately high value, thereby allowing for the maturing of beneficial vegetation (CO-110)
- Be considerate of wetland and riparian habitat value and where possible retain or recreate the natural channel with the historical ecological integrity of the stream (CO-111)
- Not line natural streams with concrete and impervious materials (CO-112)
- Encourage revegetation with natural native plant species appropriate to natural substrate conditions and avoid introduction of nonindigenous species (CO-113)
- Be done in a manner that protects or enhances the function as flood control, water quality improvement, habitat, and public interface including education opportunities where appropriate (CO-114)
- Provide urban buffer or setback of 50' to 100' (or more) from the top of the channel bank to encourage and protect riparian habitat functions (CO-115)

Figure 1 from the Conservation Element CO-115 describes typical buffer areas, to allow beneficial and natural function with drainage and flood control, when land development is proposed adjacent to a natural stream.

FIGURE 1: POLICY CO-115



g. If the watershed plan was prepared in coordination or as a part of the floodplain management plan credited in Activity 510.

All of the DMP's are consistent with the Local Hazard Mitigation Plan and County Standards.

Freeboard for New Buildings in B, C, D, and X Zones (FRX) - regulations that require the applicant provide positive drainage away from the building site

The county improvement standards and floodplain management ordinance require, in addition to FEMA flood studies that all new structures be protected from the 1% annual recurrence storm with at least 18 inches of freeboard. This requirement is found in the Improvement Standards Section 9-15, Section 10-4 and Section 10-5. It is also seen in the floodplain management ordinance that a local flood hazard is treated the same as a FEMA special flood hazard area.

(State Mandated) California's adoption of the IBC and the IRC which require positive drainage away from the foundation.
Legal basis: California Health and Safety Code, Sections 18901 and 18949, administered by the California Building Standards Commission. Positive drainage requirement is within Section 1804.4 Site Grading of the California Building Code.

Erosion and Sedimentation Control Regulations (ESC) - minimize erosion from land disturbed due to construction or farming.

(State Mandated) Requirement that construction projects of greater than 1 acre require erosion and sediment control measures.
Legal basis: 2009-0009-DWQ Construction general permit:
https://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.html

Water Quality Regulations (WQ) - regulations that improve the quality of stormwater runoff.

(State Mandated) Participation in the State NPDES Program.
Legal basis: California Regional Water Quality Control Board MS4 permit, Order No. R5-2008-0142 (NPDES No. CAS082597)

CITY OF SACRAMENTO CRS ACTIVITY 450 – PREREQUISITE

The City of Sacramento is not part of the Sacramento County Water Agency, but the City and County have a long-standing cooperative understanding on stormwater mitigation. The City of Sacramento responds to the CRS perquisites as follows:

a. "The community must have adopted a watershed master plan for one or more of the watersheds that drain into the community, and the plan must identify the natural drainage system and constructed channels."

The City has Drainage Master Plans for many of its watersheds for localized flooding, natural drainage system and constructed channels, and development driven studies.

b. "The community must have adopted regulatory standards for new construction in the watershed based on the plan that are based on the plan and receive credit under SMR in Section 452.a."

The City has adopted regulatory standards for new construction which are in alignment with this plan.

> *13.08.145 Mitigation of drainage impacts; design and procedures manual for water, sanitary sewer, storm drainage, and water quality facilities.*
>
> *A. When property that contributes drainage to the storm drain system or combined sewer system is improved or developed, all stormwater and surface runoff drainage impacts resulting from the improvement or development shall be fully mitigated to ensure that the improvement or development does not affect the function of the storm drain system or combined sewer system, and that there is no increase in flooding or in water surface elevation that adversely affects individuals, streets, structures, infrastructure, or property.*

The City's Design & Procedures Manual also requires that developments within the City of Sacramento shall be provided with storm drainage facilities that will, at minimum, provide 100-year protection to structures and 10-year protection to streets.

c. "The plan's regulatory standards manage future peak flows so that they do not increase over present values."

Our Drainage Master Plans identify a "preferred plan" that is usually the least-cost alternative that provides the required level of performance to mitigate peak flows and volumes. By virtue of being on the downstream half of local stream systems, the City can control the release of water with the City's pump stations and drainage basins without increasing peak flows in the receiving streams.

The City of Sacramento has also emphasized the value of detention basins in solving flooding problems. The primary purposes of a detention basin are to mitigate flooding, to lessen the impact of peak flows on existing or proposed infrastructure (pump stations, channels and pipelines) and to improve water quality. Detention basins are also effective because they lessen the impact on receiving streams, they provide the best opportunity to obtain mandated water quality benefits, and they provide a variety of secondary use benefits.

d. "The plan's regulatory standards require management of runoff from all storms up to and including the 25-year event."

The City's separated? Drainage system consists of 94 sumps and pumps, 140 drainage basins, many miles of improved channels and a vast network of pipes and drainage inlets that control runoff. Detention basins have been constructed in Sacramento since 1955. Ten were built before 1985. In the last 14 years, 50 more detention basins have been constructed and there are plans to build many more to help eliminate flooding. The City's Master Planning Program requires performance standards include eliminating street flooding during a 10-year storm and to prevent property damage and public safety hazards for a 100-year storm.

e. "Any plan that is more than five years old, the community must evaluate the plan to ensure that it remains applicable to current conditions."

The WMP will be evaluated and revised every five years along with the County-wide Multi-Hazard Mitigation Plan (Section 510).

CITY OF SACRAMENTO WATERSHED MASTER PLAN (WMP)

The City of Sacramento requires certain analyses in planning for new development. Activities defining this watershed management plan are listed and responded to below:

a. Up to and including the 100-year event (Activity 452.b (1) credit criteria).

The City's Master Planning Program has performance standards that include eliminating street flooding during a 10-year storm and preventing property damage and public safety hazards for a 100-year storm. Where applicable by State of California standards, many areas of the city are required to meet the 200-year storm.

b. Management of future peak flows and volumes (Activity 452.b (1) credit criteria).

The City's Master Planning Program - requires performance standards that include eliminating street flooding during a 10-year storm and preventing property damage and public safety hazards for a 100-year storm for future development. By virtue of the City being on the downstream end of local stream systems, the peak flows and volumes can be controlled by the City's pump stations and detention basins in the receiving stream.

In addition, the City's Floodplain Ordinance (Section 15.104.040) states that, "proposed construction or development shall not result in any increase in flood levels during the occurrence of the base flood". Development driven Drainage Master Plans must consider existing and future hydraulic impacts. New

projects in the watershed must appropriately mitigate these impacts. Development project impacts and and required mitigation measures are included in environmental documents and conditioned during the entitlement process.

c. The plan manages runoff from all storms up to and including the 25-year event (Activity 452.b (4) credit criteria).

The City's Design and Procedure Manual requires development to manage runoff for up to a 100-year storm. Specific performance criteria differentiates between greenfield development and infill development, but all development is required to manage runoff for up to a100-year storm.

Non-leveed channels shall, at a minimum, be designed to convey the 100-year, 10-day storm event while providing one foot of freeboard. Leveed channels shall, at a minimum, be designed to convey the 200-year, 10-day storm with 3 feet of freeboard.

d. Plan identifies existing wetlands and/or other natural open space to be preserved from development to provide natural attenuation, retention, or detention of runoff.

All grading projects of more than 5-acres size must obtain a Clean Water Act Section 401 Certification from the State. All work in or near waters of the State and water of the U.S. must obtain permits from Fish and Game and/or Corps of Engineers.

The City has two land use zones, which are used to preserve open space. The first is Open Space, which means land and water essentially without improvements and used for public recreation, enjoyment or scenic beauty, conservation or use of natural resources, production of food or fiber, light and air or an environmental amenity. The second is the American River Parkway- Flood zone (ARP-F), which is an open space zone, which constitutes a designated floodway likely to be inundated by a flood having a one percent per annum chance of occurrence or greater. The ARP-F zone is intended to protect the natural features of property within the floodplain of the American River to prevent erosion and siltation and to preserve valuable open space in accordance with the provisions of the general plan.

e. Plan was prepared in coordination with or as part of the community's floodplain management plan credited under Activity 510.

This Plan was prepared in coordination as an appendix with the County Local Hazard Mitigation Plan.

DESIGN STANDARDS AND REVIEW – COUNTY OF SACRAMENTO

Piped storm drain systems are designed to convey the County design flow which approximates the peak run off from a 5-year storm event. The larger less frequent storm events exceed the pipe capacities and travel through streets and overland from the upper shed areas to the receiving creek. Water is typically allowed to pond in streets up to 30-minutes (+/-) until the storm subsides. Development designers must analyze the 100-year, 1% annual recurrence, storm event and assure that ponding and overland flow is safely managed and that freeboard is adequate for each new structure. The impact downstream and adjacent to the proposed development must also be analyzed and mitigated.

Large development plan areas, known as specific plans and community plans, must prepare a detailed drainage study often including channel improvements and peak flow detention basins. Computer modeling is done for a watershed downstream to a point of confluence and/or hydraulic constraint. By doing so, the peak flow and volume as well as routing and storm centering are correctly analyzed using dynamic modeling tools.

New levees to reclaim floodplain are discouraged and whenever such are proposed they must be constructed to at least a 200-year (0.5% annual recurrence) level of protection in areas subject to State Urban Level of Protection criteria, and meet FEMA certification standards (44CFR65.10).

All discretionary applications are routed to Water Resources for comments and conditions. The County has a computer system that tags all parcels with known flood hazards and all building permits for those parcels are routed to Water Resources for review and approval.

From the safety element of the General Plan:

- SA-14. The County shall require, when deemed to be physically or ecologically necessary, all new urban development and redevelopment projects to incorporate runoff control measures to minimize peak flows of runoff and/or assist in financing or otherwise implementing Comprehensive Drainage Plans.

Improvement Standards require:

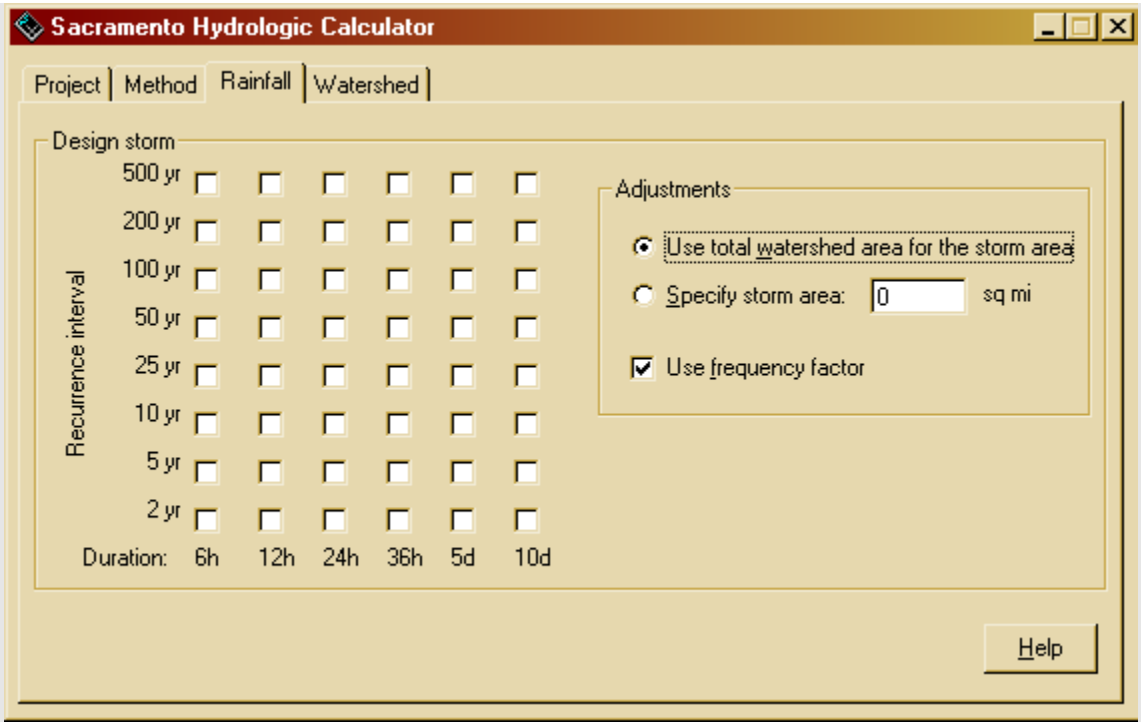
- 9-1G All new structures shall be protected from the 100-year (1-%) flood event.
  9-1H The design of a new storm drain system shall include consideration of the downstream creek or storm drain. The consulting engineer shall show that the existing storm water system can convey the proposed drainage without adverse flooding, erosion or other water quality impacts to upstream, downstream or adjacent facilities or areas; or that such facilities or areas are being improved or protected to the point where the drainage can be conveyed without adverse impacts.

HYDROLOGY STANDARDS

Sacramento County developed hydrology standards that were adopted in 1996 and have been approved for FEMA map revisions. These standards include regional rainfall tables of depth-duration-frequency; design storms of various durations, infiltration rates based on land use and soil type, and employ the unit hydrograph theory. Hydrology is modeled using the SacCalc Sacramento Calculator and hydraulics is modeled using tools from the US Army Corps of Engineers Hydraulic Engineering Center (HEC) or proprietary tools like XPSWIMM and Mike- 11.

Hydrology modeling includes a range of storms from 6-hours to 10-days, from 50% annual recurrence to 1% annual recurrence. Small watersheds tend to respond to short duration storms while larger shed areas and those with basins and convergences must consider the volume and routing characteristics of the longer duration storm event. There is also the ability to model record storm events and continuous simulation.

The County has three hydrologic rainfall zones. Sacramento County developed a hydrology calculator known as SacCalc, which is available at no cost to consulting engineers. SacCalc is a preprocessor to the US Army Corps of Engineers HEC-1 hydrology computer program. The program (freeware found at www.saccodwr.org search: SacCalc) allows modeling of a wide range of storm events, table shown below. The user may develop a hydrograph for a watershed of specified size, shape, slope, roughness, soil type and land use for a range of storms 2 year 6 hour through 500 year 10 day.



Flood control detention basins are constructed when there is need to attenuate impacts to peak flow in a watershed. Such basins are generally designed as off-line taking the peak flow off of an open channel. Stormwater quality basins are used to treat storm water pollution by maintaining a residence time at zero velocity allowing suspended solids to settle before the water is discharged, normally by gravity, to the adjacent open channel. Combined basins have a flood control volume over a permanently wet volume serving as storm water pollution prevention. Basins are designed to be aesthetic amenities for the developing community.

Urban drainage is conveyed by piped storm drain systems to the nearest open channel, creek or stream. Water quality treatment is required in accordance with the county's storm water permit from the State Regional Water Quality Control Board under Section 401 of the Clean Water Act. This is a joint permit with the cities, the County and our neighboring county of Placer as well as the City of Roseville. The group prepared a Stormwater Quality Design Manual, dated 2007. www.saccodwr.org click on Stormwater Quality.

Hydromodification and geomorphologic studies are being prepared for urbanizing watersheds to assure minimized impact to the erosion and deposition characteristics of the streambed. This is regulated by the State Regional Water Quality Control Board and the findings will be made a part of the forthcoming regional permit. It is not anticipated that mitigation for hydromodification will have an impact on the FEMA 100-year floodplain but it will likely require additional care in the design of developments including low impact development features, attenuating flows below the 10-year event.

The Sacramento County Department of Water Resources Drainage Development and Hydrology Section reviews all grading and drainage projects in the County for conformance with drainage improvement standards and the Floodplain Management Ordinance. A grading permit is required for any project that moves more than 350 cubic yards of soil. Improvement plans are required for any on-site or off-site development and for any drain pipe other than a driveway culvert. All grading plans and improvement plans are reviewed and approved by Water Resources to assure adherence to design standards. Staff also assures that new homes are constructed safely above the highest determined base flood elevation whether mapped on the FEMA Flood Insurance Rate Map or designated by County study including future condition hydrology.

COOPERATIVE TECHNICAL PARTNERSHIPS AND WATERSHED AGREEMENTS

Sacramento County has a cooperative technical partnership agreement with each of its seven cities as part of the FEMA map modernization project.

SACRAMENTO COUNTY AND PLACER COUNTY

Dry Creek conveys flows from Placer County. The Dry Creek drainage study dated 1992 was a joint effort of both the counties of Placer and Sacramento. Placer County agreed to attenuate peak flow impacts. Sacramento County agreed to pay a fair share impact fee for development in watersheds draining toward Placer County (Linda Creek and north flowing Dry Creek Tributaries such as Parkway Greens).

Placer County has prepared an update flood study for Dry Creek, Civil Engineering Solutions and RBF Consulting 2011.

The South Placer Vineyard proposed development north of the Sacramento County line drains mostly to Steelhead Creek, known also as Natomas East Main Drainage Canal, tributaries. The development is conditioned to pay the Steelhead Creek Fair Share Fee as described in the Zone 11C Engineer's Report dated 2015.

SACRAMENTO COUNTY AND CITY OF SACRAMENTO

The following watersheds flow from the County to the City: Morrison, Elder, Gerber, Florin, Unionhouse, Strawberry, Whitehouse, Laguna and Elk Grove Creeks in the south. Dry, Magpie, Robla, and Arcade Creek and the American River in the north. Natomas interior drainage canal, NEMDC, and the Sacramento River in the Natomas basin.

The South Sacramento Streams Group Project is an ongoing US Army Corps of Engineers project working in partnership with the State and the Sacramento Area Flood Control Agency as the local sponsors for the benefit of the County and City. The project included a floodwall project in the City of Sacramento on the following creeks:

- Lower Morrison
- Florin
- Elder
- Unionhouse

The South Sacramento Stream Group Project also includes channel work along the Florin and Unionhouse Creek and the construction of a flood control detention basin along Florin Creek. The County of Sacramento, the City of Sacramento, and SAFCA are coordinating on a plan to ensure these flood protection measures are not compromised by upstream development.

A drainage study was performed on Upper Morrison Creek by a consultant for Water Resources. The study focused on a reach of aggregate strip mines from the City boundary upstream to the Aspen VI/Vineyard I mining pit just upstream of Jackson Road. High flows from the channel are diverted into the Aspen VI/Vineyard pit over a weir constructed in a realigned channel. This weir controls peak flows

downstream. The study developed hydrologic (SacCalc) and hydraulic (HEC-RAS) models that are being used for planned development throughout the reach. It also ensures that design flows for the South Sacramento Streams Group flood control projects will not be exceeded. Additional analysis is being conducted in relation to the master planning for the West Jackson Highway Plan which will include a revision to the FEMA floodplain for the upper reaches of Morrison Creek.

SACRAMENTO COUNTY AND CITY OF RANCHO CORDOVA

Rancho Cordova has their own drainage and floodplain management staff. Rancho Cordova detached from the Sacramento County Water Agency Zone 11A trunk drainage impact fee program in 2020. The City of Rancho Cordova charges city residents a Rancho Cordova Stormwater Utility Fee to pay for the bulk of drainage program operation and maintenance services. Generally, Rancho Cordova is upstream of the trunk drainage in the unincorporated county.

SACRAMENTO COUNTY AND CITY OF ELK GROVE

Elk Grove has their own drainage and floodplain management staff but the City still lies within Zone 11A of the Sacramento County Water Agency and participates in the regional trunk drainage development fee program. City residents pay an Elk Grove Storm Water Utility Fee for drainage services provided by the City. All of the watersheds in the City have been master-planned. The city sits low in the county watersheds and drains to the Beach Stone Lake floodplain. Development in Zone 11A pay a Beach Stone Lake volume mitigation fee held in a trust for a future project. The Laguna West and Laguna Stonelake projects paid lump sum fees toward Beach Stone Lake Mitigation. Proposed projects for agricultural residences in the Beach Stone Lake floodplain include elevation, berms, and walls. The County Department of Water Resources pays flood insurance premiums for many homes in this floodplain from interest earned on funds held in the account.

Upstream watersheds draining into the City of Elk Grove include Strawberry Creek and Laguna Creek. Strawberry Creek is built out. Laguna Creek is master-planned and there is a flow rate at the city border that will be held as the maximum 100-year peak. This is memorialized in a FEMA Letter of Map Revision. The County is planning to utilize a large aggregate mine as a peak flow detention basin, known as Triangle Rock, to control flood flows while allowing a range of lower frequency flows to maintain aquatic habitat and geomorphologic characteristics.

COUNTY OF SACRAMENTO AND CITY OF CITRUS HEIGHTS

Citrus Heights is almost entirely built-out and is located in the upstream (northeast) portion of the natural stream watersheds. The largest infill is at Gum Ranch on South Branch Arcade Creek, which is slated for a regional detention basin. This basin will serve to attenuate peak flow immediately downstream and at the confluence with Arcade Creek.

The City of Citrus Heights is in Zone 11B and residents pay the Stormwater Utility Fee. The City's General Services Department provides over site for its drainage program, however, the bulk of City drainage services are provided by under an agreement with the County of Sacramento.

CITY OF FOLSOM

The City of Folsom is at the top of its watersheds and drains directly to the American River. Because of this there is little interaction between agencies regarding drainage and floodplain issues.

CITY OF GALT

The City of Galt is located in the middle of the rural unincorporated south County and is a pass-through for upstream rural County runoff as it drainage southwest. Deadman's Gulch and Hen Creek are the two primary watersheds serving the City. There is much cooperation between the City of Galt and the County of Sacramento Department of Water Resources associated with managing flows in these watersheds. Peak flow detention is not deemed necessary on the main branches of these streams, but there is need for detention basins to attenuate flow where there are storm drain system deficiencies. Much of the area is topographically flat and the defined drainage systems handle about a 2-year storm event.

West Galt Drainage Study

This drainage study was developed by Water Resources in 2003. It was approved for use by Sacramento County and the City of Galt. It is being used by Water Resources to condition development. The precipitation data and land use are still appropriate, as well as the hydrologic (HEC-1) and hydraulic (HEC-RAS) methods.

CITY OF ISLETON

The City of Isleton is a relatively small area of development on the rural and agricultural lands of Andrus Island. All runoff on Andrus Island drains to agricultural/ drainage ditches operated by RD545 and then

pumped to the Sacramento River. The RD545 drainage system is sized for all runoff including Isleton, and discharges to the Sacramento River are not significant.

FUTURE MITIGATION STRATEGIES

To help determine mitigation strategies for the region, an accurate and comprehensive picture of the future conditions is needed. The development of a watershed modeling project to create models for each major waterway impacting the region would provide a foundation for all stakeholders to plan for the future and not increase peak flows and volumes. Information from a unified model can be utilized to determine high priority mitigation projects and the impacts of proposed development projects.

The County, City of Sacramento, and SAFCA will work to together to development mitigation strategies that ensure future development does not increase the risk of flooding in these communities. Additional watershed management plans and agreements will be developed related to development and drainage facilities in the Dry Creek (North), Arcade Creek, and South Sacramento Stream Group (Morrison Creek) watersheds.

FUNDING

SACRAMENTO COUNTY FUNDING

Sacramento County Storm Water Utility funds maintenance and improvement of existing storm drain systems within the urban services area. This fee is billed bi-monthly on the County Utility Bill. Routine repairs and improvements are made on a continuous basis throughout the unincorporated county. Citizens are encouraged to call the drainage hotline at Call 311 (or 916-875-4311, go online at www.311.saccounty.net, or download the Sac County 311 Connect mobile app) to request immediate maintenance, improvement projects, or on-site technical assistance related to all drainage matters. The County Stormwater Utility is defined as the area known as Zone 12 of the Sacramento County Water Agency and includes the urban areas of unincorporated county and the cities of Elk Grove, Citrus Heights, and Rancho Cordova.

The Sacramento County Water Agency Zone 11 Drainage Impact Fee Program has been in existence since 1965. New storm drainage systems are generally constructed by contractors working for private

developers. Drainage fees are collected prior to improvement plan approval on a schedule rate based on percent impervious area impact to the watershed. Components of the fee include piped storm drain, open channel peak flow impact, detention volume impact, and stormwater quality. Zone 11 is divided into three sheds, 11A is the Morrison Creek and Beach Stone Lake Stream Groups, 11B is natural streams draining toward the American River, 11C is the Dry Creek and Natomas East Main Drainage Canal shed area. The fees collected are used to finance comprehensive drainage plans for urban streams.

Developers are credited and reimbursed for construction of trunk drainage facilities that are permanent and efficient systems in accordance with County standards. Trunk drainage is defined as a 30-acre water shed area or greater within a Zone of the Sacramento County Water Agency Drainage Fee Plan.

Supplemental drainage fee plans are prepared for specific plan areas where there are costs associated with trunk drainage that are not covered by Zone 11, such as environmental mitigation and channel rights-of-way.

CITY OF SACRAMENTO FUNDING

Operation, maintenance, repair and rehabilitation (OMR&R) of the City's water, sewer, drainage, and flood control facilities is the Department of Utilities' (DOU) first task. For this reason, the revenues that make up the DOU budget are first allocated to OMR&R. Any surplus may be used for new facilities, and/or improvements to existing facilities.

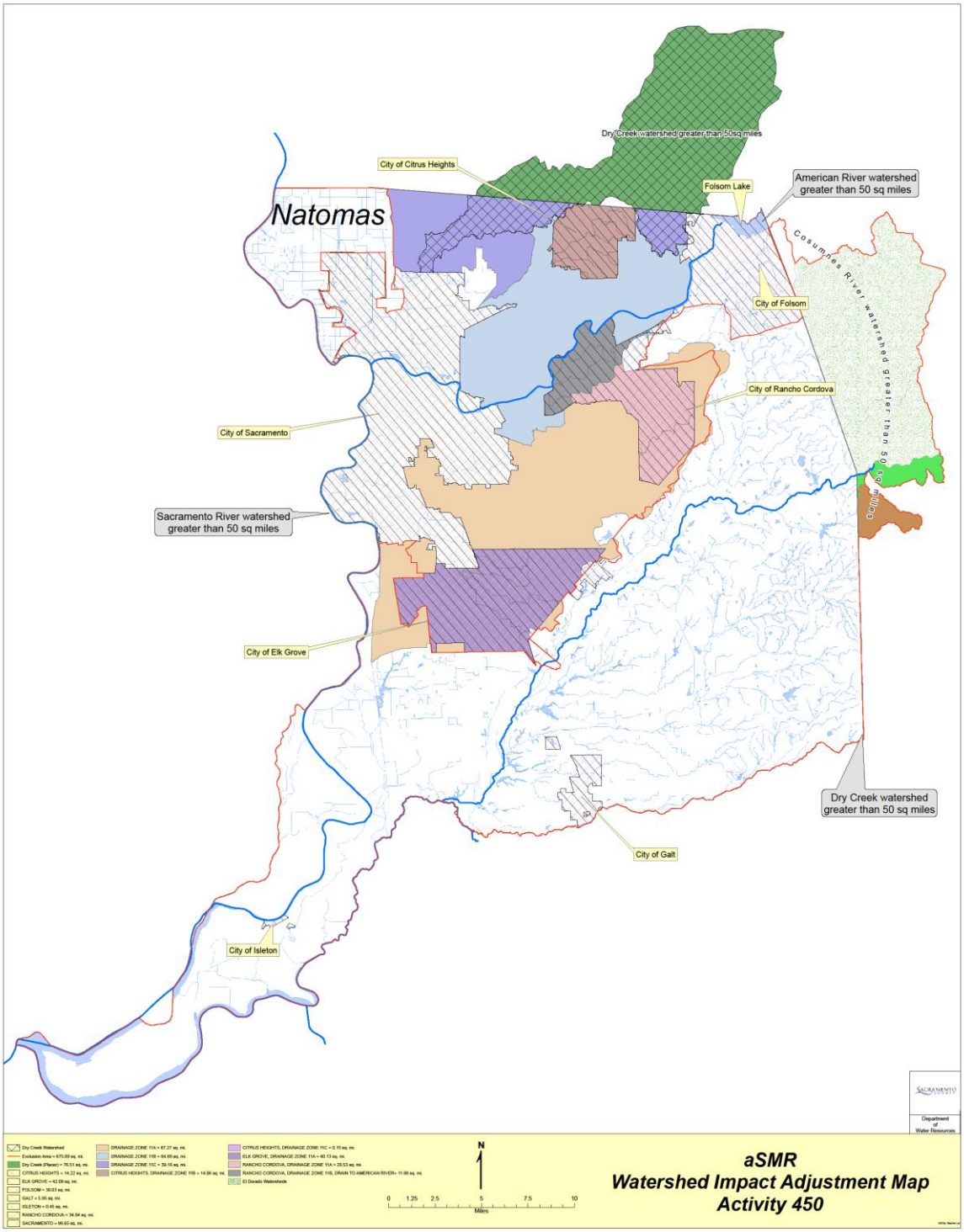
DOU has an annual budgeting process, which determines whether any funds will be available for capital improvements, and, if so, how much will be allocated to water, sewer, drainage, and flood control. DOU's drainage unit has a Drainage Master Planning process that identifies desirable drainage improvement projects, and a prioritization process, which sorts the recommended projects according to cost-effectiveness.

When the annual budget for drainage improvements is known, the drainage unit looks through the recommended drainage improvement projects, focusing on the ones that have highest priority. From this list, the decision-makers will usually set aside any projects whose estimated cost exceeds available funds, and make final selections among the remaining projects.

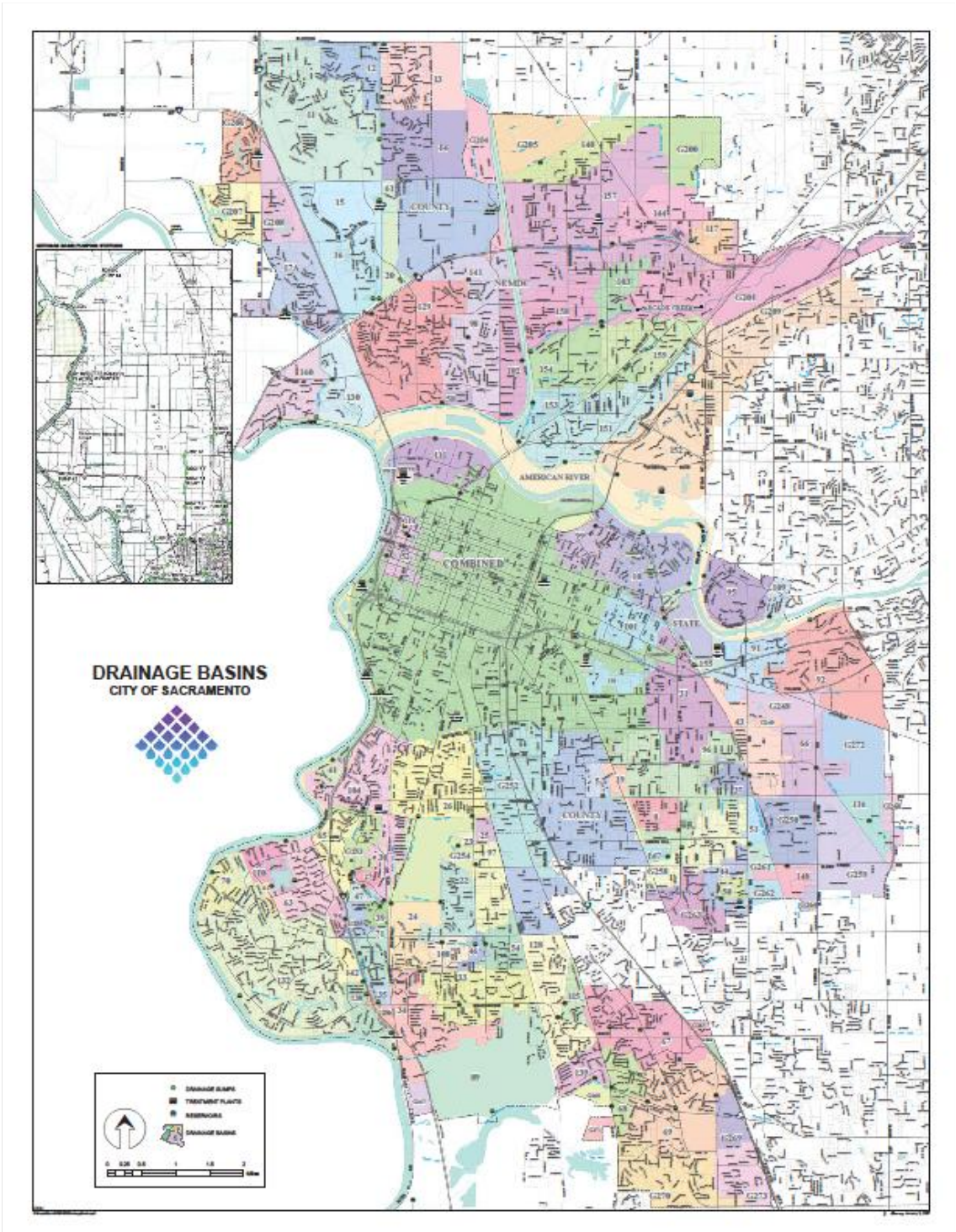
ATTACHMENTS

A. Sacramento County Stormwater Impact Adjustment Map (Activity 450 SMR)
B. City of Sacramento Map of Drainage Basins
C. Existing County of Sacramento Detention Basins

Attachment A: Sacramento County Stormwater Impact Adjustment Map (Activity 450 SMR)

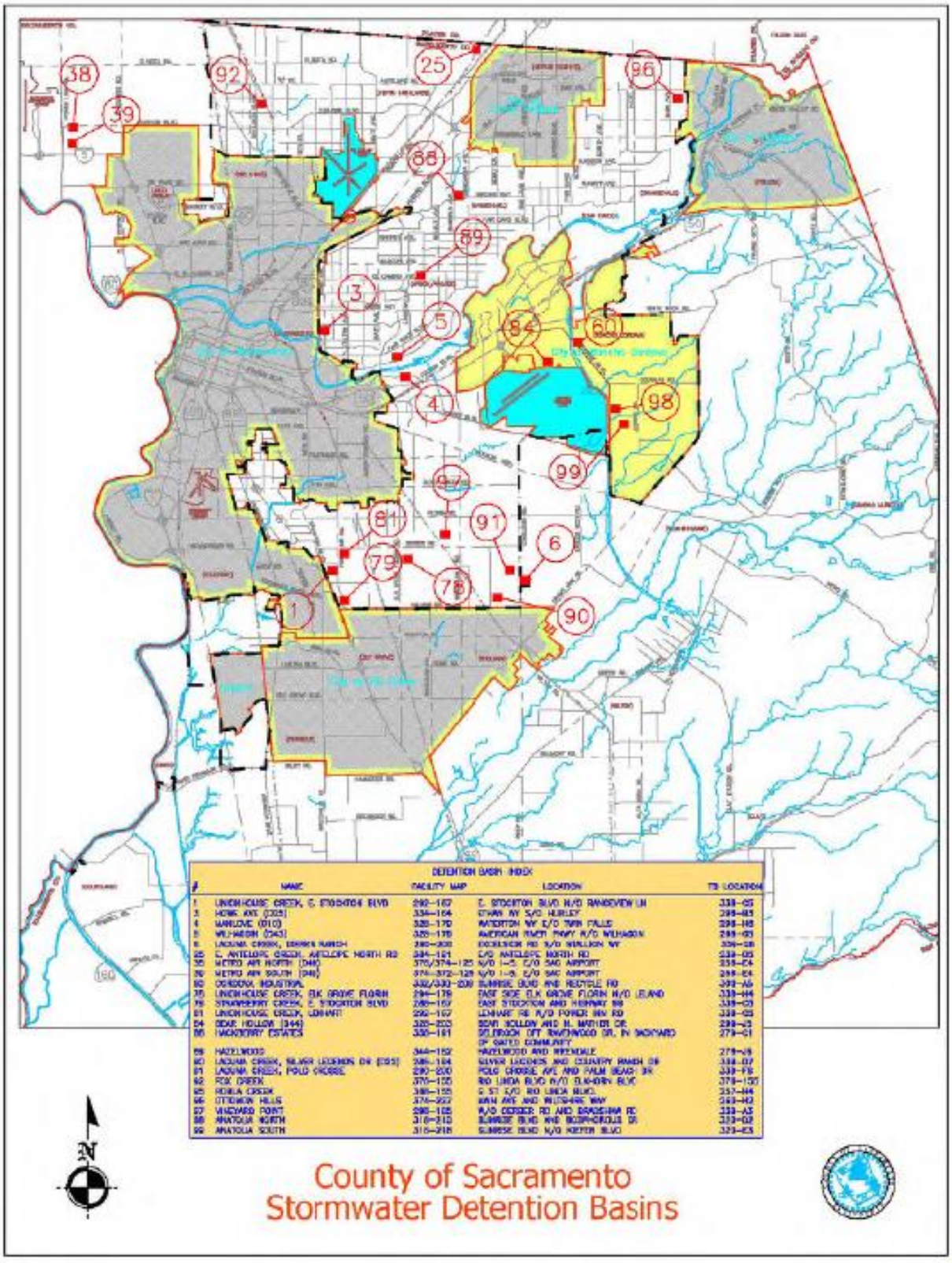


Attachment B: City of Sacramento Map of Drainage Basins



Attachment C: Sacramento County Detention Basins

DETENTION BASIN INDEX

#	NAME	FACILITY MAP	LOCATION	TB LOCATION
1	UNIONHOUSE CREEK, E. STOCKTON BLVD	292-167	E. STOCKTON BLVD N/O RANGEVIEW LN	338-C5
3	HOWE AVE (D05)	334-164	ETHAN WY S/O HURLEY	298-B3
4	MANLOVE (D10)	328-179	WATERTON WY E/O TWIN FALLS	298-H6
5	WILHAGGIN (D43)	328-179	AMERICAN RIVER PKWY W/O WILHAGGIN	298-G5
6	LAGUNA CREEK, DIERKS RANCH	290-200	EXCELSIOR RD S/O STALLION WY	339-G6
25	E. ANTELOPE CREEK, ANTELOPE NORTH RD	384-191	E/O ANTELOPE NORTH RD	239-D5
38	METRO AIR NORTH (D49)	376/374-125	N/O I-5, E/O SAC AIRPORT	256-E4
39	METRO AIR SOUTH (D49)	374-372-125	N/O I-5, E/O SAC AIRPORT	256-E4
60	CORDOVA INDUSTRIAL	332/330-209	SUNRISE BLVD AND RECYCLE RD	300-A5
78	UNIONHOUSE CREEK, ELK GROVE FLORIN	294-179	EAST SIDE ELK GROVE FLORIN N/O LELAND	338-H4
79	STRAWBERRY CREEK, E. STOCKTON BLVD	288-167	EAST STOCKTON AND HIGHWAY 99	338-C6
81	UNIONHOUSE CREEK, LENHART	292-167	LENHART RD W/O POWER INN RD	338-C5
84	BEAR HOLLOW (D44)	328-203	BEAR HOLLOW AND N. MATHER DR	298-J5
88	HACKBERRY ESTATES	358-191	DELBROOK OFF RAVENWOOD DR, IN BACKYARD OF GATED COMMUNITY	279-C1
89	HAZELWOOD	344-182	HAZELWOOD AND WRENDALE	278-J6
90	LAGUNA CREEK, SILVER LEGENDS DR (D22)	286-194	SILVER LEGENDS AND COUNTRY RANCH DR	339-D7
91	LAGUNA CREEK, POLO CROSSE	290-200	POLO CROSSE AVE AND PALM BEACH DR	339-F6
92	FOX CREEK	376-155	RIO LINDA BLVD N/O ELKHORN BLVD	376-155
95	ROBLA CREEK	368-155	G ST E/O RIO LINDA BLVD.	257-H4
96	OTTOMON HILLS	374-227	MAIN AVE AND WILTSHIRE WAY	260-H2
97	VINEYARD POINT	298-185	W/O GERBER RD AND BRADSHAW RD	339-A3
98	ANATOLIA NORTH	316-215	SUNRISE BLVD AND BOSPHOROUS DR	320-D2
99	ANATOLIA SOUTH	316-218	SUNRISE BLVD N/O KIEFER BLVD	320-E3

Detention Basin Map