

American River Flood Control District

Endorsement of CA CVFPB Permit Application – CalTrans Scour Mitigation

Staff Report

Discussion:

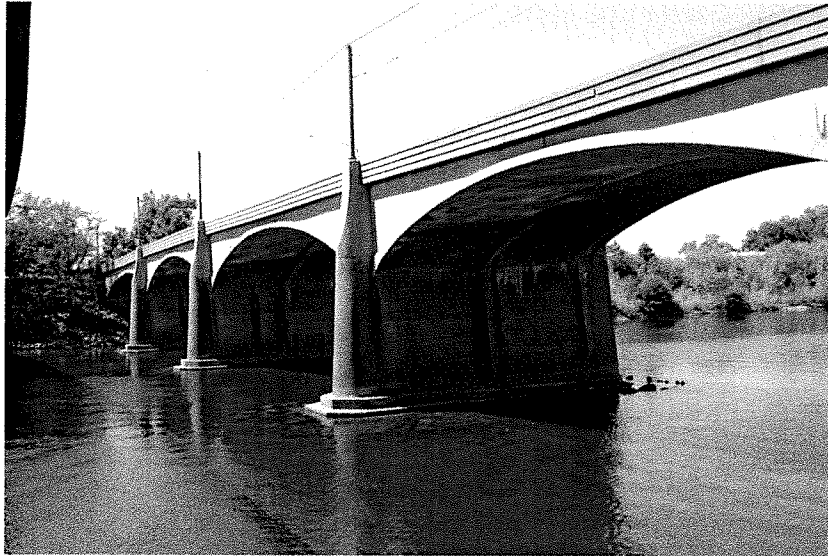
The CA Department of Transportation (CalTrans) has determined that the State Route 160 bridge crossing of the American River needs additional measures to prevent scour at the bridge piers. Scour is aggressive erosion under high flows that could undermine the footings of the bridge and cause a failure. The engineers at CalTrans initially proposed installing sheet piles into the bed of the river in a box configuration around the existing piers to protect the piers from being undermined. The proposal was revised to substitute rock revetment in place of the sheet piles because of the concern that the sheet piles would be undermined by scour. The rock revetment will be placed at a 3 to 1 slope extending out from each bridge pier in the channel.

All of the work proposed under this permit application will happen within the floodway and the levees will not be impacted. CalTrans included a hydraulic analysis of the river conditions both with and without the project. The analysis showed that hydraulic impacts from the proposed work are negligible.

Recommendation:

The General Manager recommends that the Board of Trustees endorse the permit application from CalTrans.

Central Valley Flood Protection Board (CVFPB) Encroachment Permit Application Package



For
The American River Bridge Scour Mitigation Project

Applicant
California Department of Transportation (Caltrans)

November 21, 2018

**APPLICATION FOR A CENTRAL VALLEY FLOOD PROTECTION BOARD
ENCROACHMENT PERMIT**

Application No. _____
(For Office Use Only)

1. Description of proposed work being specific to include all items that will be covered under the issued permit.

The intent of this project is to mitigate the risk of scour compromising the integrity of the American River Bridge on Highway 160 in Sacramento, California. The project will remove, and replace the existing RSP around the bridge piers. In order for the work to take place, a temporary access trestle/platform must be constructed to facilitate construction activities. See Supplemental Project Description and attached plans for more details.

2. Project

Location: American River Bridge at SR-160 County, in Section Sacramento County, Section 30

Township: 9N, Range: 5E, M. D. B. & M.

Latitude: 38.5965° Longitude: -121.4764°

Stream: American River, Levee: NA0001 Unit 04 A. River Designated Floodway: N/A

APN: State Lands Commision

3. Chris Rockey, District 03 CVFPB Liason of 703 B Street
Name of Applicant / Land Owner Address

Marysville CA 95901 (530) 741-4517
City State Zip Code Telephone Number
chris.rockey@dot.ca.gov
E-mail

4. Chris Rockey, District 03 CVFPB Liason of 703 B Street
Name of Applicant's Representative Company

Marysville CA 95901 (530) 741-4517
City State Zip Code Telephone Number
chris.rockey@dot.ca.gov
E-mail

5. Endorsement of the proposed project from the Local Maintaining Agency (LMA):

We, the Trustees of The American River Flood Control District approve this plan, subject to the following conditions:
Name of LMA

Conditions listed on back of this form Conditions Attached (see Attachment 1C) No Conditions

Trustee Date Trustee Date

Trustee Date Trustee Date

**APPLICATION FOR A CENTRAL VALLEY FLOOD PROTECTION BOARD
ENCROACHMENT PERMIT**

6. Names and addresses of adjacent property owners sharing a common boundary with the land upon which the contents of this application apply. If additional space is required, list names and addresses on back of the application form or an attached sheet.

Name	Address	Zip Code
County of Sacramento Dept. of Reg. Parks	4040 Bradshaw Road, Sacramento, CA	95827
State Lands Commission	100 Howe Avenue, Suite 100 South, Sacramento, CA	95825
Hart Enterprises, LP	1617 Kingsford Drive, Carmichael, CA	95608
Frazier Revocable Trust	27038 County Road 92F, Winters, CA	95694

7. Has an environmental determination been made of the proposed work under the California Environmental Quality Act of 1970? Yes No Pending

If yes or pending, give the name and address of the lead agency and State Clearinghouse Number:

California Department of Transportation (Caltrans)
 703 B Street
 Marysville, CA 95901
 SCH No. 2017072043

8. When is the project scheduled for construction? 07/15/2020 to 10/15/21

9. Please check exhibits accompanying this application.

- A. Regional and vicinity maps showing the location of the proposed work. (see Section 3)
- B. Drawings showing plan view(s) of the proposed work to include map scale. (see Section 5)
- C. Drawings showing the cross section dimensions and elevations (vertical datum?) of levees, berms, stream banks, flood plain,
- D. Drawings showing the profile elevations (vertical datum?) of levees, berms, flood plain, low flow, etc.
- E. A minimum of four photographs depicting the project site. (see Section 4)

Signature of Applicant

Date

Include any additional information:

This Caltrans project has two locations as seen in Attachment 3A. This application only concerns the American River Bridge on SR-160 location. A limited number of documents may refer to the other location. One such document is the Final Environmental Document provided in Section 7.

Supplemental Project Description

The Caltrans Office of Structures Maintenance and Investigations (SM&I) has determined that the American River Bridge (Bridge 24-0001L) on SR-160 is Scour Critical. This bridge crosses the American River at River Mile 1.98¹. The American River Bridge was originally built in 1915 and was widened in 1934. The bridge is approximately 695 ft. long, and features two abutments and four piers. The southern abutment is located on top of the left bank of the American River (DWR Levee Unit No. 04 American River) while the northern abutment is located within the American River Parkway. The right bank (DWR Levee Unit No. 03) is located further north and is not affected by the scope of this project. The local maintaining agency (LMA) is the American River Flood Control District (ARFCD).

Caltrans previously considered several scour mitigation alternatives. Rock Slope Protection (RSP) has been selected as the preferred alternative. The existing RSP will be removed down to the mudline, filter fabric will be placed around and on the existing piers, and new RSP will be placed around each pier. The footprint of the RSP around each pier will extend either 10'-0" or 25'-0" beyond the existing piers. Please see Structural Drawings for more detailed information. Removal and installation of new RSP is expected to be performed with an excavator and/or crane.

To place the RSP, the contractor must be able to locate his construction equipment relatively close to each pier. Two methods are being considered that may be deployed as standalone measures or in tandem. The first method is the installation of a temporary access platform (trestle). The trestle would be constructed from the north side of the channel at the bottom of an existing ramp that leads down from a mobile home park². The trestle is expected to be 30 ft. wide and extends past the southernmost pier. The trestle does not extend to the southern levee. Section of the trestle (fingers) will extend laterally from the main trestle along each side of the bridge piers. The fingers will be constructed in the same manner as the main trestle and would also be 30 ft. wide. Temporary steel piles will be driven to support the trestle and will be driven to 30 ft. below the mudline. It is anticipated that the temporary trestle piles will be stabbed into the channel bottom with a vibratory hammer followed by an impact hammer.

The second access method being considered is by floating barge. The use of floating barges would be subject to factors such as channel flow, depth, and vertical clearances under other downstream bridges. The use of barges would be at the contractor's option to provide maximum flexibility and efficiency with regards to methods of construction.

The amount of work involved in installing the RSP may require more than one construction season³. If that happens, the trestle can be removed during non-construction months.

¹ Rivermile was determined from the DWR Levee Mile Calculator at <http://ferix.water.ca.gov/webapp/LeveeMile/>. See Attachment 1-B.

² Riverdale Resort, 1501 Northgate Blvd, Sacramento CA 95815.

³ Per the project Final Environmental Document, the in-water construction season will be from July 15th to October 15th of each year.

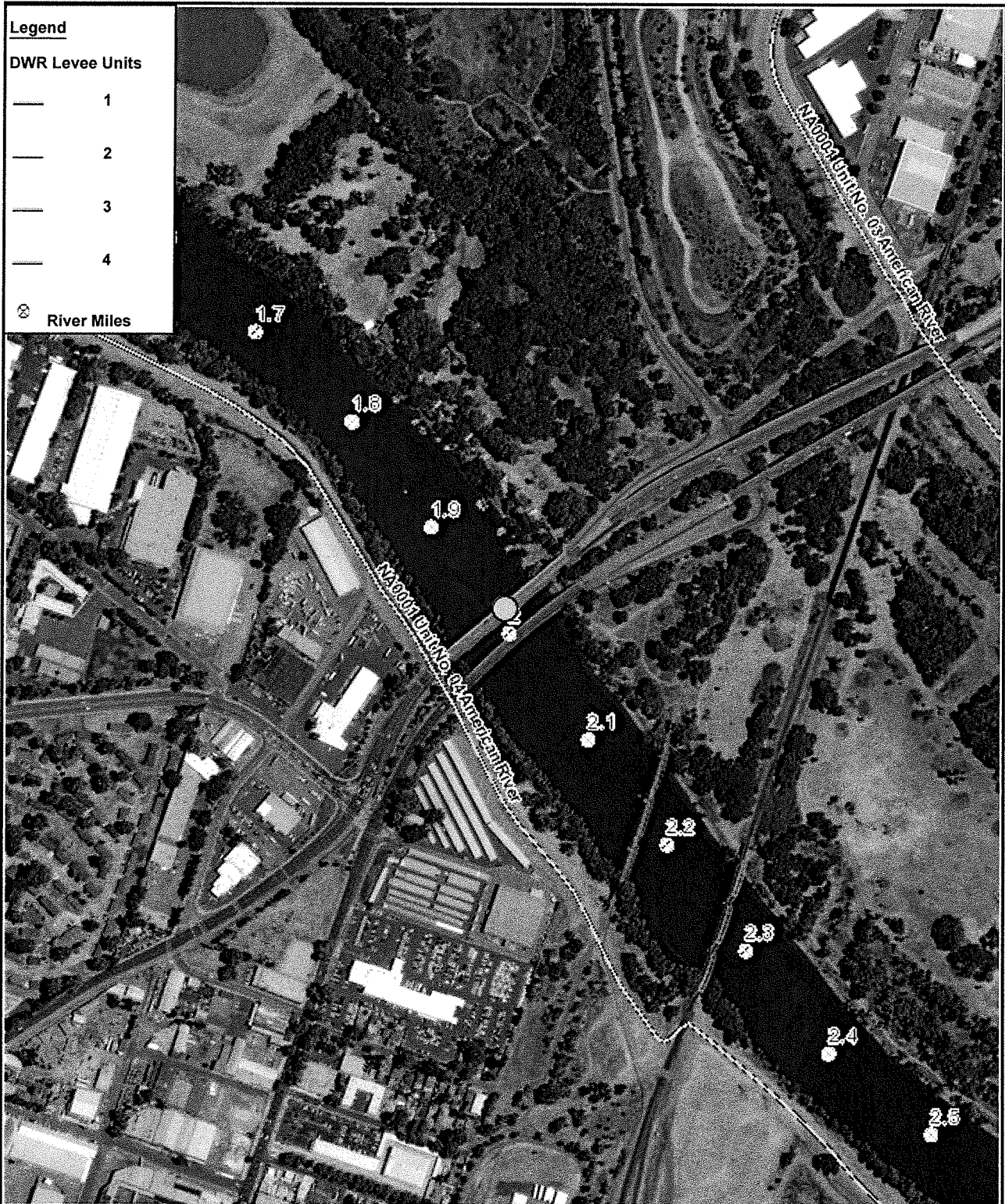
EA: 03-3F540
PID: 03-13000136

CVFPB Encroachment Permit


Attachment 1-A

However, depending on the amount of work remaining, it may be requested to allow some temporary trestle piles to remain until the following construction season. In that case, the wooden decking "crane mats" across the entire trestle would be removed along with any associated framing and bracing. Allowing the piles to remain would reduce the amount of in-water pile driving, channel bottom disturbances, and other impacts in the following construction season.

The contractor will use the existing ramp that extends from the mobile home park down to the river for much of the work. Temporary construction easements (TCEs) are being obtained to allow for equipment access and staging at vacant adjacent portions of the mobile home park. Access to the TCE will be provided from Northgate Boulevard. Other TCEs that will also be used for access and staging are being obtained within the American Rive Parkway.





0 600ft



Datum: NAD_1983 Projection: Albers
 Zone: Units: Mile
 Sources:
 [Enter source here]

[Enter title here]

[Enter sub title here]

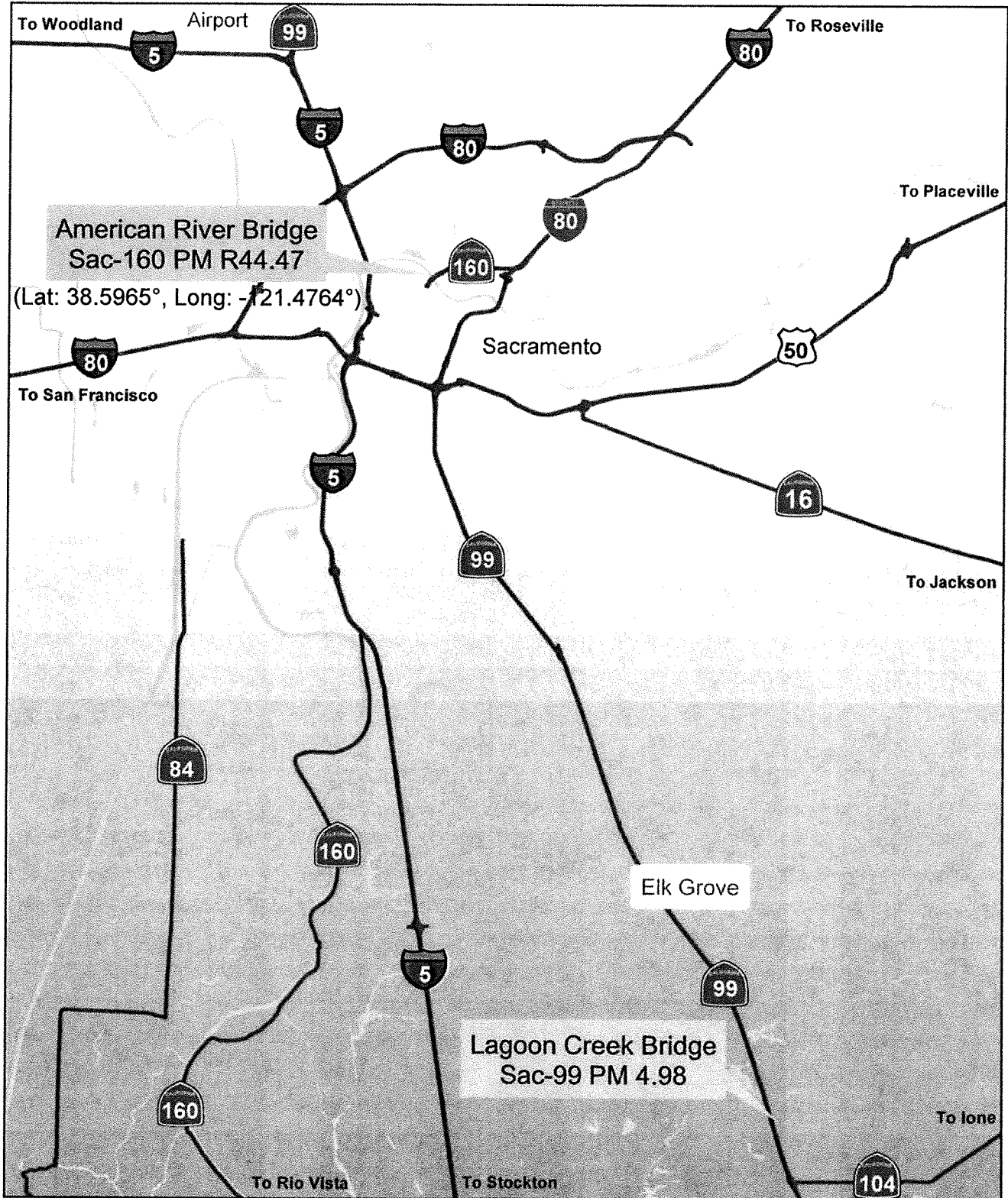
		
Prepared By: [Enter name here]	Figure:	
Job No:	Date: May 10 2018	
File:		

EA 3F540K

LOCATION MAP

SCOUR MITIGATION - American River & Lagoon Creek

SAC-160 PM 44.47, SAC-99 PM 4.98



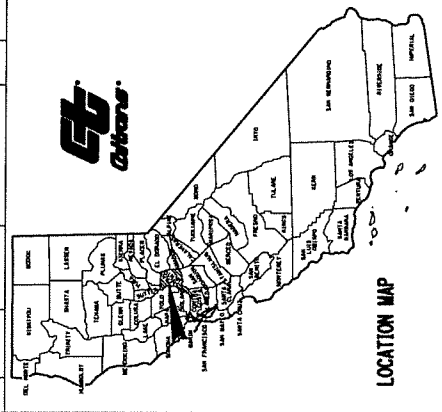
DATE	03	COUNTY	Sac	ROUTE	160	TOTAL PROJECT SHEETS	44.47	SHEET NO.	1	TOTAL SHEETS	7
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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY
IN SACRAMENTO COUNTY AT
THE AMERICAN RIVER BRIDGE
 TO BE SUPPLEMENTED BY STANDARD PLANS DATED 2015

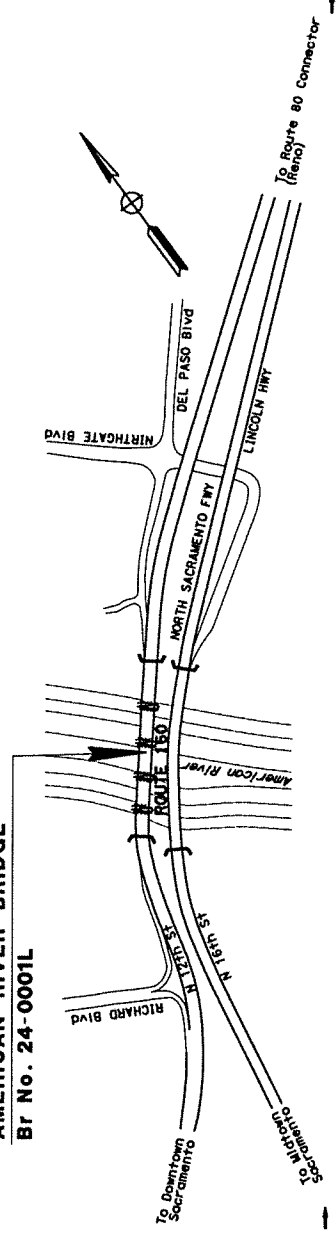
INDEX OF PLANS

SHEET No.	DESCRIPTION
1	TITLE, LOCATION, AND VICINITY MAPS
2	PROPOSED PROJECT LAYOUT PLAN
3	SECTIONS
STRUCTURE PLANS	
4-7	AMERICAN RIVER BRIDGE, Br No. 24-0001L

THE STANDARD PLANS LIST APPLICABLE TO THIS CONTRACT IS INCLUDED IN THE NOTICE TO BIDDERS AND SPECIAL PROVISIONS BOOK.



AMERICAN RIVER BRIDGE
Br No. 24-0001L



PROJECT ENGINEER
 REGISTERED CIVIL ENGINEER
 DATE _____

PLANS APPROVAL DATE _____
 THE STATE OF CALIFORNIA OR ITS
 OFFICERS OF AGENTS SHALL NOT BE
 RESPONSIBLE FOR THE ACCURACY OR
 COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.



CONTRACT No.	03-3F540
PROJECT ID	0313000136
PROJECT NUMBER & PHASE	0313000136
UNIT	0304

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."
 BORDER LAST REVISED 8/1/2016 CALTRANS WEB SITE IS: [HTTP://WWW.DOT.CA.GOV/](http://WWW.DOT.CA.GOV/)

USER NAME: 2145630
 JOB FILE # 03130002600001.dgn
 RELATIVE BORDER SCALE 0 1 2 3
 IS IN INCHES

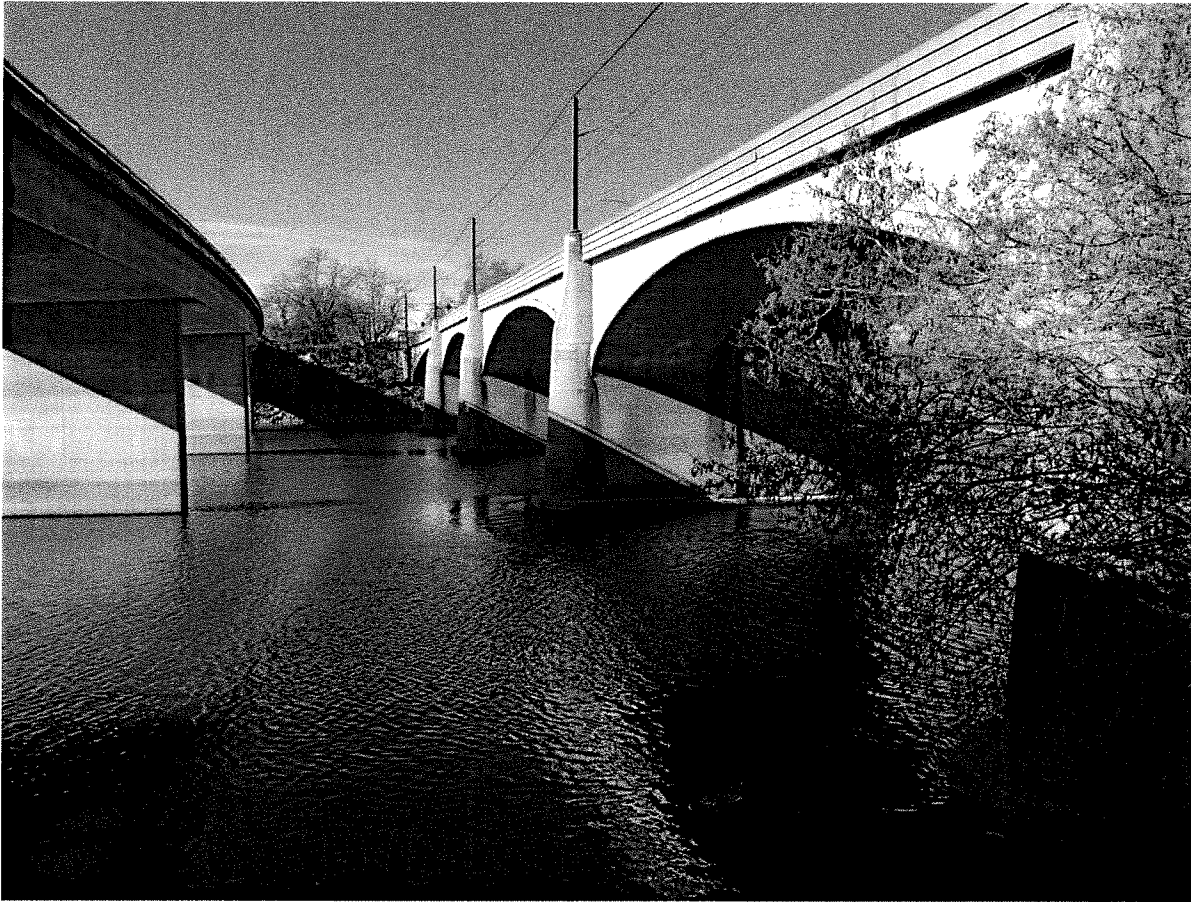


Figure 4. 1 - View of the 12th Street Bridge (right) and the 16th Street Bridge (left) along State Route 160 across the American River. This view is looking south-west. In this view Abutment 1 (south bank) can be seen, as well as Piers 2, 3, 4, and 5. Abutment 6 (north bank) is not shown. A federal levee exists along the south bank but not along the north bank.

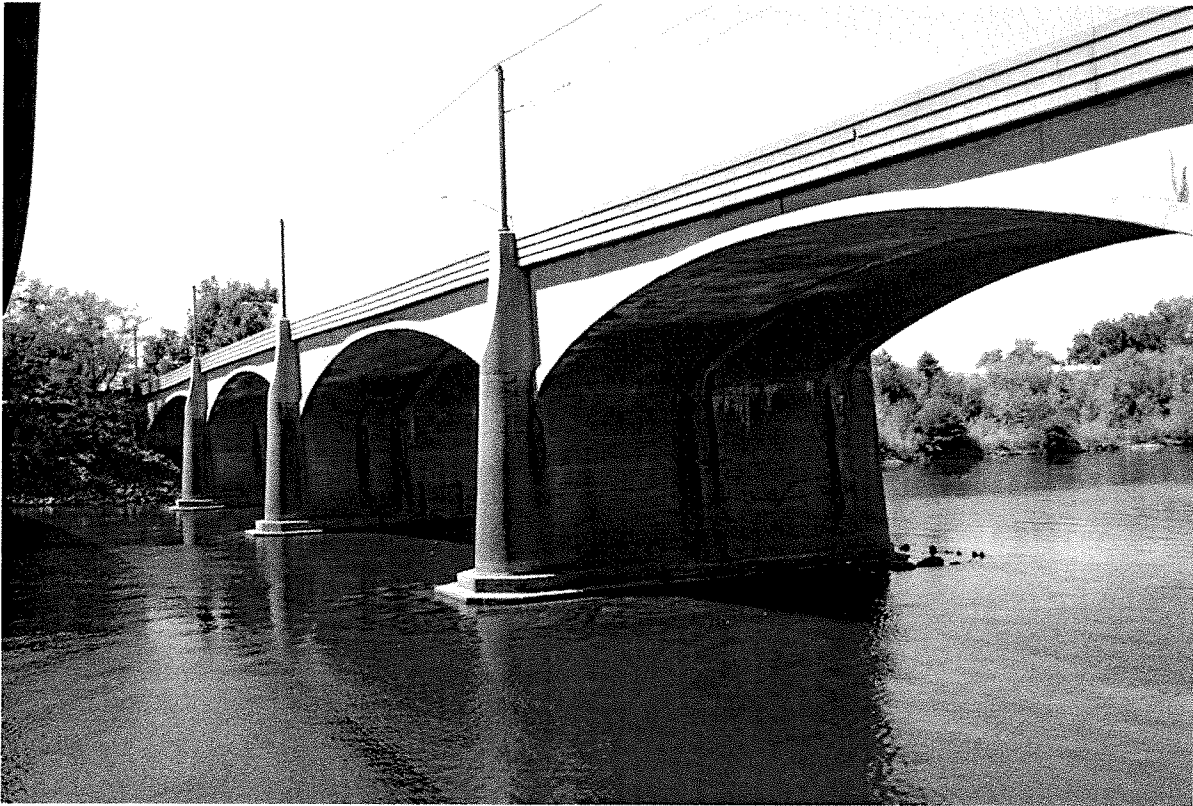


Figure 4. 2 – View of the 12th Street Bridge on state route 160 across the American River from the east side. This view is looking south-west. The south bank, where the federal levee is located, has existing rock slope protection.



Figure 4. 3 - View of the 12th Street Bridge on state route 160 across the American River from the west side. This view is looking south. The south bank, where the federal levee is located, has existing rock slope protection. Also seen is the existing north bank which does not feature a levee.



Figure 4. 4 – Example of the existing rock slope protection that will be removed and replaced with new permanent sheet piles. Some of the existing rock slope protection has been carried away while some remains in place. This photo is showing the downstream portion of the pier.

Dist	County	Route	Post Miles	Total Project	SHEET	Total
03	Soc	160	44.47	44.47	2	7

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

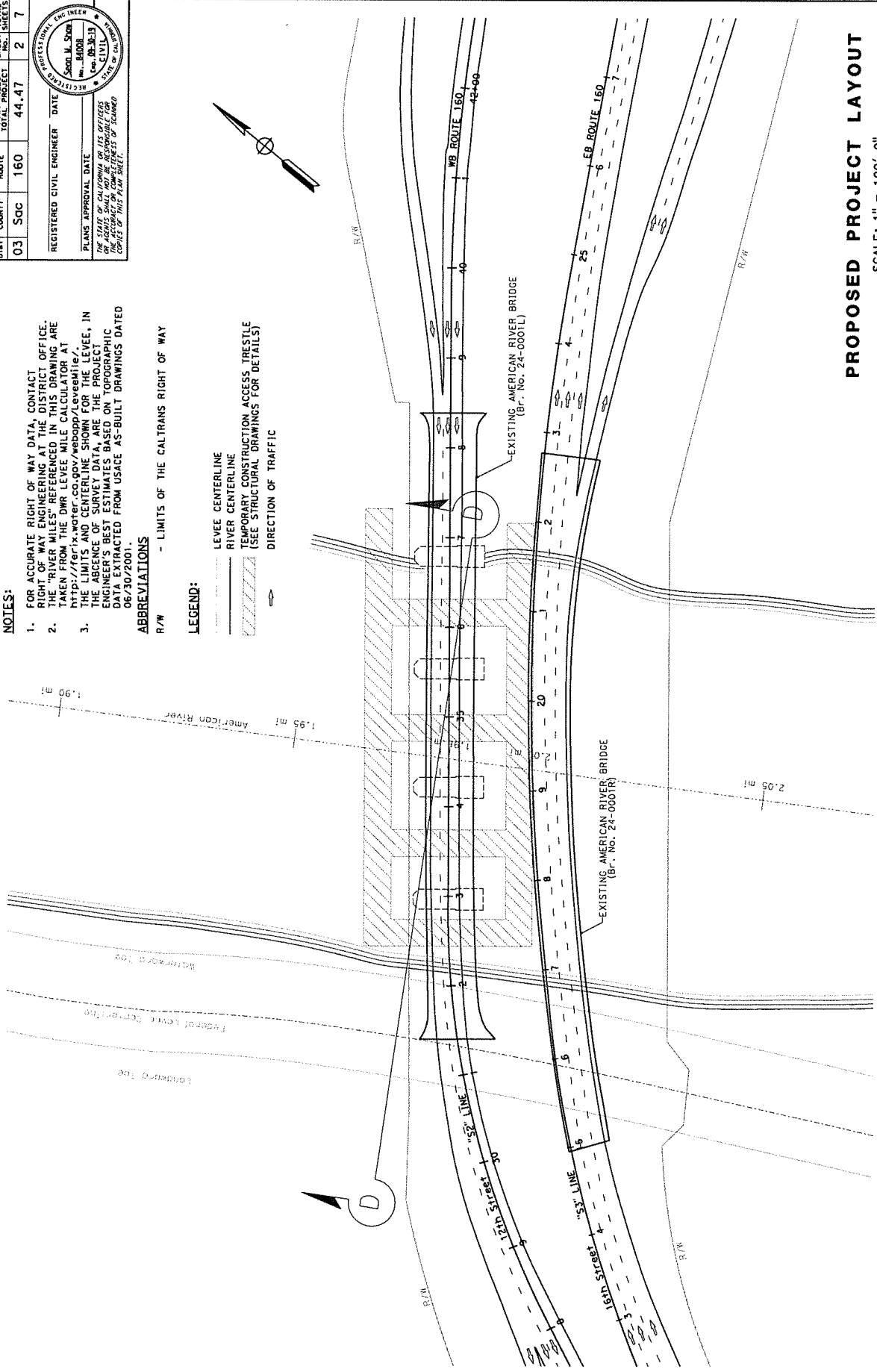
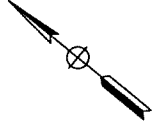
SEUNG P HONG
No. 48363
Exp. 08-31-19
CIVIL

PROFESSIONAL ENGINEER
No. 48363
Exp. 08-31-19
CIVIL

- NOTES:**
- FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE. THE "RIVER MILES" REFERENCED IN THIS DRAWING ARE TAKEN FROM THE DMR LEVEE MILE CALCULATOR AT www.dmr.ca.gov/levee/milecalc.htm.
 - THE LIMITS AND CENTERLINE SHOWN FOR THE LEVEE, IN THE ARCHIVE OF SURVEY DATA, ARE THE PROJECT ENGINEER'S BEST ESTIMATES BASED ON TOPOGRAPHIC DATA EXTRACTED FROM USACE AS-BUILT DRAWINGS DATED 06/30/2001.

ABBREVIATIONS:
R/W - LIMITS OF THE CALTRANS RIGHT OF WAY

- LEGEND:**
- LEVEE CENTERLINE
 - RIVER CENTERLINE
 - TEMPORARY CONSTRUCTION ACCESS TRESTLE (SEE STRUCTURAL DRAWINGS FOR DETAILS)
 - DIRECTION OF TRAFFIC



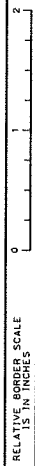
PROPOSED PROJECT LAYOUT

SCALE: 1" = 100'-0"

PROJECT NUMBER & PHASE

UNIT 0304

03130001361



STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION	FUNCTIONAL SUPERVISOR	DESIGNED BY	REVISOR	DATE REVISOR	CHECKED BY	DATE CHECKED
03-DESIGN	Seung P Hong	TBD	Seon M Show			

USERNAME: s31145530
DGN FILE: s311800026.dgn

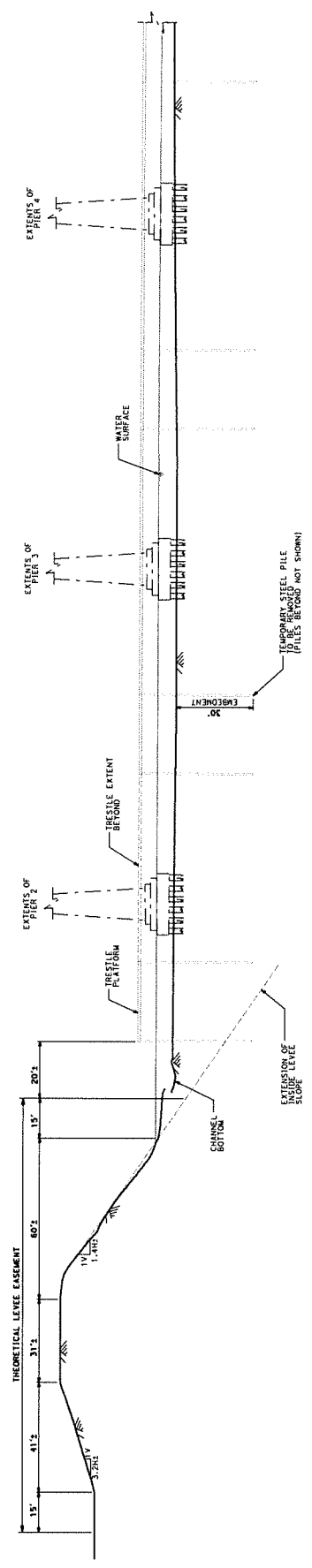
BORDER LAST REVISED 7/2/2010

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
03	Soc	160	44.47	3	7



REGISTRATION ENGINEER
Sean M. Shaw
 License No. 06-36119
 CIVIL
 STATE OF CALIFORNIA
 REGISTERED CIVIL ENGINEER DATE
 PLANS APPROVAL DATE
 THE STATE OF CALIFORNIA AND ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE CONSEQUENCES OF ANY MISTAKES OR OMISSIONS OF THIS PLAN SHEET.

- NOTES:**
1. THE PROFILE OF THE CHANNEL BOTTOM SHOWN IS PER A CALTRANS BATHYMETRY STUDY CONDUCTED IN JUNE 2016.
 2. THE LEEVE CROSS SECTION WAS EXTRACTED FROM USACE AS-BUILT DRAWINGS DATED 06/30/2001.



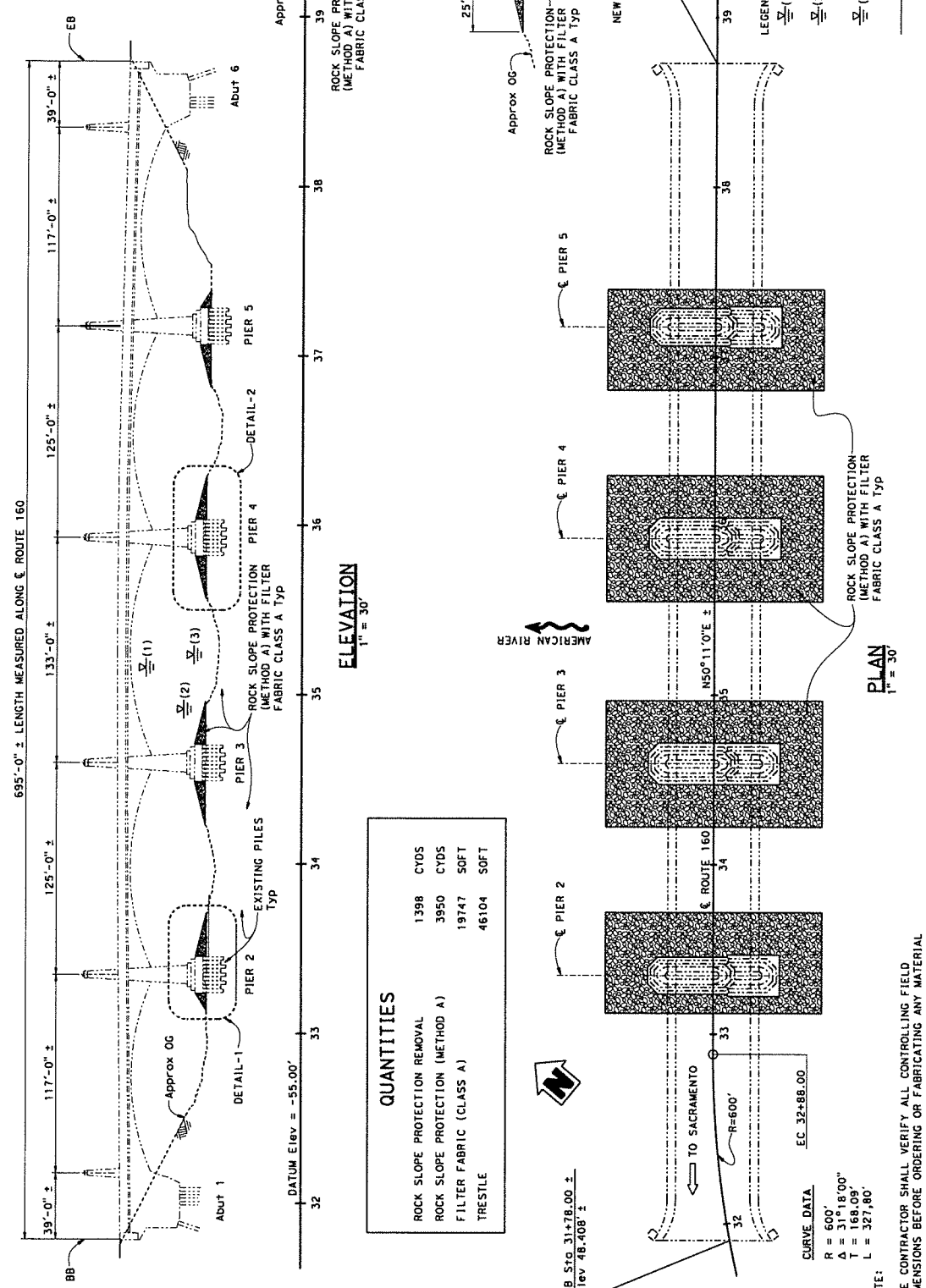
SECTION D-D
 1"=40'-0"

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION	FUNCTIONAL SUPERVISOR	Seung P Hong	CHECKED BY	Seon M Shaw	DATE REVISED	
03-DESIGN	DESIGNED BY	TBD	REVISOR			

DIST	COUNTY	ROUTE	TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
03	Soc	160	PPPP		

REGISTERED CIVIL ENGINEER	DATE	X
PLANS APPROVAL DATE		

DAVID A. ROBERT
 6180
 Exp. 08-30-13
 CIVIL
 STATE OF CALIFORNIA



QUANTITIES

ROCK SLOPE PROTECTION REMOVAL	1398	CYDS
ROCK SLOPE PROTECTION (METHOD A)	3950	CYDS
FILTER FABRIC (CLASS A)	19747	SOFT
TRESTLE	46104	SOFT

NOTE:
 THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL

DESIGN ENGINEER		DESIGN		BY		DATE		SPECIFICATIONS		LAYOUT		BY		DATE		SPECIFICATIONS		LAYOUT		BY		DATE	
X		X		X		15-MAY-2018		X		X		X		15-MAY-2018		X		X		X		15-MAY-2018	
DESIGN ENGINEER		DETAILS		QUANTITIES		FILE		DATE		BY		DATE		BY		DATE		BY		DATE		BY	
X		X		X		24-000117-0011-001		15-MAY-2018		X		15-MAY-2018		X		15-MAY-2018		X		15-MAY-2018		15-MAY-2018	

STATE OF CALIFORNIA		DIVISION OF ENGINEERING SERVICES		STRUCTURE DESIGN		DESIGN BRANCH 17		UNIT 1386		PROJECT NUMBER & PHASE: 031X000136 & 1		CONTRACT NO.: 03-3F5404	
DEPARTMENT OF TRANSPORTATION		STRUCTURE DESIGN		DESIGN BRANCH 17		UNIT 1386		PROJECT NUMBER & PHASE: 031X000136 & 1		CONTRACT NO.: 03-3F5404		SHEET NO. 1	

DIST	COUNTY	ROUTE	SHEET NO.	TOTAL SHEETS
03	Soc	160	PPPP	PPPP

REGISTERED CIVIL ENGINEER	DATE	X
DAVID J. ROMERO	01/15/2018	
PLANS APPROVAL DATE		
THE STATE OF CALIFORNIA AND THE BOARD OF CIVIL ENGINEERS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.		

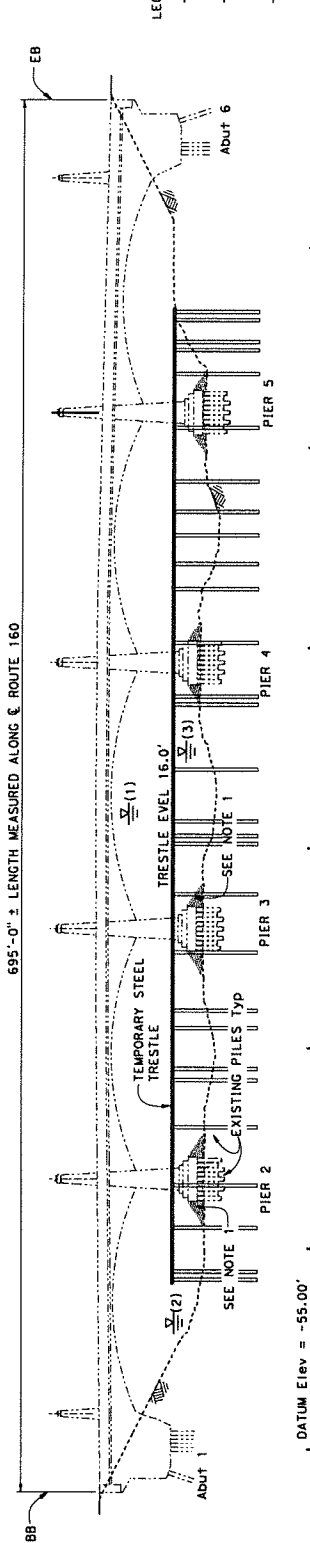
LEGEND:

(1) High water mark during A 100 year Storm 37.0' ±

(2) High water mark during Construction window July 15th through October 15th = 14.86' ±

(3) Low water mark during Construction window July 15th through October 15th = 8.86' ±

○ Temporary Trestle pile



695'-0" ± LENGTH MEASURED ALONG & ROUTE 160

DATE: 01/15/2018

FILE: 33-24-00011-C-1001.dwg

DATE PLOTTED: 15-NOV-2018

TIME PLOTTED: 14:18

ORIGINAL SCALE: 1" = 30'

USER: DMR

PROJECT NUMBER & PHASE: 0313000136 & 1

CONTRACT NO.: 03-3F5404

DESIGNER: David Romero

BY: Mili Yu

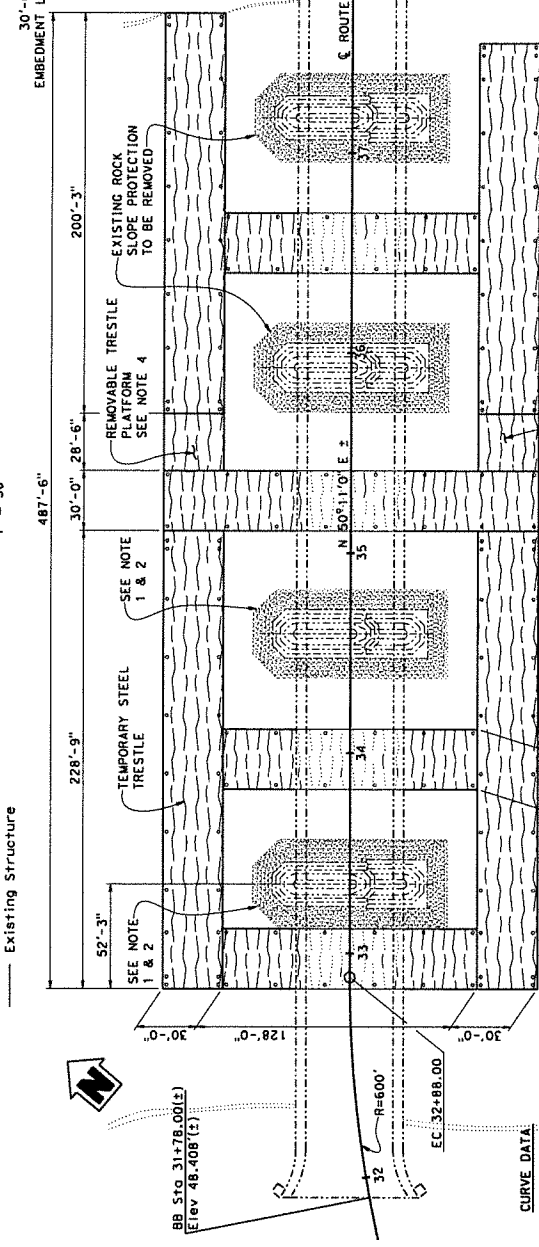
QUANTITIES: X

RECORD: X

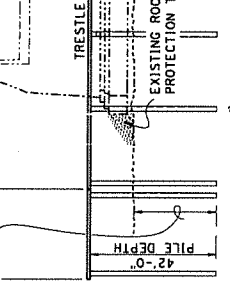
REVISIONS: X

STAGE 1 - ELEVATION

1" = 30'



LEGEND: Existing Structure



TYPICAL SECTION

1" = 20'

AT PIERS 3 & 5 (PIER 2 & 4 SIMILAR)

NOTE: Existing piles not shown for clarity

- ### STAGE 1 - SEASON 1
- INSTALL TEMPORARY TRESTLE
 - REMOVING EXISTING ROCK SLOPE PROTECTION AT PIER 2 AND 3
 - PLACE FILTER FABRIC (CLASS A) AT PIER 2 AND 3
 - PLACE ROCK SLOPE PROTECTION (METHOD A) AT PIER 2 AND 3
 - REMOVE TEMPORARY TRESTLE AND CORRESPONDING PILES AT EXISTING PIER 2 AND PIER 3
 - ALL TRESTLE PLATFORMS TO BE REMOVED FROM OCTOBER 15TH TO JULY 15TH. SUPPORTING PILES TO REMAIN IN PLACE UNTIL CONSTRUCTION WORK IS FINISHED

STAGE 1 - PLAN

1" = 30'

- NOTES:
- Existing Rock Slope Protection to be Removed
 - For Limits of Existing Rock Slope Protection Removal, see "STRUCTURE PLANS No. 2" sheet
 - Typical Temporary Trestle Pile Spacing 30' OC
 - Portion of Trestle Platform to be Removed to allow Boat traffic to pass

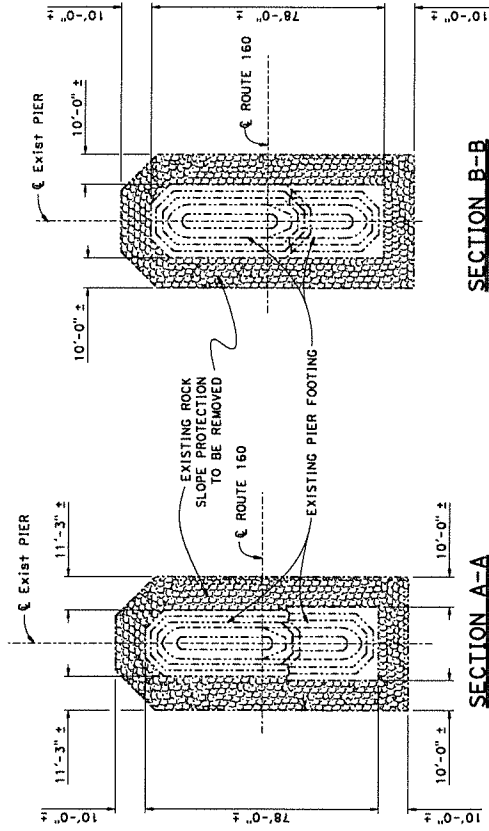
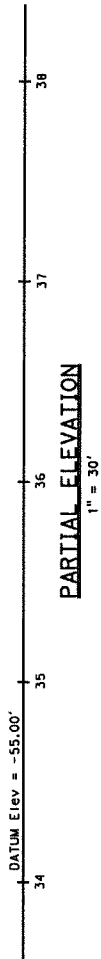
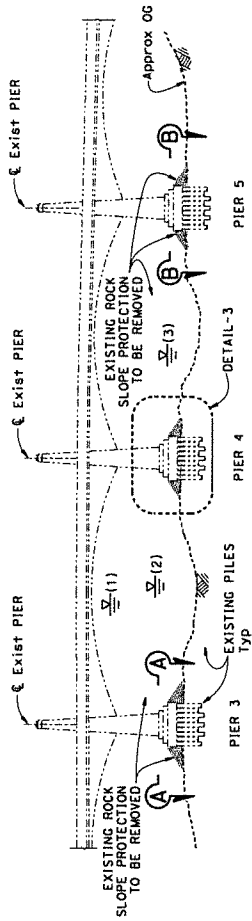
NOTE: THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL

DIVISION OF ENGINEERING SERVICES		STRUCTURE DESIGN		DESIGN BRANCH 17	
PROJECT NO.	24-00011	POST MILE	X		
STATE OF CALIFORNIA		DEPARTMENT OF TRANSPORTATION		AMERICAN RIVER BRIDGE	
STRUCTURE PLANS No. 1		STRUCTURE PLANS No. 1		STRUCTURE PLANS No. 1	

DIST	COUNTY	ROUTE	PROJECT TOTAL SHEETS	SHEET NO.	TOTAL SHEETS
03	Soc	160	PPPP		

REGISTERED CIVIL ENGINEER	DATE	PROFESSIONAL ENGINEER
AM/DD/YYYY		DAVID A. RICHMOND
PLANS APPROVAL DATE		61940
THE STATE OF CALIFORNIA IN ITS OFFICE OF HIGHWAYS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SUMMED COPIES OF THIS PLAN SHEET.		

- LEGEND:
- $\frac{\text{---}}{\text{---}}$ (1) High water mark during A 100 year Storm 37.0' ±
 - $\frac{\text{---}}{\text{---}}$ (2) High water mark during Construction window July 15th through October 15th = 14.66' ±
 - $\frac{\text{---}}{\text{---}}$ (3) Low water mark during Construction window July 15th through October 15th = 8.86' ±
 - Existing Structure



DETAIL - 3
1" = 10'

(EXIST) ROCK SLOPE PROTECTION TO BE REMOVED AT PIER 3 & 4) (AT PIER 2 & 5 SIMILAR)

LIMITS OF ROCK SLOPE PROTECTION REMOVAL
1" = 20'

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL

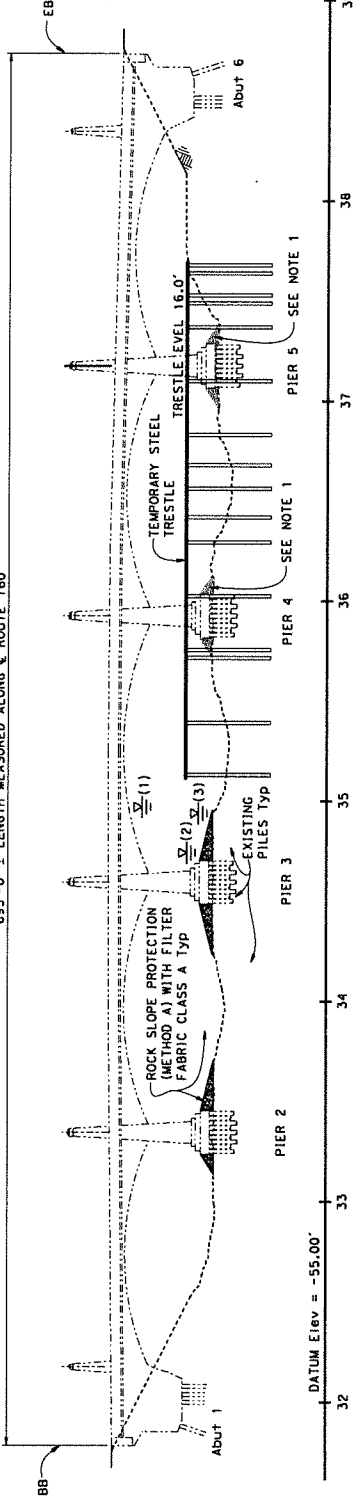
DIVISION OF ENGINEERING SERVICES		DESIGN BRANCH 17	UNIT: 3386
STRUCTURE DESIGN		24-0001L	PROJECT NO.: 03-35104
POST MILE		X	CONTRACT NO.: 03-35104
STATE OF CALIFORNIA		DEPARTMENT OF TRANSPORTATION	AMERICAN RIVER BRIDGE
STRUCTURE PLANS NO. 2			STRUCTURE PLANS NO. 2
DESIGNER: David Roberto		CHECKED: X	
DATE PLOTTED: 15-NOV-2018		THE PLOTTED: 14448	
FILE: 24-0001L-C-6082.dgn		USER: NAME: 115193	
ORIGINAL SCALE: REDUCED TO: 1" = 20'			
DATE PLOTTED: 15-NOV-2018		THE PLOTTED: 14448	
FILE: 24-0001L-C-6082.dgn		USER: NAME: 115193	
DATE PLOTTED: 15-NOV-2018		THE PLOTTED: 14448	
FILE: 24-0001L-C-6082.dgn		USER: NAME: 115193	
DATE PLOTTED: 15-NOV-2018		THE PLOTTED: 14448	
FILE: 24-0001L-C-6082.dgn		USER: NAME: 115193	

DIST	COUNTY	ROUTE	POST MILES	SHEET NO.	TOTAL SHEETS
03	Soc	160	PPPP		

REGISTERED CIVIL ENGINEER	DATE	X
MM/DD/YYYY		
PLANS APPROVAL DATE		

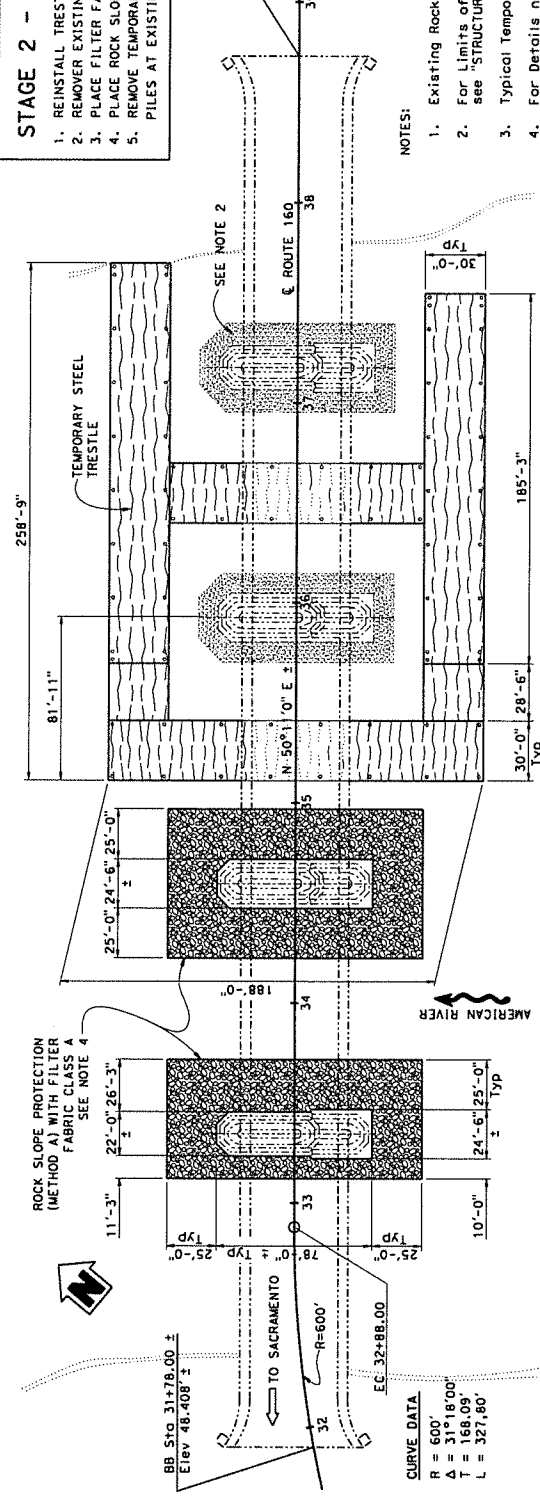
THE FILE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCALED COPIES OF THIS PLAN SHEET.

695'-0" ± LENGTH MEASURED ALONG & ROUTE 160



- LEGEND:
- (1) High water mark during A 100 year Storm 37.0' ±
 - (2) High water mark during Construction window July 15th through October 15th = 14.66' ±
 - (3) Low water mark during Construction window July 15th through October 15th = 8.86' ±
 - Existing Structure
 - Temporary Trestle pile

STAGE 2 - ELEVATION
1" = 30'



- STAGE 2 - SEASON 2**
1. REINSTALL TRESTLE DECK
 2. REMOVE EXISTING ROCK SLOPE PROTECTION AT PIER 4 AND 5
 3. PLACE FILTER FABRIC (CLASS A) AT PIER 4 AND 5
 4. PLACE ROCK SLOPE PROTECTION (METHOD A) AT PIER 4 AND 5
 5. REMOVE TEMPORARY TRESTLE AND CORRESPONDING PILES AT EXISTING PIER 4 AND PIER 5

- NOTES:
1. Existing Rock Slope Protection to be Removed
 2. For Limits of Existing Rock Slope Protection Removal, see "STRUCTURE PLANS No. 2" sheet
 3. Typical Temporary Trestle Pile Spacing 30' 0"
 4. For Details not shown, see "DETAIL-1" on sheet "GENERAL PLAN" sheet
 5. Pier 5 Similar Pier 2 Reverse, Pier 4 Similar Pier 3

STAGE 2 - PLAN
1" = 30'

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL

DESIGN	BY	David Romero	CHECKED	X
	DATE	11/10/18	DATE	11/10/18
DETAILS	BY	M.H. Yu	CHECKED	X
QUANTITIES	BY		CHECKED	X

DATE PLOTTED	15-NOV-2018	TIME PLOTTED	14:48
FILE	21-00011-C-003-001	USER NAME	115193

STATE OF CALIFORNIA	DIVISION OF ENGINEERING SERVICES	STRUCTURE DESIGN	UNIT: 3586
DEPARTMENT OF TRANSPORTATION	DESIGN BRANCH 17	PROJECT NUMBER & PHASE: 0313000136 & 1	CONTRACT NO.: 03-35404
AMERICAN RIVER BRIDGE		STRUCTURE PLANS NO. 3	

Memorandum

To: Gary Joe
Branch Chief
Bridge Design 17
At: David Romero

Date: October 23, 2018

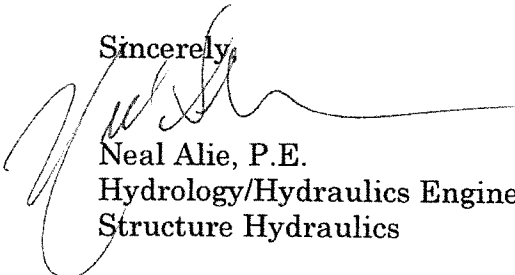
File: American River
Br. No. 24-0001L
03-SAC-160-PM 44.47
EA 03-3F540
Project ID: 03-1300-0136

From: **Department of Transportation**
Engineering Service Center MS #9
Structure Hydraulics and Hydrology

Subject: Final Hydraulic Report

Attached is the Final Hydraulic Report (FHR) for the proposed scour countermeasure for the American River Bridge (Left) on SR 160 in Sacramento County at PM 44.47. This report should supersede all other FHR's submitted. If you have any questions, please call me at (916) 227-0444 or my mobile at (916) 224-9640.

Sincerely,



Neal Alie, P.E.
Hydrology/Hydraulics Engineer
Structure Hydraulics

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State of California – Department of Transportation
Division of Engineering Services
Structure Design Services

Structure Hydraulics and Hydrology

FINAL HYDRAULIC REPORT

American River Bridge

Located in Sacramento County
Bride No. 24-0001L

03-Sac-160-PM 44.47

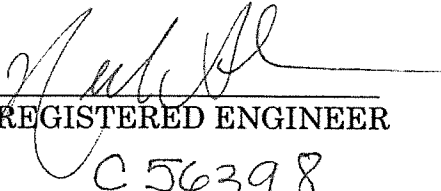
EA 03-3F540
EFIS: 03 1300 00136

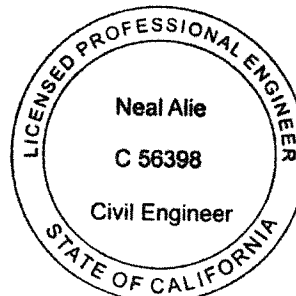
October 23, 2018

WRITTEN BY:
Neal Alie

REVIEWED BY:
Ronald McGaugh

This report has been prepared under my direction as the professional engineer in responsible charge of the work, in accordance with the provisions of the Professional Engineers Act of the State of California.


REGISTERED ENGINEER
C 56398
REGISTRATION NUMBER



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 Br. No. 24-0001L
 03-Sac-160-PM 44.47
 EA 03-3F540
 Project ID: 03-1300-0136

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Hydrology/Hydraulic Report

1.0 General

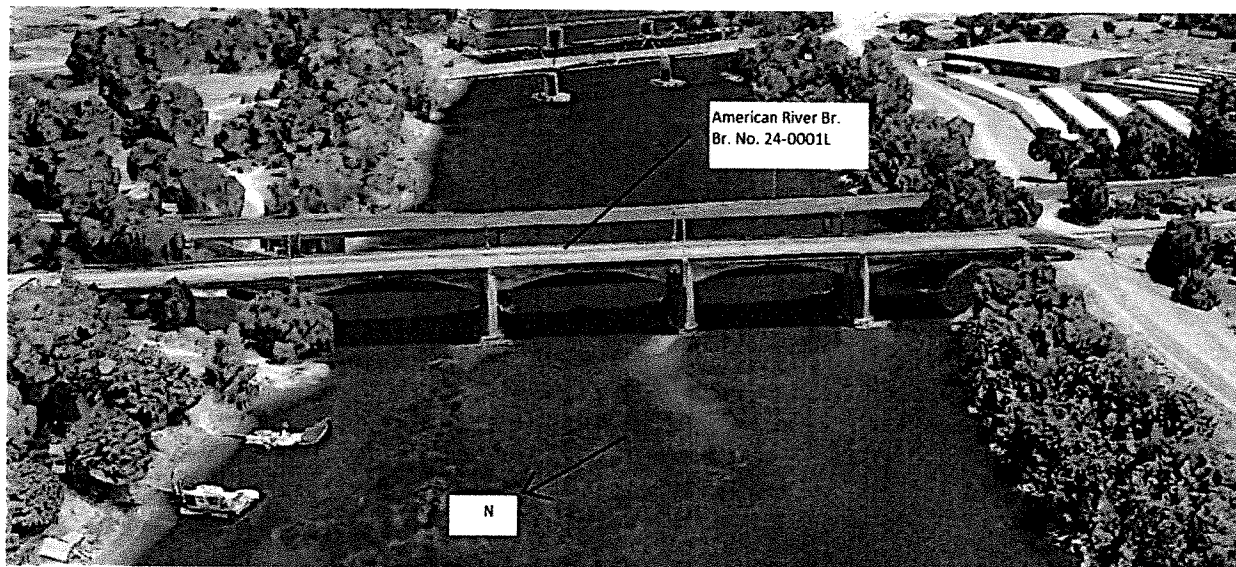


Figure 1- American River Bridge, Br. No. 24-0001L on SR 160

The American River Bridge (160 WB) is a 5-span, 620-foot-long, 57.4-foot-wide structure built in 1915 and widened in 1934. The original 1915 structure is a 5-span filled concrete arch on RC pier walls and RC abutments with non-monolithic wing walls all founded on timber piles. The 1934 left side widening is a 5-span non-filled spandrel arch (with side walls to simulate a filled arch) on RC pier walls and RC abutments with non-monolithic wing walls founded on steel piles.

In July 2010, the Bridge's scour potential was assessed in accordance with FHWA Technical Advisory T5140.23, "Evaluating Scour at Bridges", and within current Caltrans guidelines. The bridge was determined to be scour critical, and the item 113 code "Vulnerability to scour", was changed to 3; "Bridge Foundations determined to be unstable for assessed or calculated scour conditions; scour below spread-footing or piles.

Structure Design in coordination with the District has proposed removing the existing Rock Slope Protection (RSP) around the piers and installing new half ton RSP with filter fabric using Method A.

This report makes extensive reference to the (1) Caltrans Bridge Maintenance

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Reports, (2) General plans and profiles submitted by structures, (3) Caltrans As-Built Plans (4) Previous Hydrology/Hydraulics Report (5) American River Watershed Report, December 2015, US Army Corps of Engineers (6) Caltrans Geotechnical report, April 2010 (7) SM&I Ratings Report, July 2010 (8) FEMA Report, October 20, 2016 (8) USGS Water Information System.

All Elevations used in this report are based on the NAVD 88 Datum.

2.0 Drainage Basin

The American River drains a watershed of approximately 1875 square miles of the Tahoe and El Dorado National Forests, including the Granite Chief Wilderness and Desolation Wilderness. The river flows west from the peaks of the northern Sierra Nevada west of Lake Tahoe. Its streams gradually converge into the South, Middle and North Forks of the American River draining into Folsom Dam.

Although it was originally authorized by Congress in 1944 as flood control unit, Folsom Dam was reauthorized in 1949 as a multipurpose facility to also store water for irrigation, domestic, municipal and industrial use, hydropower generation, recreation, water quality and maintenance of flows stipulated to protect fish. Folsom Lake features roughly 10,000 surface acres of water when full and has 75 miles of shoreline. It extends about 15 miles up the North Fork American River and about 10 ½ miles up the South Fork.

During a 24-hour period, the releases of water from Folsom Dam can vary greatly to meet changing demands for water and power. Nimbus Dam, 7 miles downstream from Folsom Dam, stores these releases and re-regulates them to a steady flow downstream in the American River and allows Folsom Dam releases and power generation to fluctuate with daily power demands. Nimbus Dam forms Lake Natoma located in the town of Folsom. The Lower American River has levees on its north and south banks for about 13 miles from the Sacramento River to Carmichael on the north end. Portions of the floodplain have been acquired by either the City or County of Sacramento and is managed cooperatively as the American River Parkway.

The Lower American River begins at Folsom Dam and flows approximately 30 miles to its confluence with the Sacramento River near downtown Sacramento. The Lower American River Watershed has several contributing streams including Coon Creek, Markham Ravine, Auburn Ravine, Pleasant Grove Creek, Curry Creek, Dry Creek, Cordova Creek (aka Clifton's Drain), and Arcade Creek. Most of these creeks enter the floodplain drainage systems of the Natomas Cross Canal and Natomas East Main Drainage Canal in southern Sutter and northern Sacramento Counties. The Natomas

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Cross Canal drains into the Sacramento River just south of the Feather River, and the Natomas East Main Drainage Canal drains into the Sacramento River just to the north of the American River.

The Lower American River watershed elevations range from approximately 400 feet at Folsom Dam to approximately 23 feet at the confluence with the Sacramento River. The channel slope at the bridge site is approximately 0.0003 ft/ft. Average annual precipitation based on the Oregon Climate Service Prism Program (Annual normal from 1981 to 2010) is about 23 inches.

The project is in a FEMA Special Flood Hazard Area (SFHA) designated as a Zone AE, where the Base Flood Elevations have been determined.

3.0 Discharge

The American River levees were originally intended to convey a release from Folsom Dam of 115,000 cfs. During several major storm events since the construction of Folsom Dam, flows have equaled or exceeded the design capacity and caused significant erosion at the levees.

In the 1955 flood event, the peak release from Folsom Dam was 115,000 cfs. Soon after this flood event, the flood magnitude was factored into the hydrology of Folsom Dam operations, which led to the level of protection provided by Folsom Dam being considerably lowered.

In the 1964 flood event, Folsom Dam was again forced to release 115,000 cfs which was the first time the complete American River levee system was tested. This 1964 flood event showed considerable stress on the levee system but no major levee failures.

In the 1986 flood event, Folsom Dam was forced to release 130,000 cfs to avoid a dam failure. The peak flow was passed without any levee failure, but two locations were almost breached. One of the sites upstream from the Capital City Freeway experienced significant erosion and if the discharge was sustained any longer, the levee would have likely failed.

In 1997 Folsom Lake experienced a peak inflow of 255,000 cfs and was able to control it by releasing 115,000 cfs. Significant erosion occurred at five different sites along the American River which required immediate repair.

The objective release from Folsom Dam is currently under review as part of the

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Folsom dam Reoperations Study and the Joint Federal Project which is currently constructing improvements to the dam for a release of 160,000 cfs.

For this project the Design Flood Flow Capacity of **160,000 cfs** will be used.

4.0 Stage, Velocity and Waterway

The U.S. Army Corps of Engineers Surface Water Modeling System (SMS) program was used to perform a two-dimensional hydraulic analysis to calculate the water surface elevations and velocity for the following conditions:

1. Existing Bridge Pre-Construction Condition.
2. Interim Construction Condition with temporary steel trestle on piles.
3. Post Construction Condition with RSP Installed.

The General Plans submitted by Structure Design was referenced to acquire the planned deck elevation height. The proposed freeboard is measured from the water surface elevation to the lowest chord of the soffit of the structure (45.27 ft).

The parameters used to model the existing and post construction conditions include a Design Flood Flow Capacity for the American River of 160,000 cfs, a 100-year discharge of 16,000 cfs for the Natomas East Main Drainage Canal and a 100-year discharge of 120,000 cfs for the Sacramento River. A manning's roughness coefficient of 0.033 was used for the river and 0.03 to .12 for the floodplain and a channel slope of 0.0003 ft/ft for the American River.

The model results for the existing condition is as follows:

4.1 Existing Condition

Discharge (cfs)	Minimum Soffit Elevation (ft)	Water Surface Elevation (ft)	Average Channel Velocity (fps)	Available Freeboard (ft)
Design Flood Flow Capacity 160,000 cfs	45.27	37.00	6.92	8.27

There is adequate freeboard for the projected Design Flood Flow Capacity of 160,000 cfs with a freeboard of 8.27 ft.

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4.2 Interim Condition

The interim condition includes the installation of a temporary trestle that will be supported on 20-inch piles. The construction season is normally between the months of May to October and the mean daily flow rate during the summer months for the American River is approximately 5000 cfs.

The parameters used to model the Interim condition with and without the trestle includes an average summer flow for the American River of 5000 cfs, a summer flow of 1000 cfs for the Natomas East Main Drainage Canal and a summer flow of 17,500 cfs for the Sacramento River. A manning's roughness coefficient of 0.033 was used for the river and 0.03 to .12 for the floodplain and a channel slope of 0.0003 ft/ft for the American River.

The model results are as follows:

4.2A Interim Condition with no trestle

Discharge (cfs)	Minimum Soffit Elevation (ft)	Water Surface Elevation (ft)	Average Channel Velocity (fps)	Available Freeboard (ft)
Mean Summer Flow 5000 cfs	45.27	14.65	1.00	30.62

4.2B Interim Condition with trestle

Discharge (cfs)	Minimum Soffit Elevation (ft)	Water Surface Elevation (ft)	Avg. Channel Velocity (fps)	Available Freeboard (ft)	Δ Existing to Proposed	
					Δ Water Surface Elevation (ft)	Δ Avg. Channel Velocity (fps)
Mean Summer Flow 5000 cfs	45.27	14.66	0.90	30.61	+0.01	-0.10

The trestle will have minimal effect on the water surface elevation during the construction season. The trestle should be installed with the estimated water surface elevation of 14.66 ft in mind.

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Proposed Condition

The proposed condition includes the installation of RSP at Piers 2 through 5 and should not affect the water surface elevation.

The model results are as follows:

Discharge (cfs)	Minimum Soffit Elevation (ft)	Water Surface Elevation (ft)	Avg. Channel Velocity (fps)	Available Freeboard (ft)	Δ Existing to Proposed	
					Δ Water Surface Elevation (ft)	Δ Avg. Channel Velocity (fps)
Design Flood Flow Capacity 160,000 cfs	45.27	37.00	6.92	8.27	0.0	0.0

There is adequate freeboard for the projected Design Flood Flow Capacity of 160,000 cfs with a freeboard of 8.27 ft.

5.0 Streambed and Scour

Streambed materials at the bridge site were mostly composed of loose granular material such as sand and gravel.

According to the Caltrans Maintenance records this bridge has a history of scour. The channel has degraded approximately 10 feet between 1934 and 1970. However, channel cross-sections taken in 1987, 2001 and 2006 indicate the degradation has stabilized.

Underwater Inspections were completed in 1998, 2003, 2008 and 2012 revealing various levels of footing and pile exposure at Piers 2 through 5. The most recent underwater inspection completed on 9/12/2017 revealed the following:

Previously Installed 2 to 3-foot nominal dimension RSP was in place around Piers 2, 3 and 4. The RSP had large voids which allowed water to flow through it. Approximately 10 to 15-feet of the upstream nose of these pile caps were undermined by about 1.5 feet. Due to the presence of the RSP there was limited access to the undermined area. There could be up to 20 exposed piles on each pier, however only Pier 3 had access to the undermined area due to a section at the south side that had no RSP present. This section extended from the upstream nose downstream approximately 10 feet with 3 piles exposed.

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In general, the surrounding channel bottom at Piers 2, 3 and 4 was approximately at elevation -4.5 (As-Builts). The RSP sloped up at 35 to 45 degrees to be level at slightly above the third footing step from the top at an average elevation of 4.0 feet (As-Builts).

At Pier 5 there was no RSP and undermining was found at several locations at the upstream span 4 side. The undermining was approximately 1.0 feet in height at the corner exposing one steel pile and 1.6 feet in height at the middle of the Pier.

In 2010, the bridge scour potential was calculated to be 16.8 ft deep at elevation (-21.6 ft). SM&I Ratings and the Office of Geotechnical Support determined that although the steel piles had adequate capacity to carry the load demand, the original timber piles did not have adequate strength and the structure may become unstable.

In July 2010, the Bridge's scour potential was assessed in accordance with FHWA Technical Advisory T5140.23, "Evaluating Scour at Bridges", and within current Caltrans guidelines. The bridge was determined to be scour critical, and the item 113 code "Vulnerability to scour", was changed to 3; "Bridge Foundations determined to be unstable for assessed or calculated scour conditions; scour below spread-footing or piles.

A peer review meeting was held, and four scour mitigation alternatives were discussed.

- 1- Replace the missing RSP at the Piers installed in previous years.
- 2- Install Sheet Piles at Piers 2 through 5.
- 3- Installing supplemental piles.
- 4- Installing properly engineered RSP at the piers.

It was unanimously decided that alternative 2, installing sheet piles at Piers 2 through 5 was the best alternative.

In December 2015 an updated Plan of Action was completed with no major changes to the previous recommendations. In 2016 a SHOPP project was programmed to install sheet piles at Piers 2 through 5 for scour mitigation.

In August 2017 a Bridge strategy meeting was held and once again several alternatives were discussed including engineered RSP, Sheet piles and bridge replacement. It was unanimously decided to proceed with the sheet pile alternative.

On 09/27/2018 a PDT meeting was held to discuss the potential impact the sheet piles could have on the existing foundation and constructability. Structure Design decided

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against the sheet piling due to issues regarding the stability of the sheet piles confinement (for both seismic and service loads) of the piers at the maximum scour depth of 35 feet. In addition, there was a potential of liquefaction around the existing piles during the installation of the sheet piles.

The scope of the project was changed to remove the existing RSP around the piers and install new RSP with filter fabric using Method A.

Structure Hydraulics recommends designing the RSP according to The FHWA Hydraulic Engineering Circular, (HEC-23), "Bridge Scour and Stream Instability Countermeasures". This would be a more permanent solution and would require excavation and a coffer dam to divert water. The District chose not to proceed with the standard FHWA RSP Design to avoid any need for a coffer dam or any excavation.

It is important to note that installing the RSP without following the FHWA guidelines would be a temporary scour countermeasure that will have a limited life span.

Structure Hydraulics has the following recommendations for placement of the RSP:

- Half Ton RSP with a diameter of 24 inches should be used.
- The RSP should extend 25 feet from all directions from the lowest step footing at a 3:1 slope.
- The RSP should be placed flush with the top of the lowest step footing. This may differ from one pier to the next.
- Filter Fabric should not be extended fully beneath the RSP and instead terminate 16.5 feet from the edges of the RSP. The filter fabric should extend vertically to the top of the step footing in all directions.
- Any existing loose rocks should be removed from under the bridge prior to placement of proposed countermeasure.
- The recommended countermeasure should be inspected during the bi-annual bridge maintenance inspections and after significant storm events to determine countermeasure performance.

6.0 Drift

There is a moderate potential of drift and Structure Hydraulics recommends the removal of any drift build up on a consistent basis, especially after major storm events.

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7.0 Bank Protection

The average velocity has been provided in this report to assist the District Hydraulic Engineers in the design of bank protection if necessary.

8.0 Hydrologic and Scour Summary for Design Engineer

HYDROLOGIC SUMMARY Br. No. 24-0001L			
Drainage Area: 1875 square miles			
	Design Flood Flow Capacity	Base Flood	Overtopping Flood/Flood of Record?
Frequency	N/A	N/A	N/A
Discharge	160,000 cfs	N/A	N/A
Water Surface Elevation at Bridge	37.0 ft	N/A	N/A
Flood plain data are based upon information available when the plans were prepared and are shown to meet federal requirements. The accuracy of said information is not warranted by the State and interested or affected parties should make their own investigation.			

9.0 Scour Data Table with RSP Installed

Support No.	Long Term (Degradation and Contraction) Scour Elevation (ft)*	Short Term (Local) Scour Depth (ft)
Abutment 1	39.00	0.00
Pier 2	-1.70	0.00
Pier 3	-0.60	0.00
Pier 4	0.00	0.00
Pier 5	1.10	0.00
Abutment 6	39.00	0.00

*There is no anticipated degradation, contraction or local pier scour with the temporary installed RSP as long it is functioning properly, this is the existing approximate ground elevation.