

**Meeting of the Central Valley Flood Protection Board
October 28, 2011**

**Staff Report
Butte County Department of Public Works
Ord Ferry Road Bridge Seismic Retrofit Project**

1.0 – ITEM

Consider approval of Permit No. 18677 (Attachment B).

2.0 – APPLICANT

Butte County Department of Public Works, Butte County

3.0 – LOCATION

The project is located at the intersection of State Highway 32 and the Sacramento River, on the Jacinto and De Farwell Land Grants approximately 7 mi south of Hamilton City and 10 mi west of the City of Chico (Sacramento River, Butte County, see Attachment A).

4.0 – DESCRIPTION

The Ord Ferry Road bridge is a nine-span concrete box girder bridge accommodating two-lane of east-west traffic and has been deemed by the State to be inadequate for the seismic region in which it is located. To seismically retrofit of an existing State bridge 12C-120 on the Ord Ferry Road by retrofitting 6 of the 8 pier foundations, and by installing steel column casings on all 8 piers across the Sacramento River.

5.0 – PROJECT ANALYSIS

The project proposes the retrofit of an existing two-lane bridge crossing over the Sacramento River. The existing nine-span 1,308 ft long and 32.5 ft wide Ord Ferry Road bridge has eight piers founded on concrete piles and hinges located on span 2,4,6, and 8. The project proposes foundation retrofit and installation of steel column casing around the bridge piers modifying the column width from 6 ft to 6.5 ft.

The method of construction is to drive sheet piles approximately 3.5 ft from the existing pile cap and excavate approximately 15 ft of native material that is between the sheet pile and the existing pile cap. The area between the pile cap and the sheet piling will be

dewatered and pumped to the shore for treatment. New 14-in. round steel pipe piles will be driven between the existing pile cap and sheet pile. Each foundation retrofit requires 12 steel pipe piles, which results in a total of 72 permanent piles required for the entire retrofit. A concrete seal course will be placed over the steel pipe piles using the sheet pile as the form. The existing concrete pile cap will be enlarged to cover the new pile. The sheet pile will then be removed.

Within the Sacramento River, Butte County is proposing to drive permanent piles (piers 2, 4, 5, 6, 7, and 9), and the trestle piles during the work window of May 15 through October 15 to minimize effects on threatened species. For the in-water work, it is anticipated that the trestle installation, existing bridge foundation work, pier retrofit, and trestle removal will be conducted over three construction seasons.

Each of the eight piers will require the installation of steel column casings. These casings can be installed using the trestle for the piers that are located within the active channel or from the dry riverbed for the piers that are not located within the active channel. All water that is between the sheet piling and the column will be pumped to the shore.

Temporary trestle will be built from the western shore of the Sacramento River out to the two westerly in-water piers. Each trestle is expected to require 40 temporary 12-in to 16-in. round steel pipe piles. This will leave the most easterly of the three spans open to river traffic. Once the westerly retrofit work has been completed, the trestle, trestle piles, and sheet piling will be removed. After the work has been completed on the western piers, it is anticipated to construct a temporary trestle from the eastern shore of the Sacramento River out to the three easterly in-water piers. Once the easterly retrofit work has been completed, the trestle, trestle piles, and sheet piling will be removed.

Each of the four hinges will get retrofitted by adding hinge seat extenders. This work will be accomplished via scaffolding that will be constructed off of the overhang of the existing bridge. Additional work on the bridge that does not require access from the Sacramento River will be performed.

5.1 – Hydraulic Analysis

The datum elevation used for study is NGVD 29. A HEC-RAS model is used to analyze the output result of hydraulic model with existing conditions and proposed conditions.

The discharge of the 100-yr flood used for the bridge design analysis is 300,000 cfs which is taken from the design flow of the designated floodway of Title 23. However, based on the Operation and Maintenance Manual of the U.S. Army Corps of Engineers (USACE), the design flood of the Sacramento River Flood Control Project is 160,000 cfs. The discharge of 300,000 cfs is applied for the existing and proposed condition of 100-yr flood at the Ord Ferry Road bridge.

The WSEL of the existing condition ranges from 117.49 ft to 117.53 ft and the velocity ranges from 4.27 ft/s to 4.45 ft/s near the existing bridge location. The WSEL of the proposed project condition ranges from 117.49 ft to 117.53 ft and the velocity ranges from 4.27 ft/s to 4.45 ft/s near the bridge. The difference of WSEL for existing and proposed condition is almost negligible. The freeboard for both cases is about 4.4 ft.

The proposed project meets the Board's standards contained in Title 23, California Code, Article 8, Section 128(a)(10)(A) which states "The bottom members (soffit) of a proposed bridge must be at least three (3) feet above the design flood plane. The required clearance may be reduced to two (2) feet on minor streams at sites where significant amounts of stream debris are unlikely".

The scour and countermeasure analyses are performed using the standards from the Federal Highway Administration's HEC-18, Evaluating Scour at Bridges. The total scour of bridge is comprised of three components such as long-term aggradation and degradation, contraction scour and local scour. The total scour ranges from 6.3 ft to 11.5 ft for 100-yr flow discharge. The top of existing footing elevation is 1.6 ft lower than the scoured channel bed elevation which has a maximum total scour depth of 11.5 ft near pier 4 with velocity of 4.45 ft/s.

Based on these results, the proposed project will convey the 100-yr design flow without significant damage to either the flood plain or surrounding property.

5.2 – Geotechnical Analysis

This project has no significant geotechnical impacts to the existing streambank or the floodway. Excavation occurs at locations that are not critical to the integrity of the natural stream bank or creek. All fill, excavation, and temporary structures will be completed in compliance with Permit No. 18677 (see Attachment B) and Title 23.

6.0 – AGENCY COMMENTS AND ENDORSEMENTS

The comments and endorsements associated with this project, from all pertinent agencies are shown below:

- The U. S. Army Corps of Engineers Section 208.10 letter has not been received but is expected to be received prior to the October 28, 2011 Board meeting which then will become Exhibit A of the permit.

7.0 – CEQA ANALYSIS

The Board, as a responsible agency under CEQA, has reviewed Initial Study/Mitigated

Negative Declaration (IS/MND) (SCH Number: 2002122056, November 2002) and Mitigation Measures for the Ord Ferry Bridge Seismic Retrofit Project prepared by the lead agency, Butte County. These documents, including project design, may be viewed or downloaded from the Central Valley Flood Protection Board website at <http://www.cvfpb.ca.gov/meetings/2011/10-28-2011.cfm> under a link for this agenda item. These documents are also available for review in hard copy at the Board and the Butte County offices.

Butte County has determined that the project would not have a significant effect on the environment at the Board of Supervisors Meeting on January 28, 2003 and filed a Notice of Determination on February 12, 2003 with the State Clearinghouse.

Board staff finds that although the proposed project could have a potentially significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. The project proponent has incorporated mandatory mitigation measures into the project plans to avoid identified impacts or to mitigate such impacts to a point where no significant impacts will occur. These mitigation measures are included in the project proponent's IS/MND and address impacts to air quality, biological resources, cultural resources, and noise. The description of the mitigation measures are further described in the adopted IS/MND.

8.0 – SECTION 8610.5 CONSIDERATIONS

1. Evidence that the Board admits into its record from any party, State or local public agency, or nongovernmental organization with expertise in flood or flood plain management:

The Board will make its decision based on the evidence in the permit application and attachments, this staff report, and any other evidence presented by any individual or group.

2. The best available science that related to the scientific issues presented by the executive officer, legal counsel, the Department or other parties that raise credible scientific issues.

The accepted industry standards for the work proposed under this permit as regulated by Title 23 have been applied to the review of this permit.

3. Effects of the decision on the entire State Plan of Flood Control:

This project has no negative impacts on the State Plan of Flood Control. Both hydraulic and geotechnical impacts from the project construction are negligible.

4. Effects of reasonable projected future events, including, but not limited to, changes in hydrology, climate, and development within the applicable watershed:

Climate change issues have not been taken into account in the hydraulic analysis for this project and the water surface elevation change resulting from change in climate for the site is unknown. However, it is not foreseeable that sea level rise as a result of climate change would have an adverse effect to both the bridge and the project levee. There are no other foreseeable projected future events that would impact this project.

9.0 – STAFF RECOMMENDATION

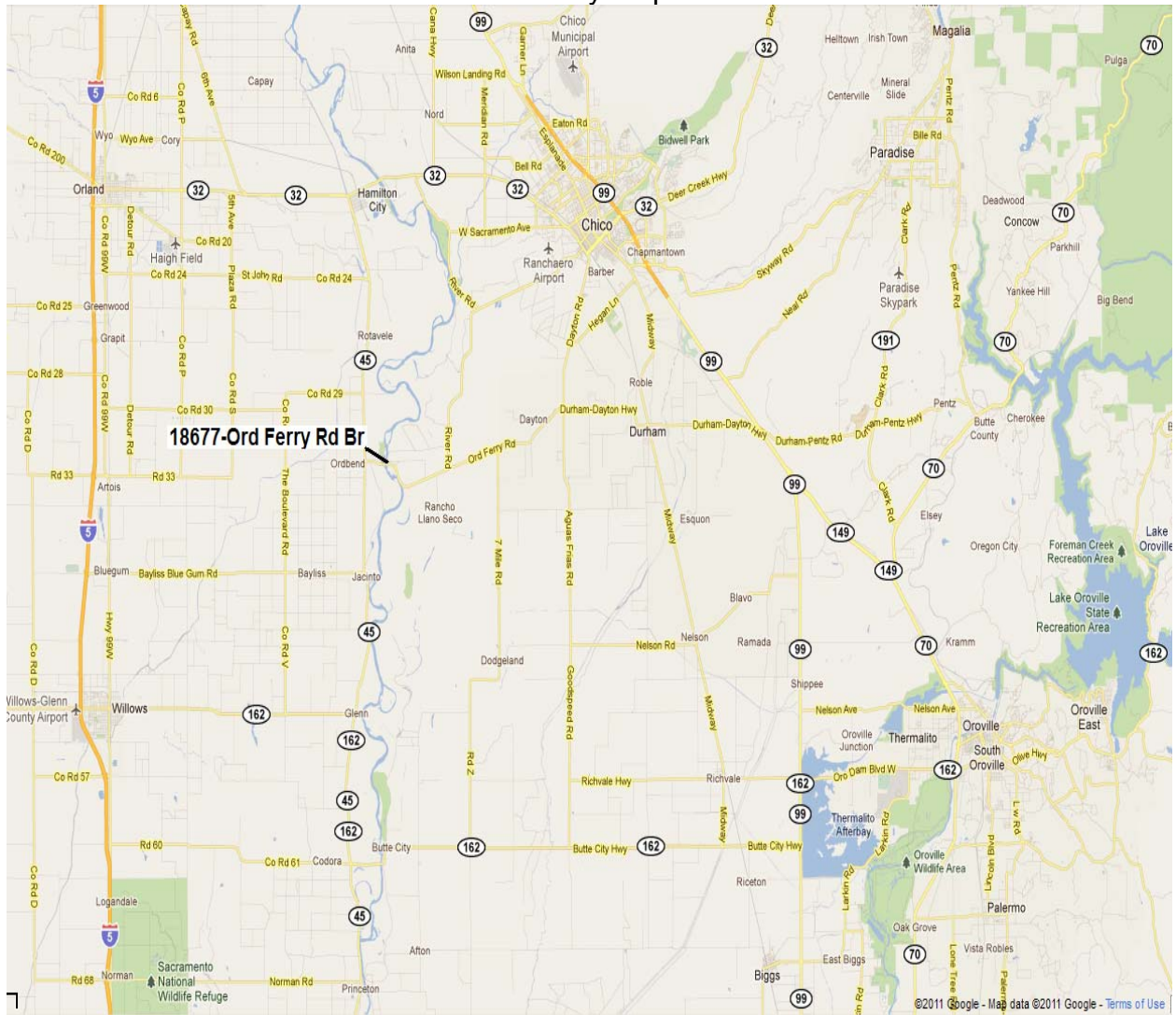
Staff recommends that the Board adopt the CEQA findings, approve Permit No. 18677 conditioned upon receipt of a favorable U.S. Army Corps of Engineers' 208.10 comment letter and direct the Executive Officer to take necessary actions to execute the permit and to file a Notice of Determination with the State Clearinghouse.

10.0 – LIST OF ATTACHMENTS

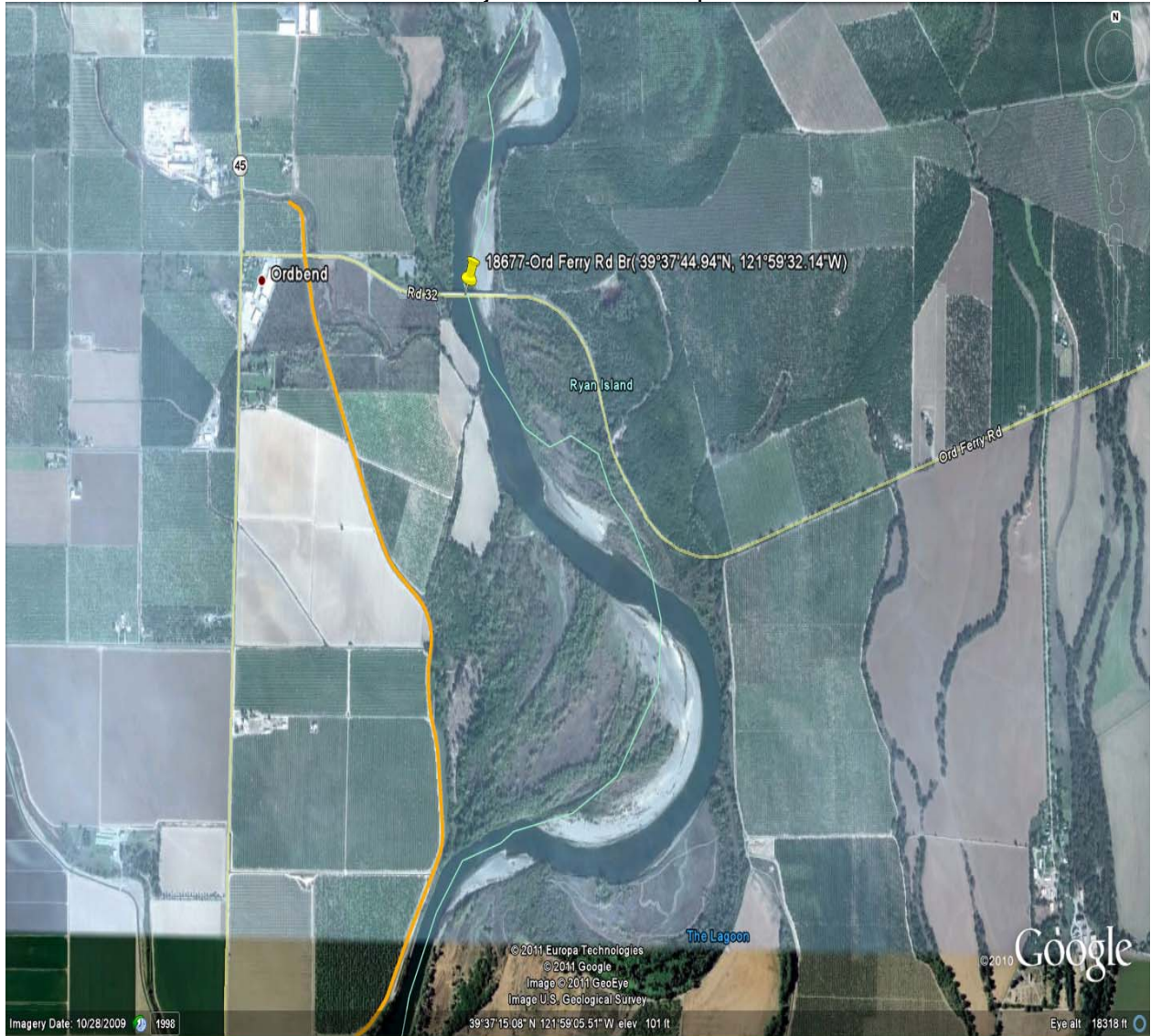
- A. Location Maps and Photos
- B. Draft Permit No. 18677
- C. Ord Ferry Road Bridge Seismic Retrofit General Plan & Foundation
- D. HEC-RAS Model Result

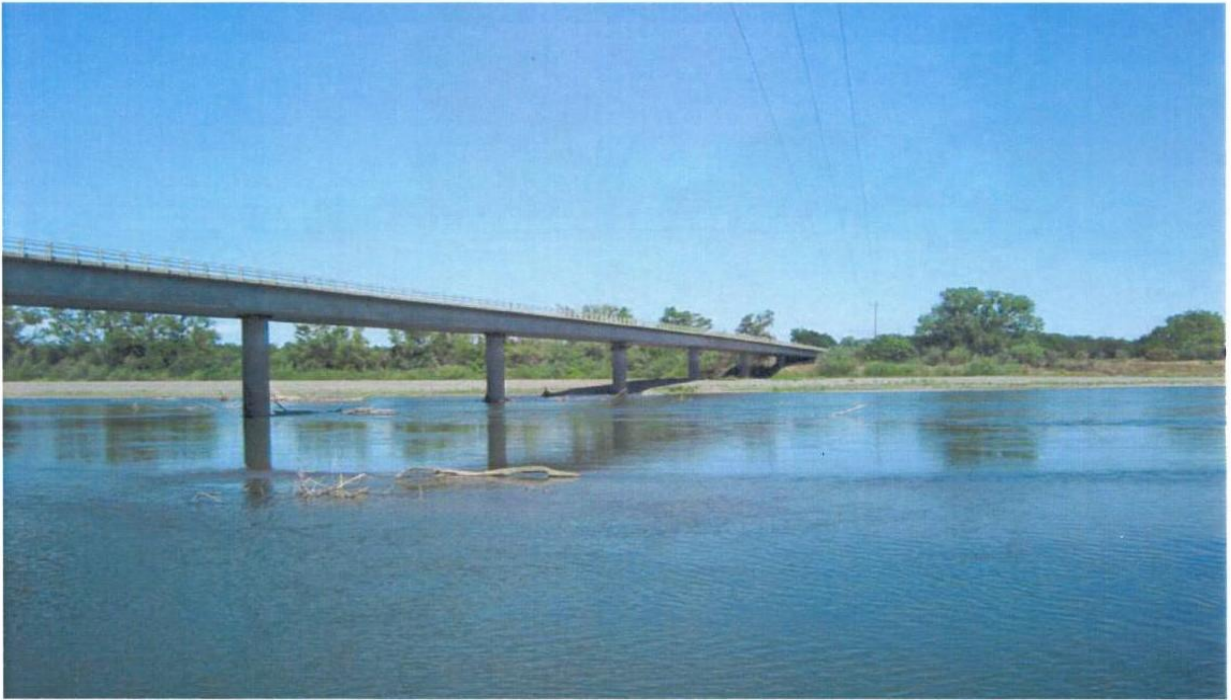
| | |
|-----------------------|---|
| Design Review: | Sungho Lee |
| Environmental Review: | James Herota |
| Document Review: | David Williams, Eric Butler, Len Marino |

Vicinity Map



Project Location Map





Ord Ferry Bridge. Photo taken from west bank looking east toward Butte County side.



Pier #2 near western abutment. Photo taken looking north toward Glenn County boat launch.

Existing Ord Ferry Bridge

DRAFT

STATE OF CALIFORNIA
THE RESOURCES AGENCY
THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 18677 BD

This Permit is issued to:

Butte County Department of Public Works
7 County Center Drive
Oroville, California 95965

To seismically retrofit the Ord Ferry Bridge by retrofitting 6 of the 8 pier foundations, and by installing steel column casings on all 8 pier foundations. Located at the intersection of State Highway 32 and the Sacramento River, on the Jacinto and Rancho De Farwell Land Grants (Section 31, 33, T21N, R1W, MDB&M, Butte County Public Works, Sacramento River, Butte County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

(SEAL)

Dated: _____

Executive Officer

GENERAL CONDITIONS:

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any other land.

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15

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days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 18677 BD

THIRTEEN: If the construction project extends onto land owned in fee and/or easement by the Sacramento and San Joaquin Drainage District acting by and through the Central Valley Flood Protection Board (Board), the permittee should secure an easement, license, or temporary entry permit from the Board prior to commencement of work. Contact Angelica Aguilar at (916) 653-5782.

FOURTEEN: All work approved by this permit shall be in accordance with the submitted drawings and specifications except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of the Central Valley Flood Protection Board.

FIFTEEN: The permittee shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Department of Water Resources or any other agency responsible for maintenance.

SIXTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California, including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection Board's approval of this permit, including but not limited to claims filed pursuant to the California Environmental Quality Act. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

SEVENTEEN: The Central Valley Flood Protection Board and Department of Water Resources shall not be held liable for any damages to the permitted encroachment(s) resulting from flood fight, operation, maintenance, inspection, or emergency repair.

EIGHTEEN: The permittee shall contact the Department of Water Resources by telephone, (916) 574-0609, and submit the enclosed postcard to schedule a preconstruction conference. Failure to do

so at least 10 working days prior to start of work may result in delay of the project.

NINETEEN: The permittee may be required, at permittee's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted encroachment(s) if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with any present or future flood control plan or project or if damaged by any cause. If the permittee does not comply, the Central Valley Flood Protection Board may remove the encroachment(s) at the permittee's expense.

TWENTY: The permittee should contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, 1325 J Street, Sacramento, California 95814, telephone (916) 557-5250, as compliance with Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act may be required.

TWENTY-ONE: The permittee shall be responsible for repair of any damages to the project levee and other flood control facilities due to construction, operation, or maintenance of the proposed project.

TWENTY-TWO: If the project, or any portion thereof, is to be abandoned in the future, the permittee or successor shall abandon the project under direction of the Central Valley Flood Protection Board and Department of Water Resources, at the permittee's or successor's cost and expense.

TWENTY-THREE: The permittee shall provide supervision and inspection services acceptable to the Central Valley Flood Protection Board. A professional engineer registered in the State of California shall certify that all work was inspected and performed in accordance with submitted drawings, specifications, and permit conditions.

TWENTY-FOUR: Upon completion of the project, the permittee shall submit as-built drawings to: Department of Water Resources, Flood Project Inspection Section, 3310 El Camino Avenue, Suite Rm 256, Sacramento, California 95821.

TWENTY-FIVE: No construction work of any kind shall be done during the flood season from November 1 to April 15 without prior approval of the Central Valley Flood Protection Board.

TWENTY-SIX: At all times during construction, at least one lane of the levee crown roadway shall be kept clear for vehicular access.

TWENTY-SEVEN: No excavation shall be made or remain in the levee section during the flood season from November 1 to April 15 without prior approval of the Central Valley Flood Protection Board.

TWENTY-EIGHT: A temporary bench mark, set to a known datum, shall be placed at the project site during construction.

TWENTY-NINE: All cleared trees and brush shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1 to April 15.

THIRTY: Temporary staging, formwork, stockpiled material and/or equipment shall not remain in the floodway during the flood season from November 1st to April 15.

THIRTY-ONE: The work area shall be restored to the condition that existed prior to start of work.

THIRTY-TWO: Trees, brush, sediment, and other debris shall be kept cleared from the bridge site and disposed of outside the floodway to maintain the design flow capacity and flowage area.

THIRTY-THREE: If the bridge is damaged to the extent that it may impair the channel or floodway capacity, it shall be repaired or removed prior to the next flood season.

THIRTY-FOUR: All debris generated by this project shall be disposed of outside the adopted plan of flood control and/or the flood control project works.

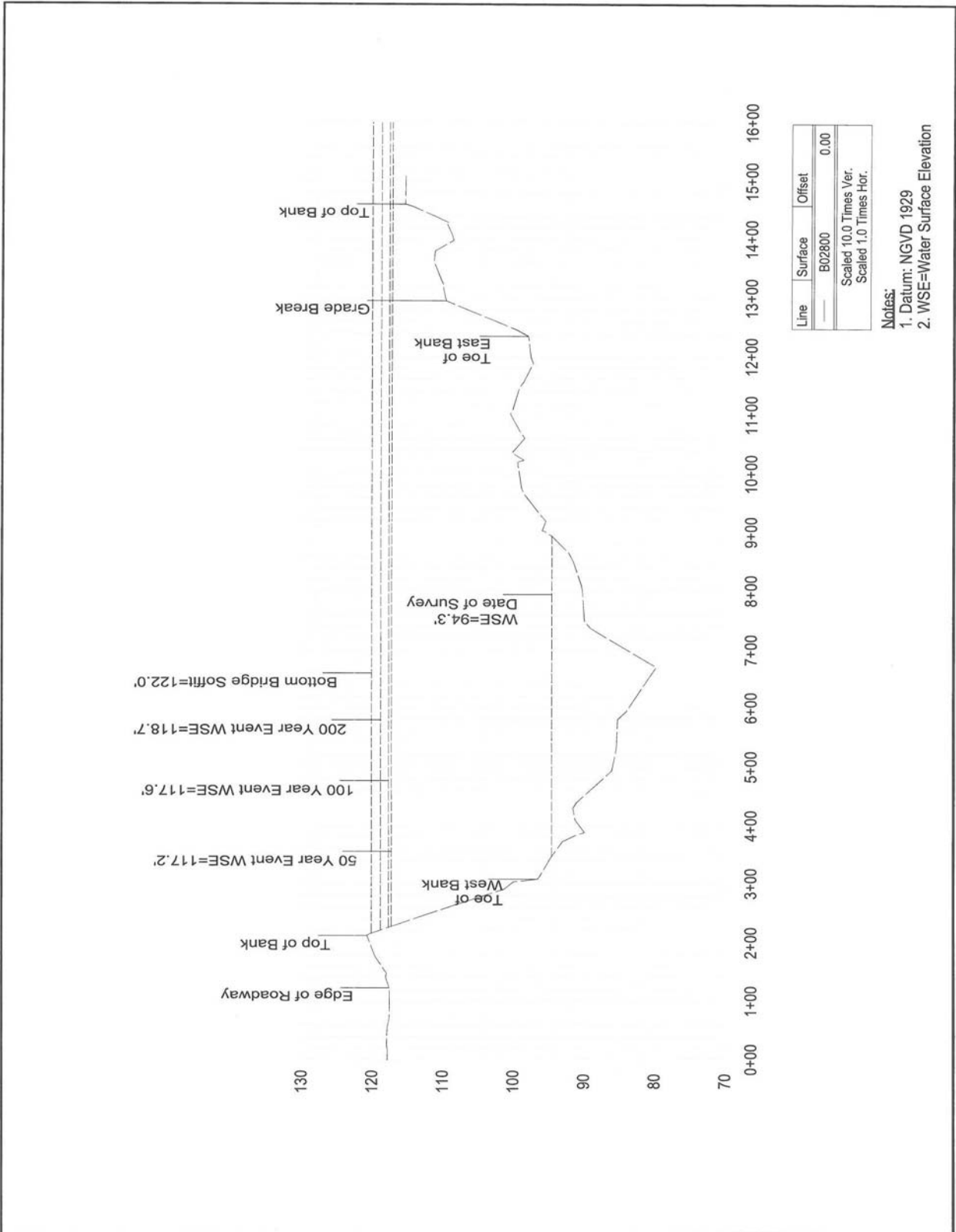
THIRTY-FIVE: If the permitted encroachment result in an adverse hydraulic impact, the permittee shall provide appropriate mitigation measures, to be approved by the Central Valley Flood Protection Board, prior to implementation of mitigation measures.

THIRTY-SIX: The mitigation measures approved by the CEQA lead agency and the permittee are found in its Mitigation and Monitoring Reporting Program (MMRP) adopted by the CEQA lead agency. The permittee shall implement all such mitigation measures.

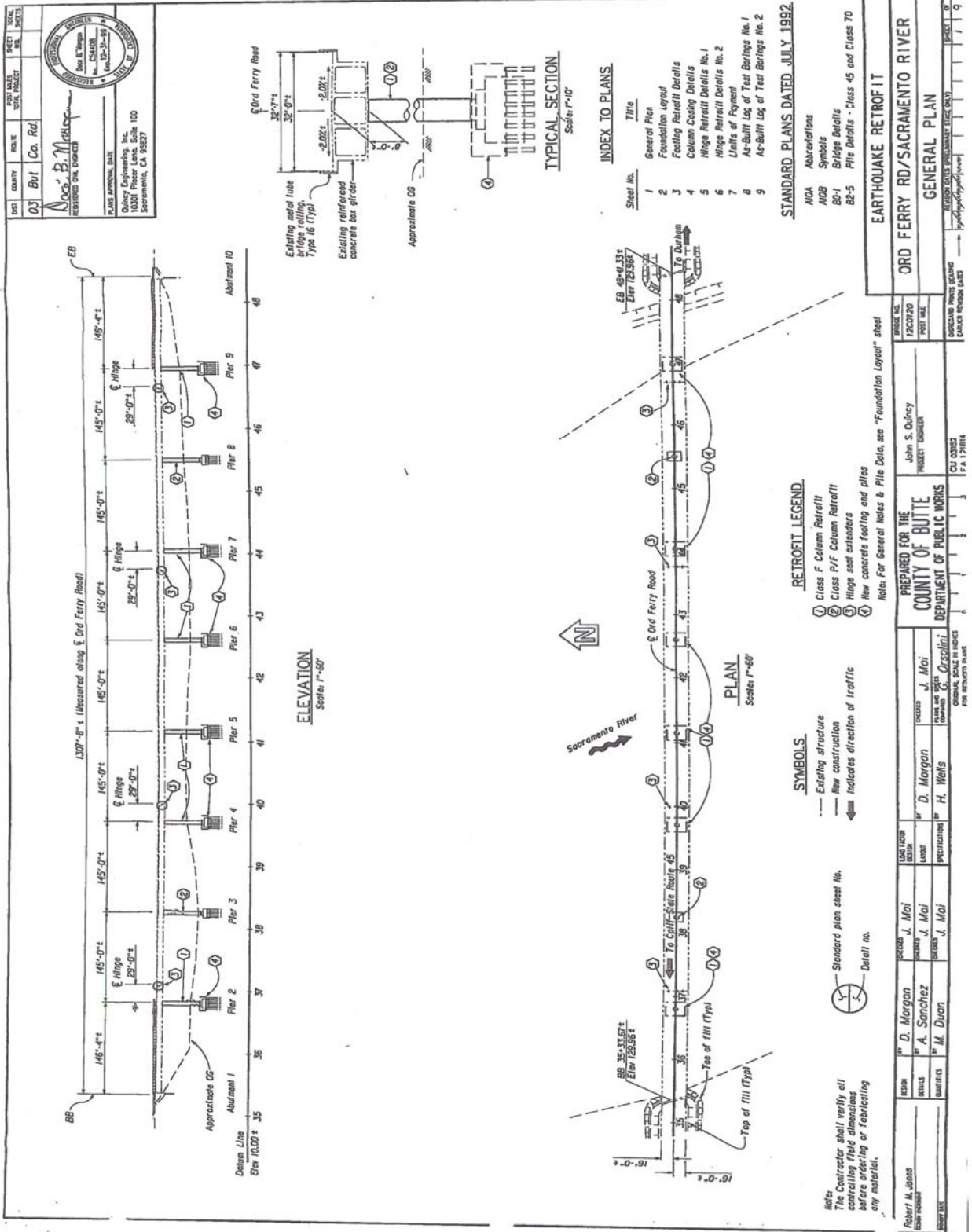
THIRTY-SEVEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

THIRTY-EIGHT: The letter from the Department of the Army dated xxxxx, which is attached to this permit as Exhibit A and is in reference to this project.

Sacramento River Cross Section at the Ord Ferry Bridge



Ord Ferry Bridge General Plan

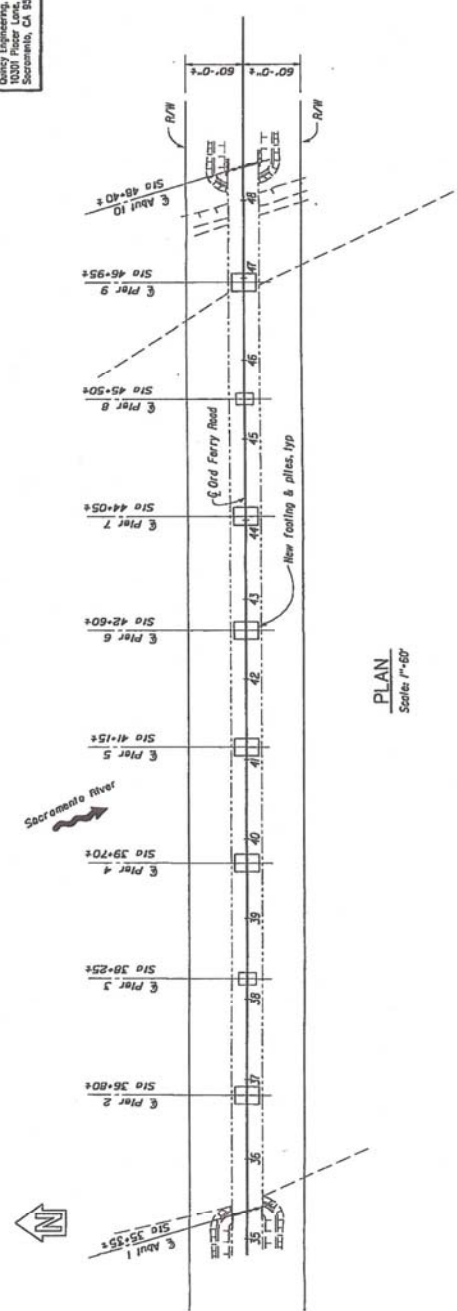


Ord Ferry Bridge Foundation Layout

SHEET TOTAL: 2 OF 9
 COUNTY: Butte Co. Rd.
 PROJECT: Ord Ferry Bridge
 DATE: 12/20/20
 DRAWN BY: J. Mai
 CHECKED BY: J. Mai
 PROJECT ENGINEER: J. Mai
 PROJECT NUMBER: EA 12184

PROFESSIONAL SEAL
 CIVIL ENGINEER
 STATE OF CALIFORNIA
 No. 52400
 DATE: 12/20/20

PLANS APPROVAL DATE: _____
 Doherty Engineering, Inc.
 10301 Florio Lane, Suite 100
 Sacramento, CA 95827



PLAN
 Scale 1"=60'

Pile Data Class 70 Piles - Alternative "B"
 Design Tip elevation is controlled by (1) Compression (2) Tension
 * Reference Elevation is the top of existing footing

| Location | Design Loading (20 Tons) | Allowable Resistance | Compression | Tension | Design Elevation | Specified Elevation | Reference Elevation * |
|----------|--------------------------|----------------------|-------------|---------|------------------|---------------------|-----------------------|
| Pier 2 | 70 Tons | 210 kips | 160 kips | 32.0(1) | 30.0(2) | 30.0 | 72.75 |
| Pier 4 | 70 Tons | 210 kips | 160 kips | 35.0(1) | 27.0(2) | 27.0 | 71.75 |
| Pier 5 | 70 Tons | 210 kips | 160 kips | 35.0(1) | 30.0(2) | 30.0 | 72.75 |
| Pier 6 | 70 Tons | 210 kips | 160 kips | 35.0(1) | 30.0(2) | 30.0 | 71.75 |
| Pier 7 | 70 Tons | 210 kips | 160 kips | 35.0(1) | 30.0(2) | 30.0 | 71.75 |
| Pier 9 | 70 Tons | 210 kips | 160 kips | 34.0(1) | 30.0(2) | 30.0 | 71.75 |

GENERAL NOTES

LOAD FACTOR DESIGN
 Bridge design specifications 1983 AASHTO
 with Interims and Revisions by Caltrans

SEISMIC DESIGN LOAD
 Peak Peak Accel = 0.2g
 Depth of Alluvium = 7.150 feet

REINFORCED CONCRETE (EXISTING)
 (Assumed for Retrofit Evaluation)
 fy = 60,000 psi
 fc = 5,000 psi (Columns)
 fc = 4,500 psi (Remainder of the structure)

REINFORCED CONCRETE (NEW)
 fy = 60,000 psi
 fc = 3,250 psi

STRUCTURAL STEEL (NEW)
 fy = 35,000 psi

Notes:
 The Contractor shall verify all
 controlling field dimensions
 before ordering or fabricating
 any material.

PREPARED FOR THE
 COUNTY OF BUTTE
 DEPARTMENT OF PUBLIC WORKS

DESIGNER: J. Mai
 CHECKER: J. Mai
 PROJECT ENGINEER: J. Mai

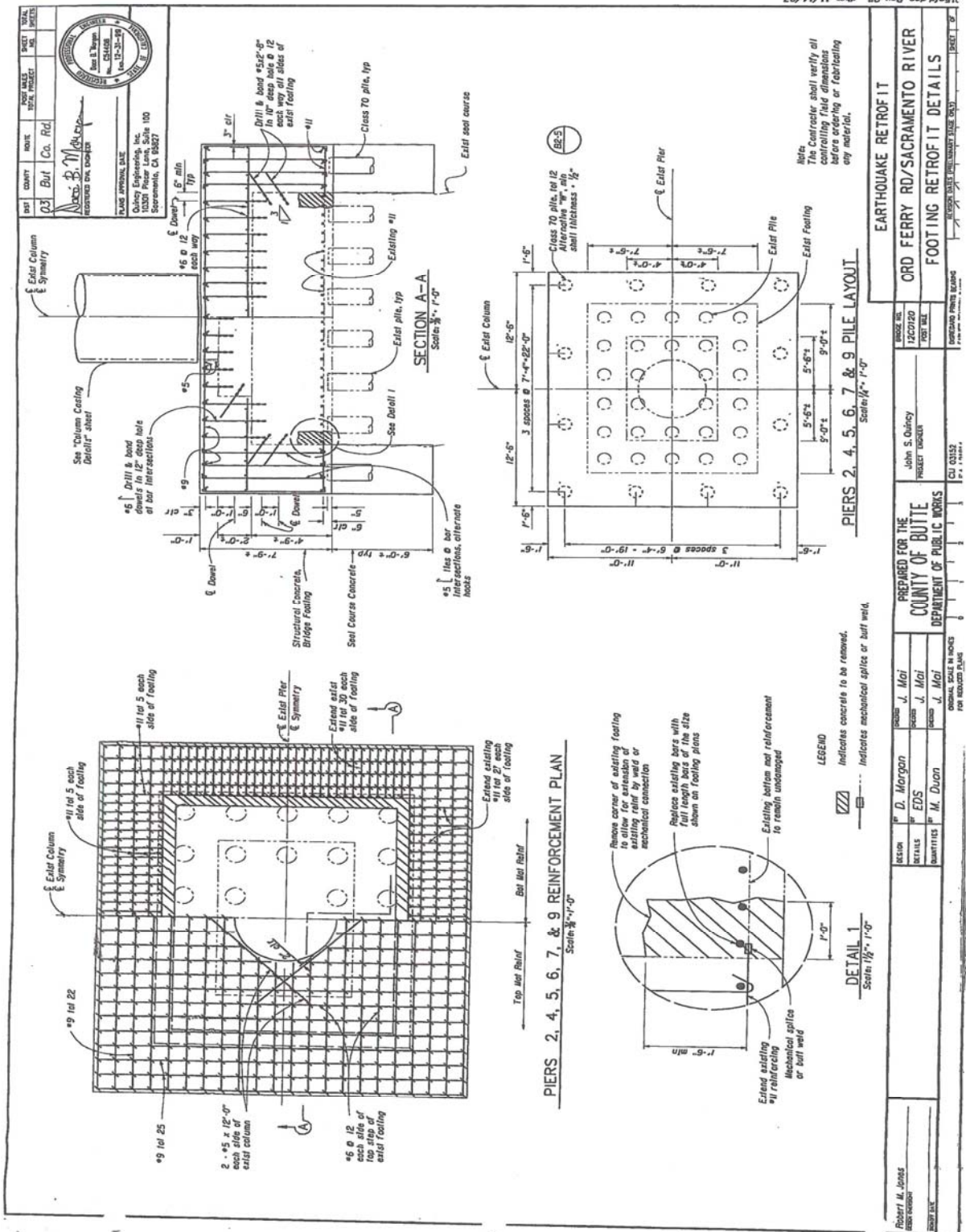
DESIGN SCALE: AS SHOWN
 FOR REDUCED PLANS

BRIDGE NO.: 12C0120
 POST MILE: _____
 ORDERING AGENCY: BUTTE COUNTY
 ORDERING AGENCY DATE: 12/20/20

EARTHQUAKE RETROFIT
 ORD FERRY RD/SACRAMENTO RIVER
 FOUNDATION LAYOUT

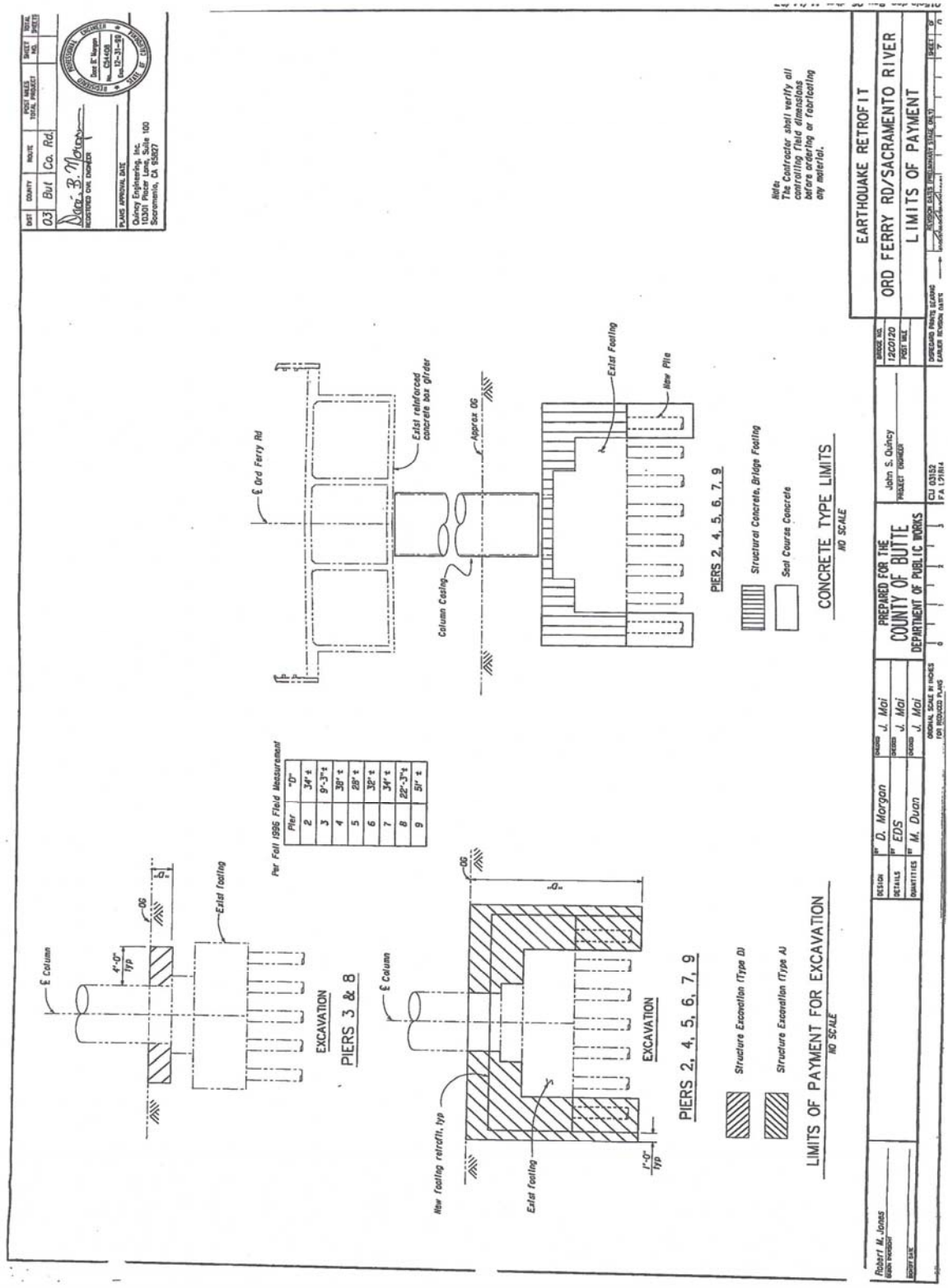
SHEET NO.: 2 OF 9

Ord Ferry Bridge Footing Retrofit Details

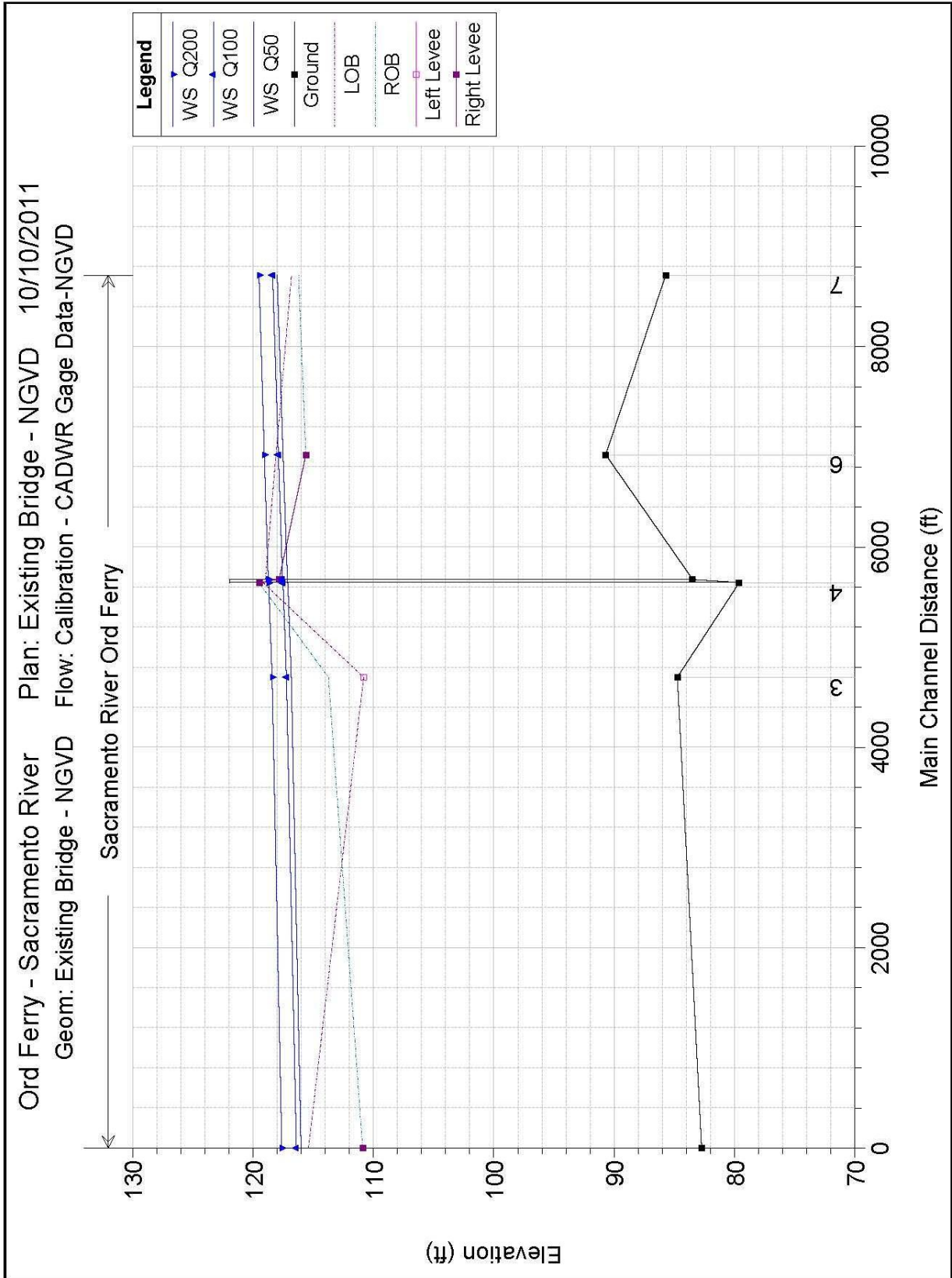


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| PROJECT: BUTTE COUNTY DEPARTMENT OF PUBLIC WORKS PROJECT TITLE: ORD FERRY RD/SACRAMENTO RIVER FOOTING RETROFIT DETAILS SHEET NO.: 11/14/97 | |
| PREPARED FOR THE COUNTY OF BUTTE DEPARTMENT OF PUBLIC WORKS PROJECT MANAGER: John S. Quinby PROJECT NUMBER: 12C0120 | EARTHQUAKE RETROFIT ORD FERRY RD/SACRAMENTO RIVER FOOTING RETROFIT DETAILS SHEET 11 OF 11 |
| DESIGNER: J. Mai CHECKER: J. Mai DATE: 11/14/97 | ORIGINAL SCALE IN WORKS FOR REDUCED PLANS: 1/8" = 1'-0" |

Limits of Excavation and Concrete type



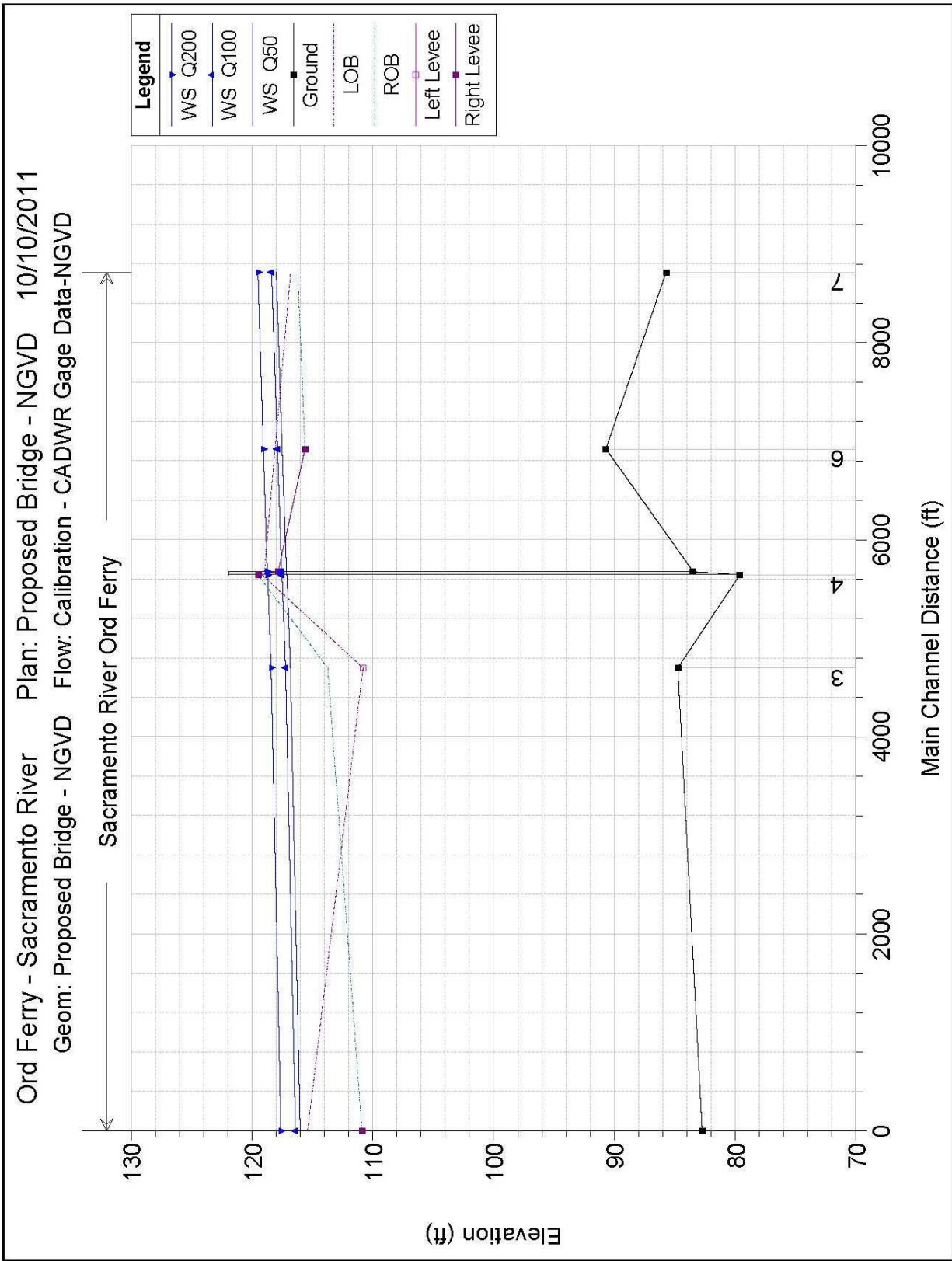
Existing Condition of HEC-RAS Model (100-yr)



HEC-RAS Plan: Exist-NGVD-01 River: Sacramento River Reach: Ord Ferry

| Reach | River Sta | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|-----------|-----------|---------|------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|--------------------|----------------------|-------------------|--------------|
| Ord Ferry | 7 | Q50 | 279000.00 | 85.71 | 117.98 | | 118.04 | 0.000119 | 1.26 | 155279.50 | 24635.85 | 0.07 |
| Ord Ferry | 7 | Q100 | 300000.00 | 85.71 | 118.36 | | 118.41 | 0.000114 | 1.25 | 164522.80 | 24927.34 | 0.06 |
| Ord Ferry | 7 | Q200 | 370000.00 | 85.71 | 119.49 | | 119.56 | 0.000104 | 1.24 | 193284.90 | 25813.30 | 0.06 |
| Ord Ferry | 6 | Q50 | 279000.00 | 90.69 | 117.49 | 113.18 | 117.67 | 0.000398 | 5.37 | 161017.50 | 25393.12 | 0.22 |
| Ord Ferry | 6 | Q100 | 300000.00 | 90.69 | 117.88 | 113.42 | 118.06 | 0.000394 | 5.40 | 170987.50 | 25663.49 | 0.22 |
| Ord Ferry | 6 | Q200 | 370000.00 | 90.69 | 119.06 | 114.12 | 119.22 | 0.000385 | 5.53 | 201517.70 | 26442.08 | 0.21 |
| Ord Ferry | 5 | Q50 | 279000.00 | 83.49 | 117.14 | 106.80 | 117.26 | 0.000255 | 4.23 | 171696.60 | 25250.49 | 0.16 |
| Ord Ferry | 5 | Q100 | 300000.00 | 83.49 | 117.53 | 107.43 | 117.65 | 0.000254 | 4.27 | 181643.10 | 25632.77 | 0.16 |
| Ord Ferry | 5 | Q200 | 370000.00 | 83.49 | 118.73 | 112.82 | 118.84 | 0.000238 | 4.26 | 223730.30 | 31366.39 | 0.16 |
| Ord Ferry | 4.5 | Bridge | | | | | | | | | | |
| Ord Ferry | 4 | Q50 | 279000.00 | 79.62 | 117.10 | 105.85 | 117.24 | 0.000242 | 4.40 | 170918.50 | 25175.49 | 0.17 |
| Ord Ferry | 4 | Q100 | 300000.00 | 79.62 | 117.49 | 106.52 | 117.63 | 0.000243 | 4.45 | 180838.20 | 25558.42 | 0.17 |
| Ord Ferry | 4 | Q200 | 370000.00 | 79.62 | 118.68 | 112.76 | 118.81 | 0.000245 | 4.59 | 211871.70 | 26721.02 | 0.17 |
| Ord Ferry | 3 | Q50 | 279000.00 | 84.74 | 116.81 | 113.06 | 116.97 | 0.000328 | 5.69 | 167684.30 | 27130.64 | 0.20 |
| Ord Ferry | 3 | Q100 | 300000.00 | 84.74 | 117.20 | 113.24 | 117.36 | 0.000322 | 5.70 | 178611.80 | 27822.95 | 0.20 |
| Ord Ferry | 3 | Q200 | 370000.00 | 84.74 | 118.41 | 113.77 | 118.55 | 0.000306 | 5.73 | 213399.30 | 29920.45 | 0.20 |
| Ord Ferry | 1 | Q50 | 279000.00 | 82.73 | 116.00 | 108.14 | 116.04 | 0.000125 | 2.73 | 228486.70 | 30302.00 | 0.12 |
| Ord Ferry | 1 | Q100 | 300000.00 | 82.73 | 116.40 | 108.33 | 116.44 | 0.000125 | 2.78 | 240703.30 | 30921.10 | 0.12 |
| Ord Ferry | 1 | Q200 | 370000.00 | 82.73 | 117.60 | 108.89 | 117.65 | 0.000125 | 2.90 | 279233.40 | 32797.19 | 0.12 |

Proposed Condition of HEC-RAS Model



HEC-RAS Plan: Prop-NGVD-01 River: Sacramento River Reach: Ord Ferry

| Reach | River Sta | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|-----------|-----------|---------|------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|--------------------|----------------------|-------------------|--------------|
| Ord Ferry | 7 | Q50 | 279000.00 | 85.71 | 117.99 | | 118.04 | 0.000119 | 1.26 | 155285.90 | 24636.05 | 0.07 |
| Ord Ferry | 7 | Q100 | 300000.00 | 85.71 | 118.36 | | 118.41 | 0.000114 | 1.25 | 164529.10 | 24927.54 | 0.06 |
| Ord Ferry | 7 | Q200 | 370000.00 | 85.71 | 119.49 | | 119.56 | 0.000104 | 1.24 | 193291.60 | 25813.50 | 0.06 |
| Ord Ferry | 6 | Q50 | 279000.00 | 90.69 | 117.49 | 113.18 | 117.67 | 0.000398 | 5.37 | 161026.00 | 25393.34 | 0.22 |
| Ord Ferry | 6 | Q100 | 300000.00 | 90.69 | 117.88 | 113.42 | 118.06 | 0.000394 | 5.40 | 170995.70 | 25653.71 | 0.22 |
| Ord Ferry | 6 | Q200 | 370000.00 | 90.69 | 119.06 | 114.12 | 119.22 | 0.000384 | 5.53 | 201525.80 | 26442.30 | 0.21 |
| Ord Ferry | 5 | Q50 | 279000.00 | 83.49 | 117.14 | 106.80 | 117.26 | 0.000254 | 4.23 | 171706.30 | 25250.87 | 0.16 |
| Ord Ferry | 5 | Q100 | 300000.00 | 83.49 | 117.53 | 107.43 | 117.65 | 0.000254 | 4.27 | 181652.70 | 25633.13 | 0.16 |
| Ord Ferry | 5 | Q200 | 370000.00 | 83.49 | 118.73 | 112.82 | 118.84 | 0.000238 | 4.26 | 223741.10 | 31366.96 | 0.16 |
| Ord Ferry | 4.5 | Bridge | | | | | | | | | | |
| Ord Ferry | 4 | Q50 | 279000.00 | 79.62 | 117.10 | 105.85 | 117.24 | 0.000242 | 4.40 | 170918.50 | 25175.49 | 0.17 |
| Ord Ferry | 4 | Q100 | 300000.00 | 79.62 | 117.49 | 106.52 | 117.63 | 0.000243 | 4.45 | 180838.20 | 25558.42 | 0.17 |
| Ord Ferry | 4 | Q200 | 370000.00 | 79.62 | 118.68 | 112.76 | 118.81 | 0.000245 | 4.59 | 211871.70 | 26721.02 | 0.17 |
| Ord Ferry | 3 | Q50 | 279000.00 | 84.74 | 116.81 | 113.06 | 116.97 | 0.000328 | 5.69 | 167684.30 | 27130.64 | 0.20 |
| Ord Ferry | 3 | Q100 | 300000.00 | 84.74 | 117.20 | 113.24 | 117.36 | 0.000322 | 5.70 | 178611.80 | 27822.95 | 0.20 |
| Ord Ferry | 3 | Q200 | 370000.00 | 84.74 | 118.41 | 113.77 | 118.55 | 0.000306 | 5.73 | 213399.30 | 29920.45 | 0.20 |
| Ord Ferry | 1 | Q50 | 279000.00 | 82.73 | 116.00 | 108.14 | 116.04 | 0.000125 | 2.73 | 228486.70 | 30302.00 | 0.12 |
| Ord Ferry | 1 | Q100 | 300000.00 | 82.73 | 116.40 | 108.33 | 116.44 | 0.000125 | 2.78 | 240703.30 | 30921.10 | 0.12 |
| Ord Ferry | 1 | Q200 | 370000.00 | 82.73 | 117.60 | 108.89 | 117.65 | 0.000125 | 2.90 | 279233.40 | 32797.19 | 0.12 |