Agenda Item 5D

CVFPB Permit No. 19431 COSUMNES RIVER BRIDGE REPLACEMENTS PROJECT (Sacramento County)

September 27, 2019

Presented by:
Mauricio Meza, Engineer, Water Resources
Central Valley Flood Protection Board

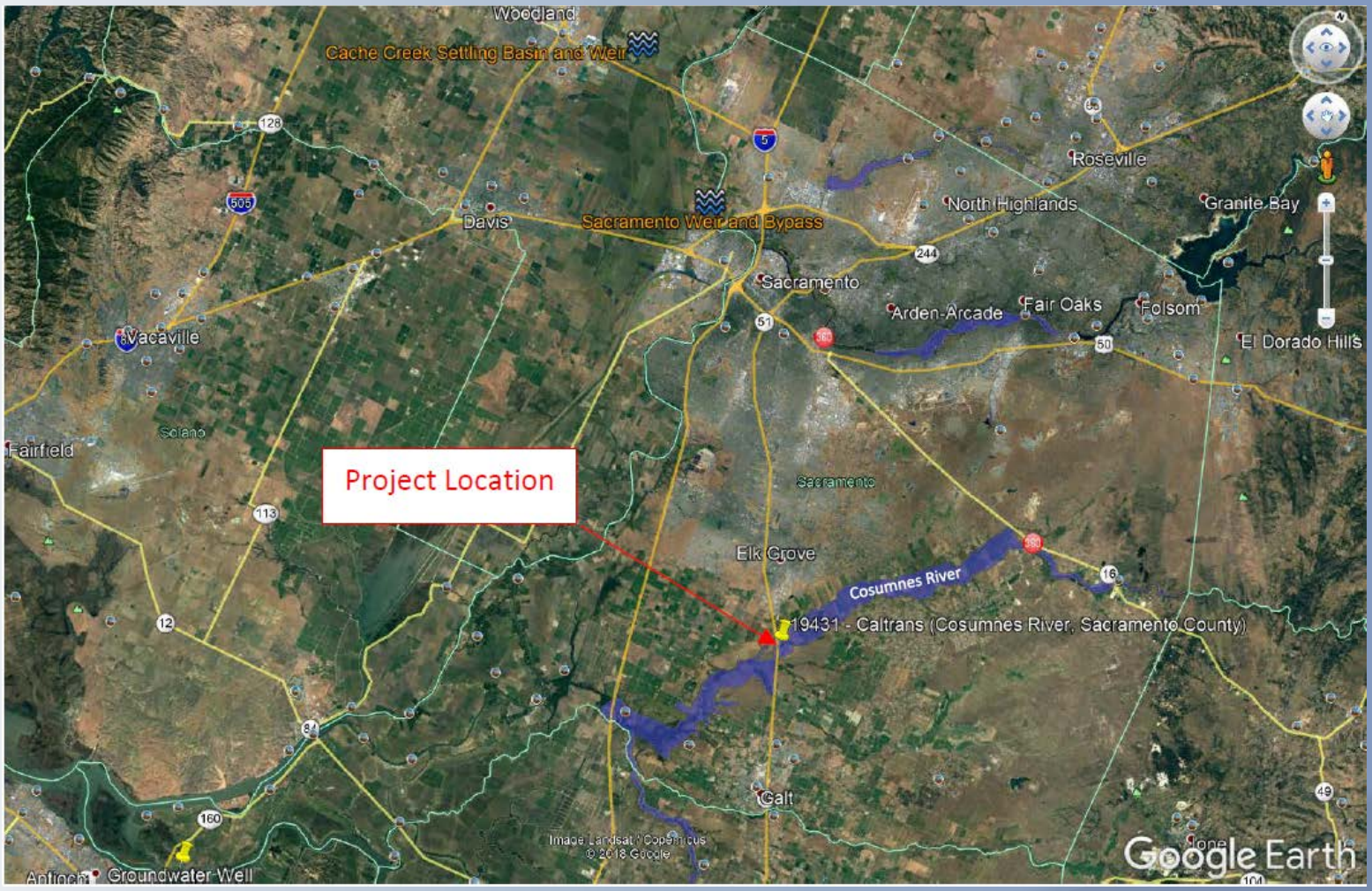
Background

- Applicant : California Department of Transportation. (Caltrans)
- Project Location: The project is located where State Route (SR) 99 crosses the Cosumnes River Designated Floodway (DF), approximately 1.6 miles south of the Grant Line Road Overcrossing, about 2.5 miles south of the City of Elk Grove.
- Stream: Cosumnes River

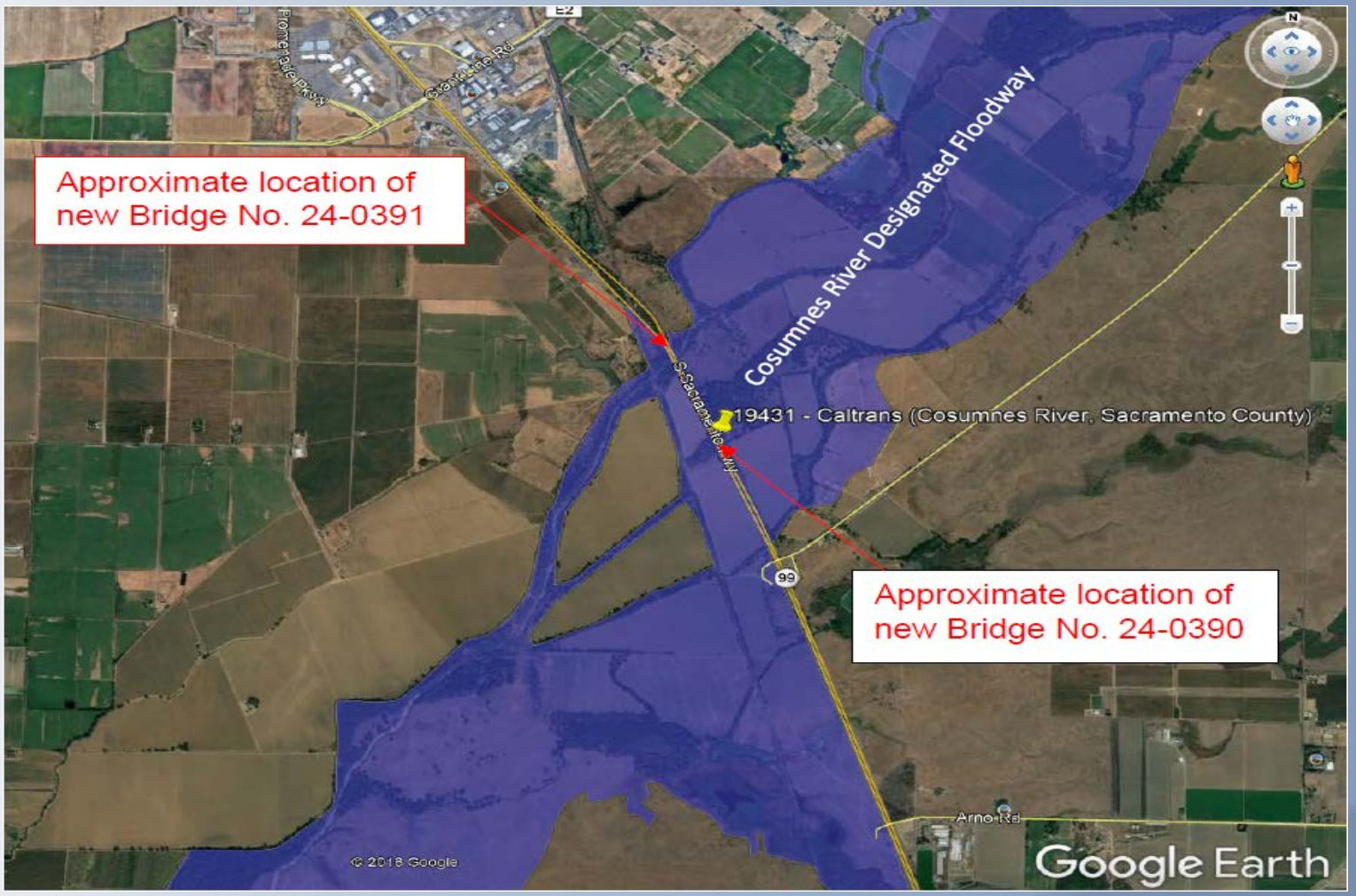
Project Description

- Applicant proposes to:
  - Remove four (4) existing bridge structures within the Cosumnes River DF: two (2) bridges span the main channel at Post Mile (PM) 8.4 (Bridge Nos. 24-0020R and 24-0020L) and two (2) bridges span the overflow channel at PM 7.9. (Bridge Nos. 24-0021R and 24-0021L); and
  - Construct two new bridge structures (Cosumnes River Bridge Nos. 24-0391 and 24-0390).

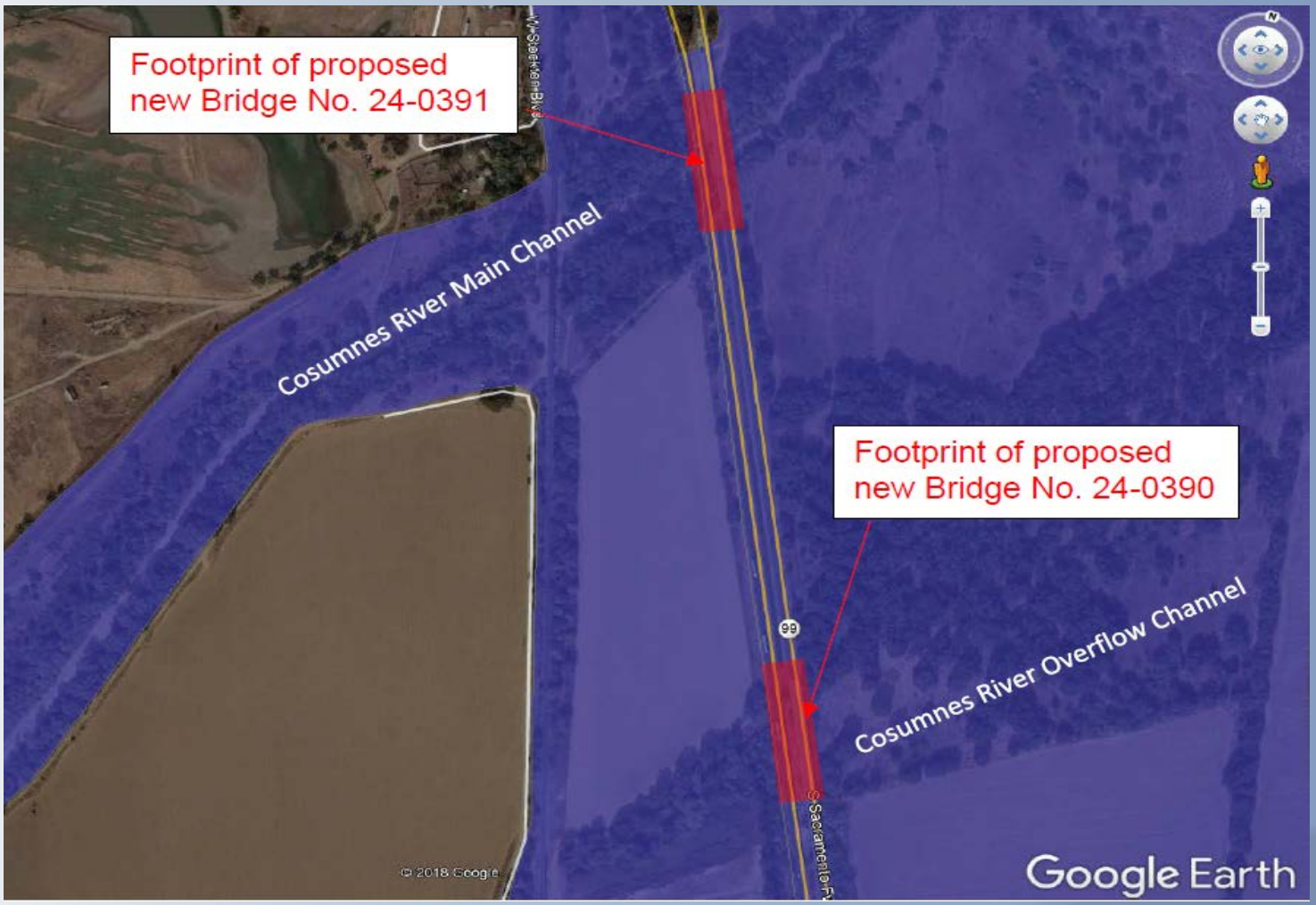
Project Location Map



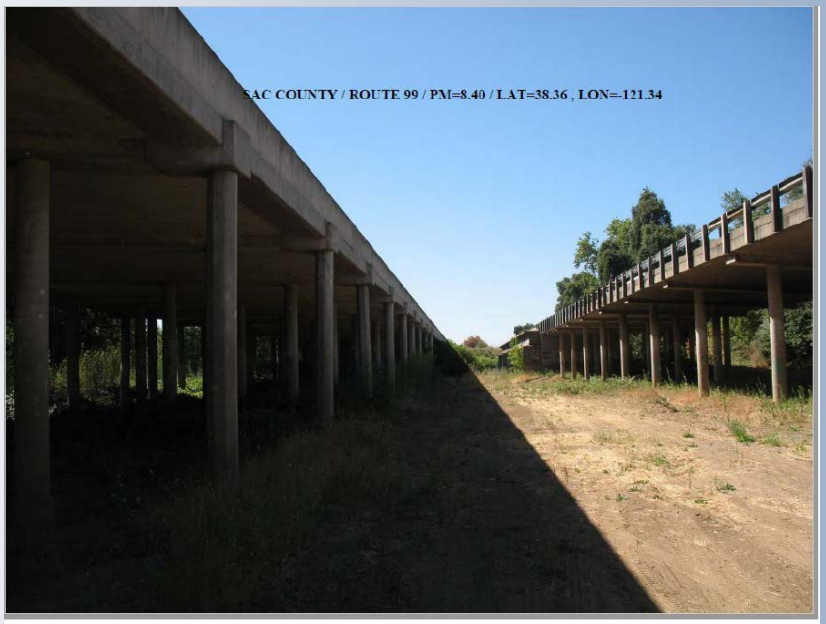
Project Location Map (Cont.)



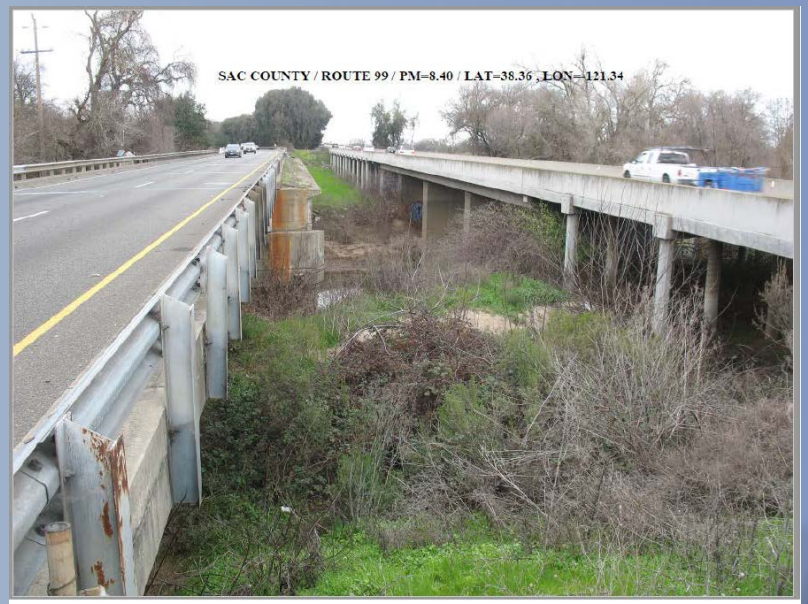
Project Footprint



Photos

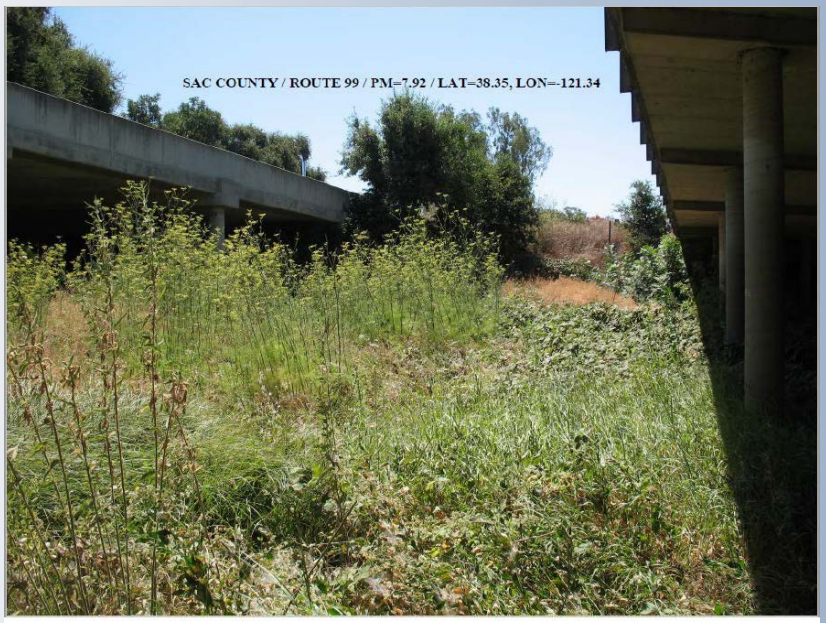


Cosumnes River Bridges spanning the main channel at Post Mile (PM) 8.4 (Bridge Nos. 24-0020R and 24-0020L)



Cosumnes River Bridges spanning the main channel at Post Mile (PM) 8.4 (Bridge Nos. 24-0020R and 24-0020L)

Photos



Cosumnes River Overflow Bridges spanning the overflow channel at PM 7.9. (Bridge Nos. 24-0021R and 24-0021L);

Cosumnes River Overflow Bridges spanning the overflow channel at PM 7.9. (Bridge Nos. 24-0021R and 24-0021L);

Authority of the Board

- California Water Code § 8534, 8590 – 8610.5, and 8700 – 8710
- California Code of Regulations, Title 23, Division 1 (Title 23):
  - § 6, Need for a Permit
  - § 13.3, Consent Calendar
  - § 107, Permitted Uses in Designated Floodways
  - § 112, Streams Regulated and Nonpermissible Work Periods
  - § 121, Erosion Control
  - § 128, Bridges

Project Analysis

- The existing four (4) bridge structures to be replaced were originally constructed in 1958 (Permit No. 2404) and then widened in 1993 (Permit No. 15887).
- Bridge No. 24-0020R crosses the main channel and is 660.8 feet long, 42 feet wide, 22-span bridge with pier walls on reinforced concrete (RC) pile cap on timber piles.
- Bridge 24-0020L also crosses the main channel and is 658.2 feet long, 38 feet wide, 22-span bridge with pier walls on reinforced concrete (RC) pile cap on timber piles.
- Bridge No. 24-0021R crosses the Cosumnes River overflow channel and is a 639.8 feet long, 42-feet wide, 25-span bridge that is constructed with continuous reinforced concrete slab on RC piles/bents.

Project Analysis (Cont.)

- Bridge No. 24-0021L also crosses the river's overflow channel and is a 639.8 feet long, 32.2 feet wide, 25-span bridge with continuous RC slab on RC pile/bents.
- The existing four bridges are thought to be seismically and structurally deficient for rehabilitation. In addition, the two south-bound Cosumnes River bridges (Br No. 24-0020L and 24-0021L) have sub-standard freeway/expressway bridge shoulder widths. The new bridges will meet current Caltrans Bridge Design Standards and all applicable Title 23 Standards.

Project Analysis (Cont.)

- The proposed work consist of:
- Constructing two new bridge structures:
  - Bridge No. 24-0391 will cross the main channel and will be a 697 feet long, 117.5 feet wide, 5-span precast, pre-stressed wide flange girder bridge on seated abutments on piles; and
  - Bridge No. 24-0390 will cross the overflow channel and will be a 665 feet long, 117.5 feet wide, 6-span precast, pre-stressed wide flange girder bridge on seated abutments on piles.
  - Both new bridges will have piers that will consist of five—5-foot diameter concrete columns on 7-foot diameter case-in-drilled-hole (CIDH) piles.
- Removing the existing four bridge structures;
- Constructing two temporary bridges adjacent to the existing Bridges (Nos. 24-0020R and 24-0021R) to accommodate traffic during construction of the new bridges, which is expected to last approximately four (4) years; and
- Placing rock slope protection at all four abutments for scour protection.

Hydraulic Analysis

- The one-dimensional U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center-River Analysis System (HEC-RAS) program was used to assess the impacts.
- The analysis was done using the Board adopted design flow of 81,000 cubic feet-per-second (cfs) for the Cosumnes River DF.
- The DF design water surface elevation (DWSE) at the existing bridges was computed to be 44.58 feet and the proposed soffit elevations in the main and overflow channels for the new bridges will be 50.2 feet and 50.1 feet, respectively. This provides 5.62 feet of flowage clearance in the main channel and 5.52 feet of clearance in the overflow channel.

Hydraulic Analysis

- The hydraulic analysis indicates there will be a slight rise in water surface elevation upstream of the bridges (0.01 feet) and a slight decrease in stream velocity (0.01 feet-per-second (fps)) due to the reduction of the number of bridge spans and piers within the channels.
- Caltrans also evaluated a peak flow of 93,000 cfs that was recorded during the 1997 flood that inundated parts of SR-99 in the Cosumnes River floodplain. The peak water surface elevation for that event was determined to be 44.92 feet. Even with this higher flow the bottom members of the proposed bridges will be 5.28 feet and 5.18 feet above the water surface elevation in the main channel and the overflow channels, respectively.
- The proposed project is not expected to result in any adverse hydraulic impacts to the Cosumnes River DF.

Geotechnical Analysis

- There are no levees associated with this project; therefore, a geotechnical analysis was not required for this review.

Agency comments and endorsements

- There are no Local Maintaining Agencies in the project area.
- The USACE Sacramento District Engineer has no comments or recommendations regarding flood control because the proposed work does not affect a federally constructed project.

CEQA Conclusions:

- Staff has prepared a CEQA analysis, as included in the Staff Report. For information regarding staff's CEQA analysis, refer to Section 8.0 of the Staff Report.

Staff Recommendation

Adopt:

- CEQA finding: The Board, acting as a responsible agency under CEQA, has independently reviewed and considered the environmental documents prepared for the project. Approving Permit 19431 will not result in any significant adverse impacts related to flood risk and no additional mitigation measures within the Board's jurisdiction are required;

Approve:

- Encroachment Permit No. 19431 in substantially the form provided in Attachment A; and,

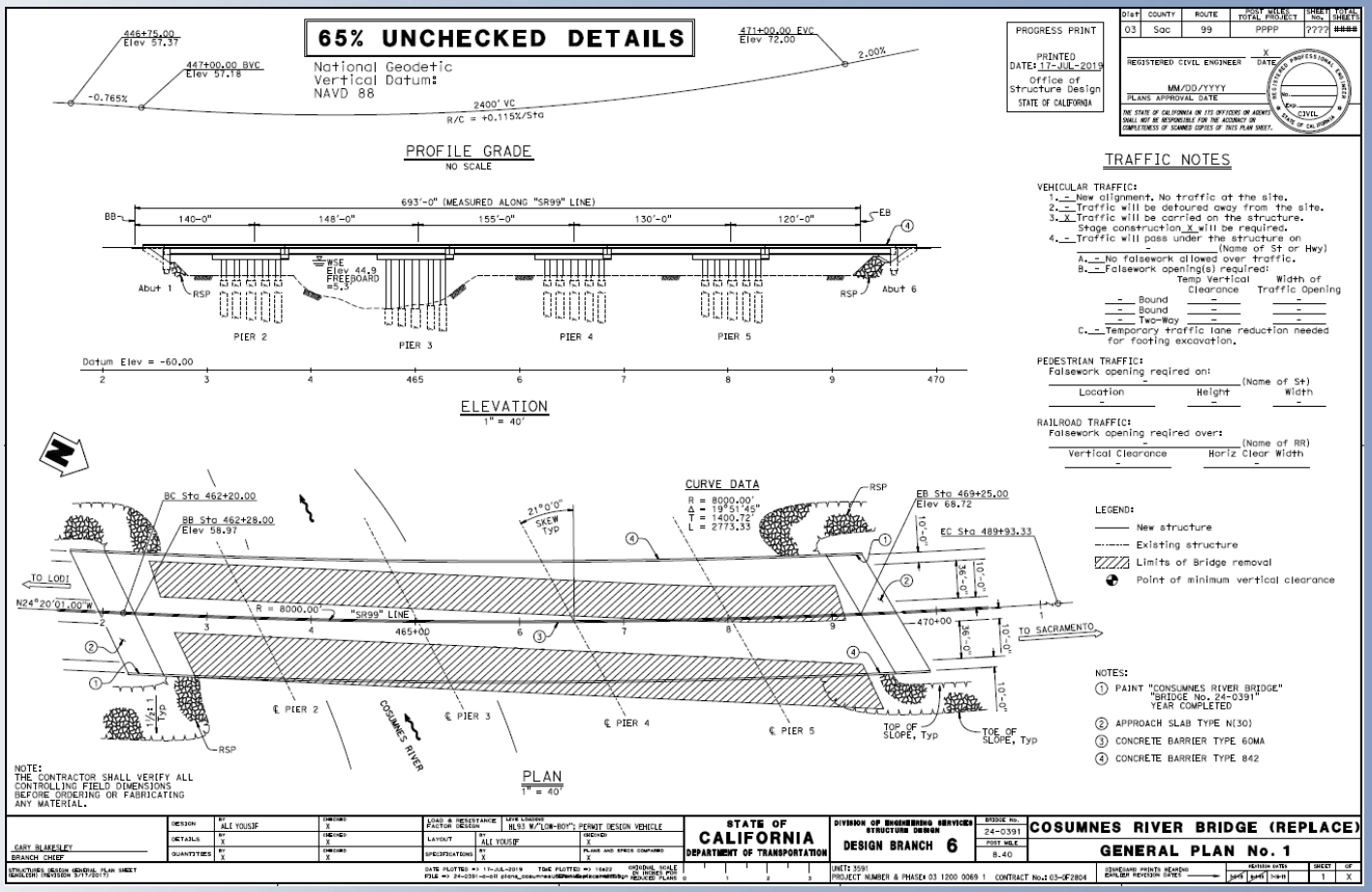
Direct:

- The Executive Officer to take the necessary actions to execute the permit and file a CEQA Notice of Determination with the State Clearinghouse.

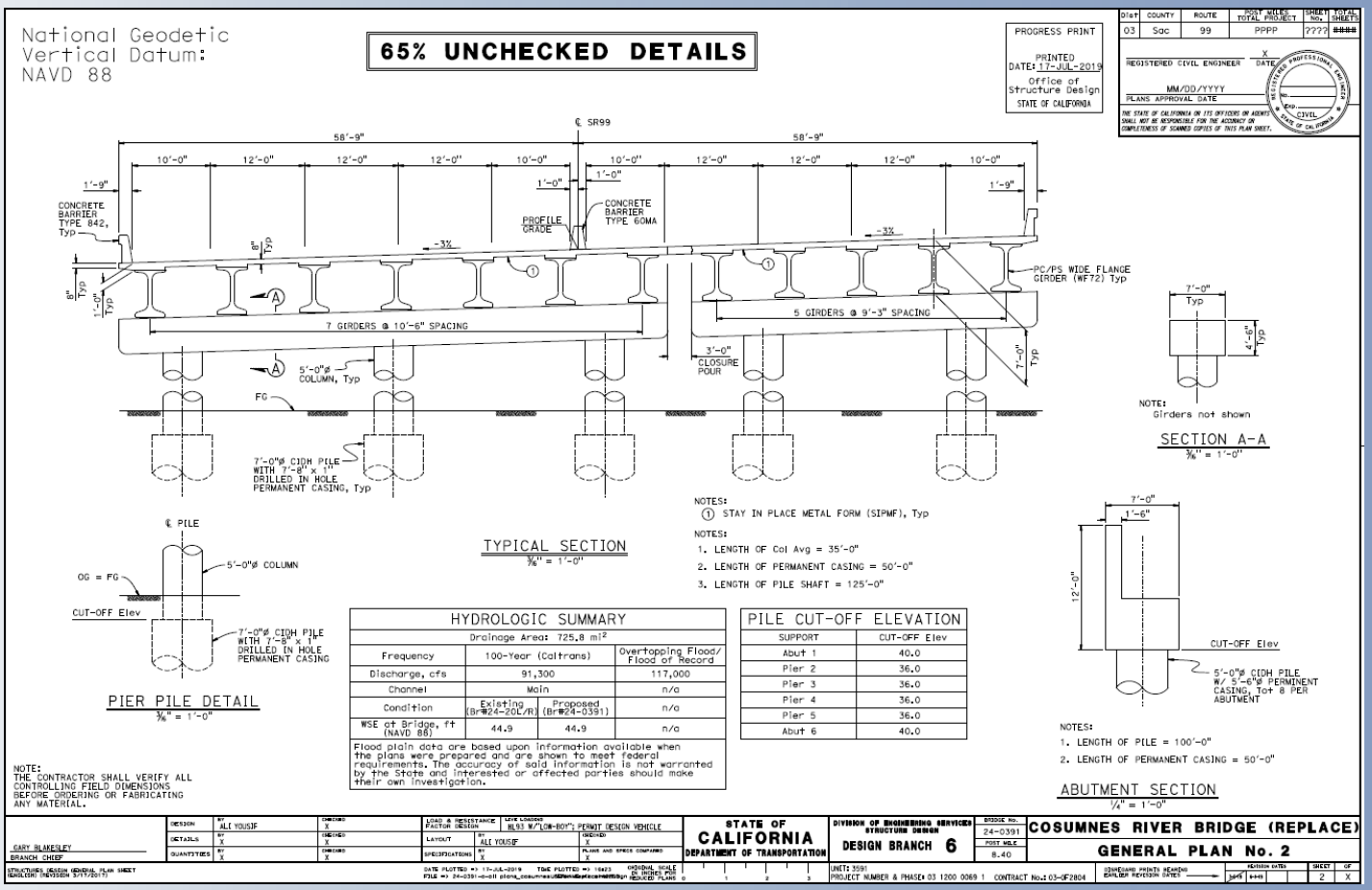
Questions, Comments, Concerns….

Source: pme-acquisition.com

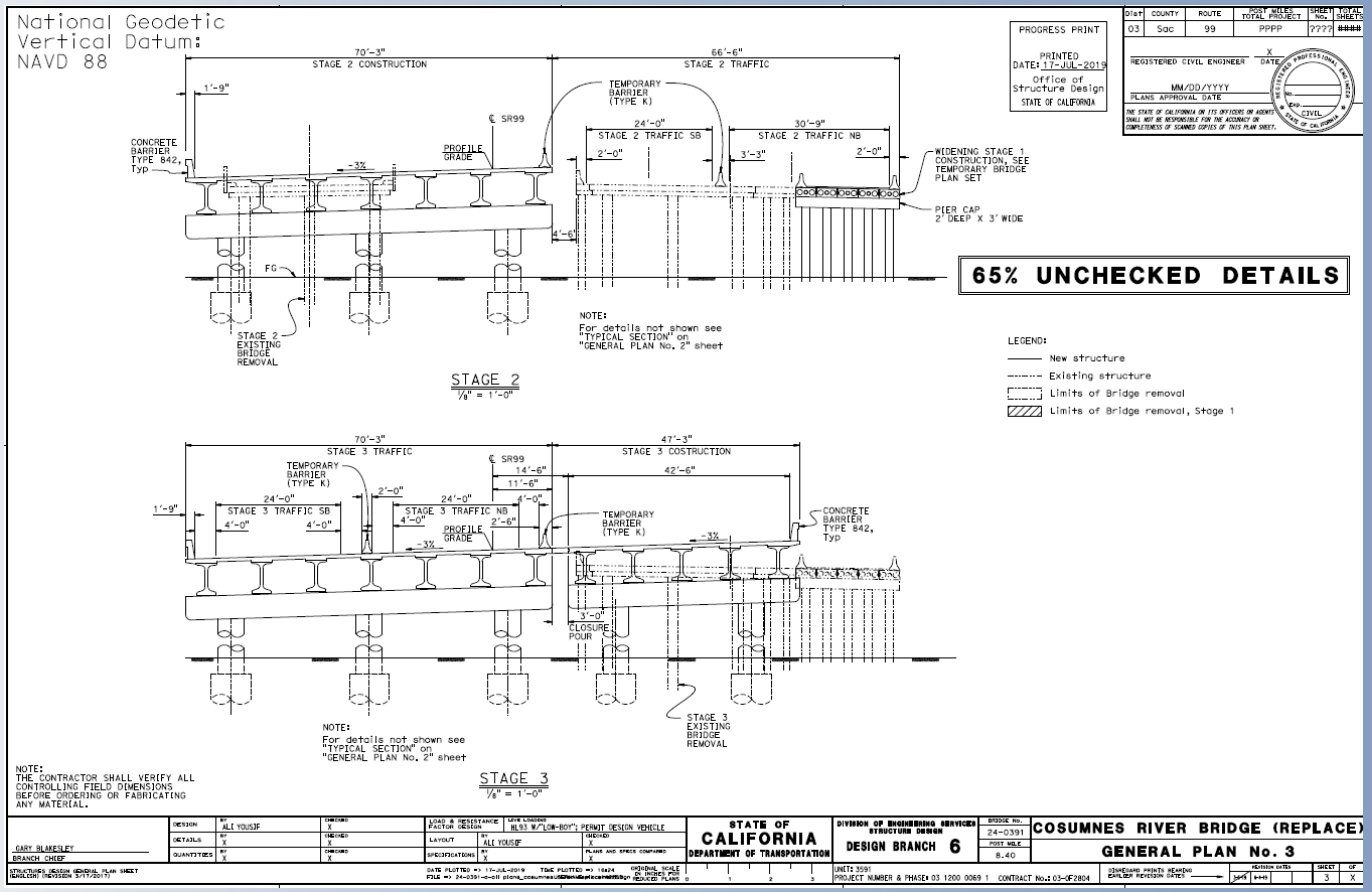
Drawings - Proposed Bridge



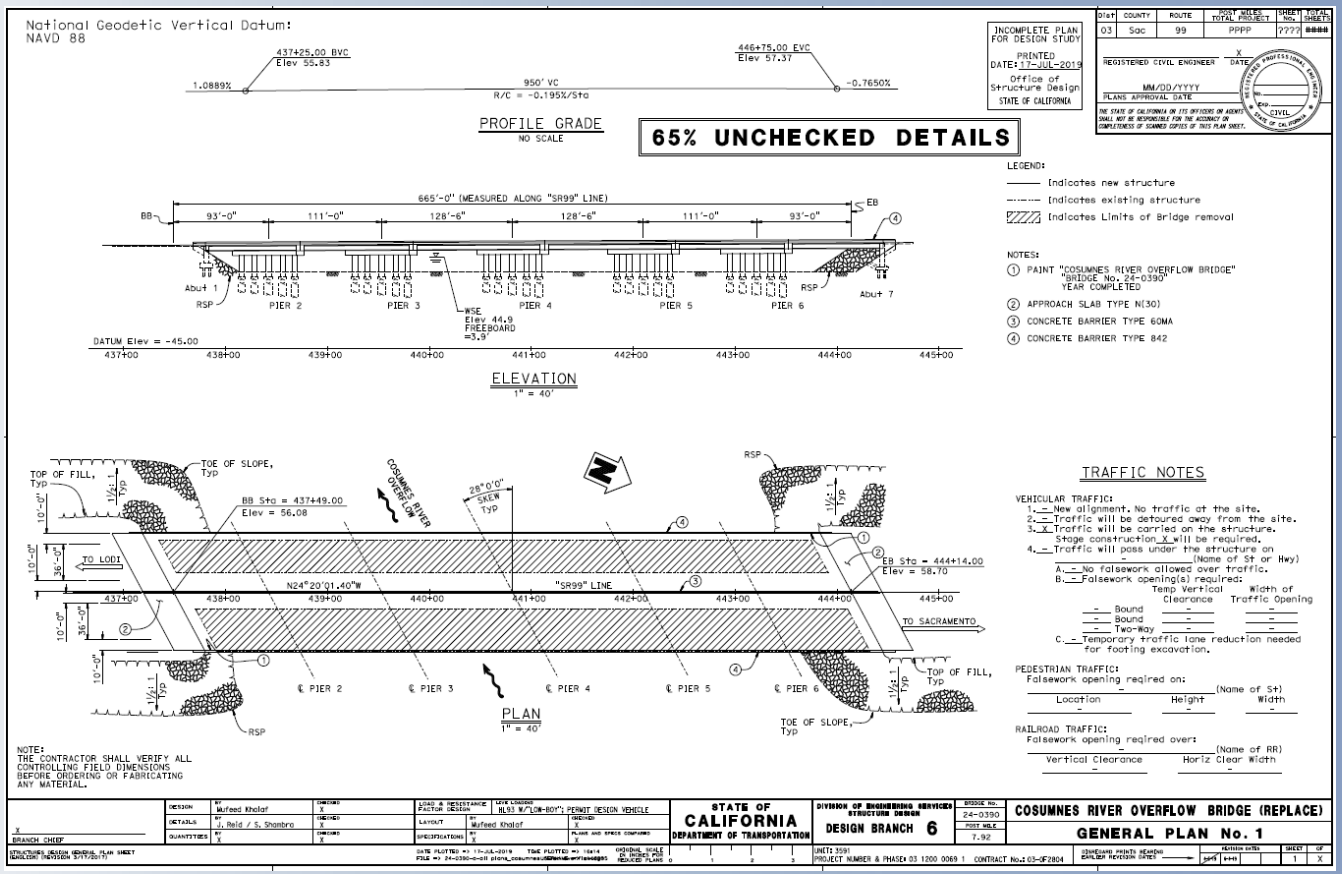
Drawings - Proposed Bridge (Cont.)



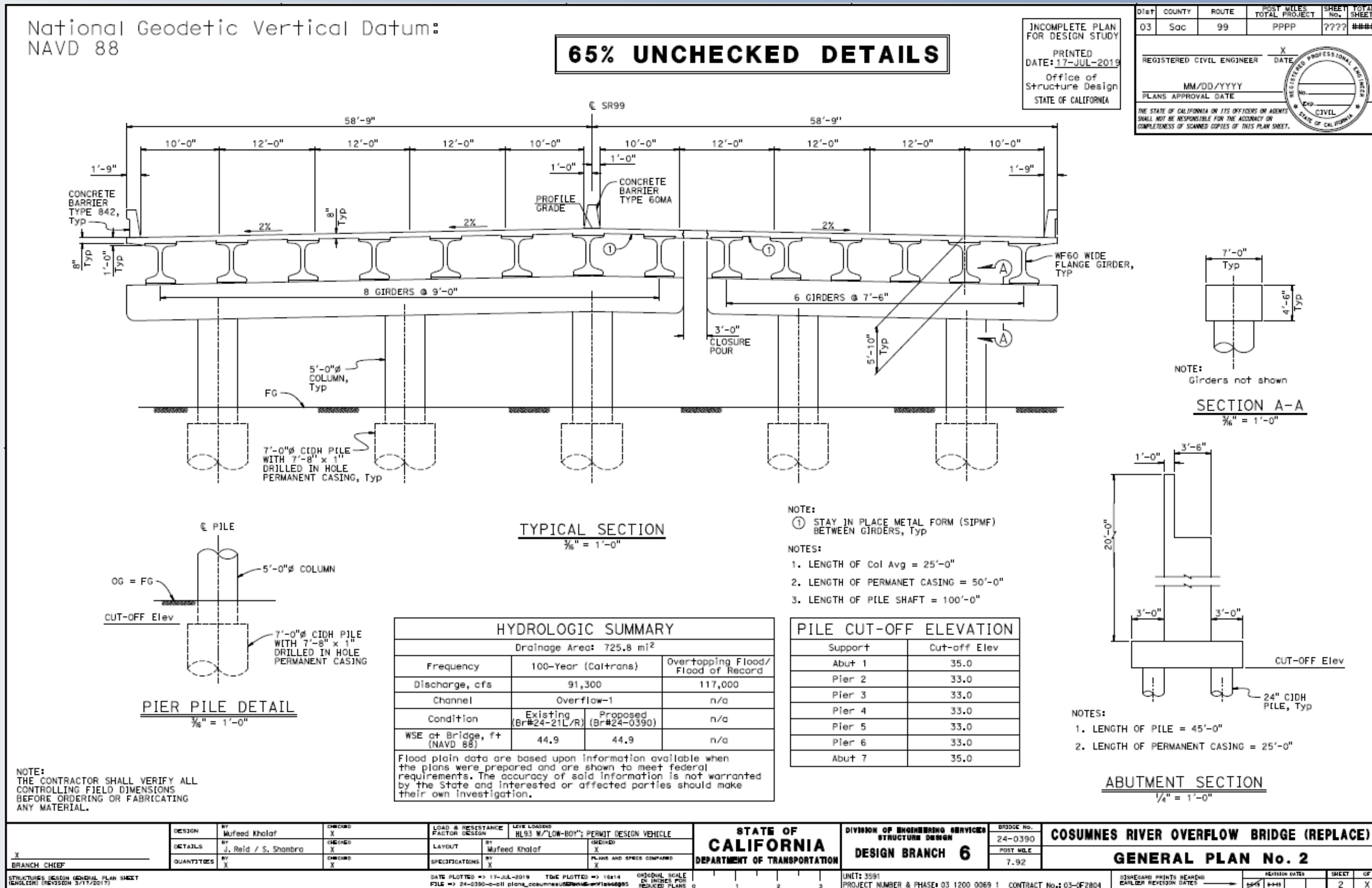
Drawings - Proposed Bridge (Cont.)



Drawings - Proposed Bridge (Cont.)



Drawings - Proposed Bridge (Cont.)



HYDROLOGIC SUMMARY

Drainage Area: 725.8 mi²

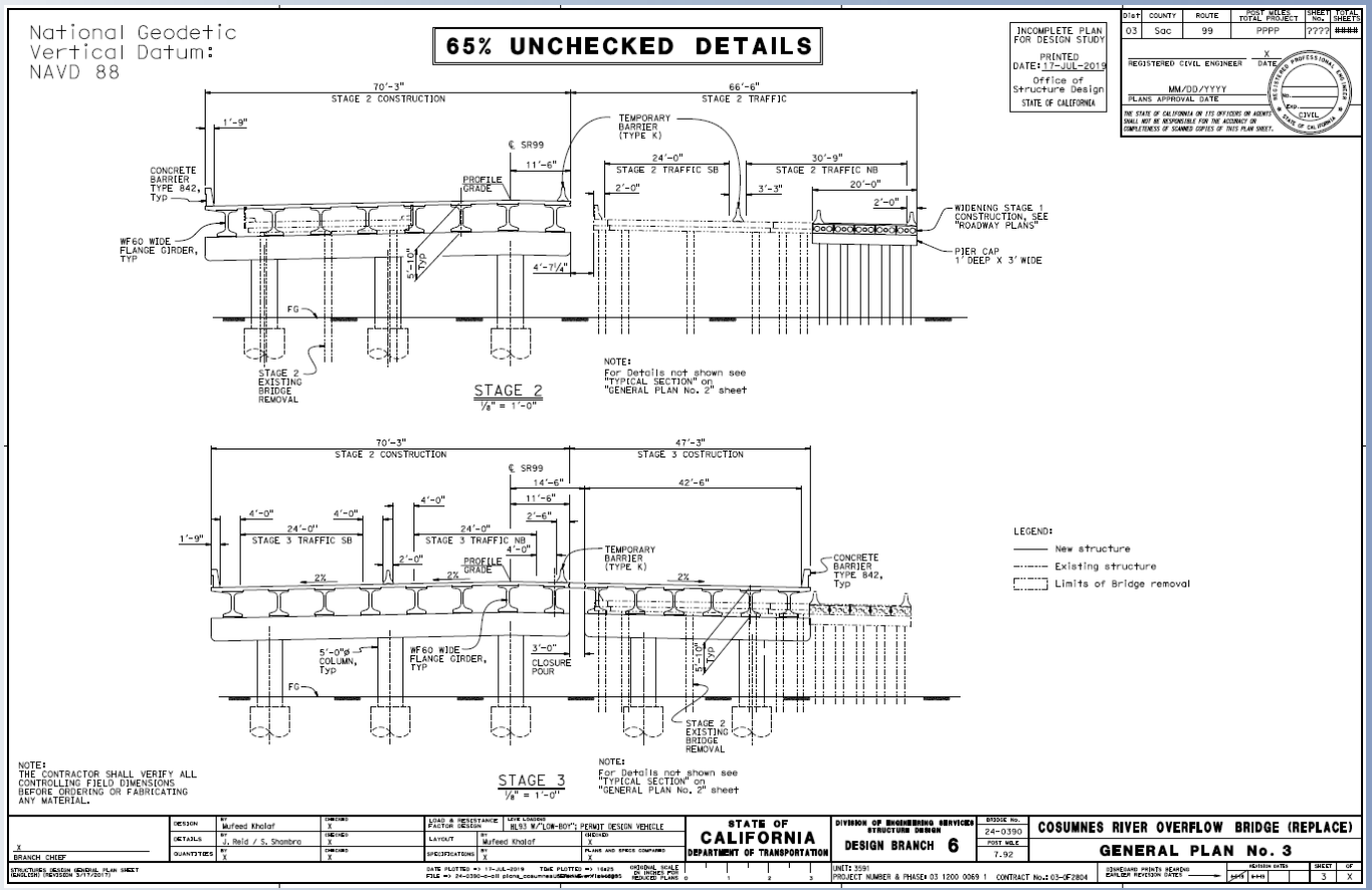
Frequency	100-Year (Caltrans)		Overtopping Flood/ Flood of Record
Discharge, cfs	91,300		117,000
Channel	Overflow-1		n/a
Condition	Existing (Br#24-21L/R)	Proposed (Br#24-0390)	n/a
WSE at Bridge, ft (NAVD 88)	44.9	44.9	n/a

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.

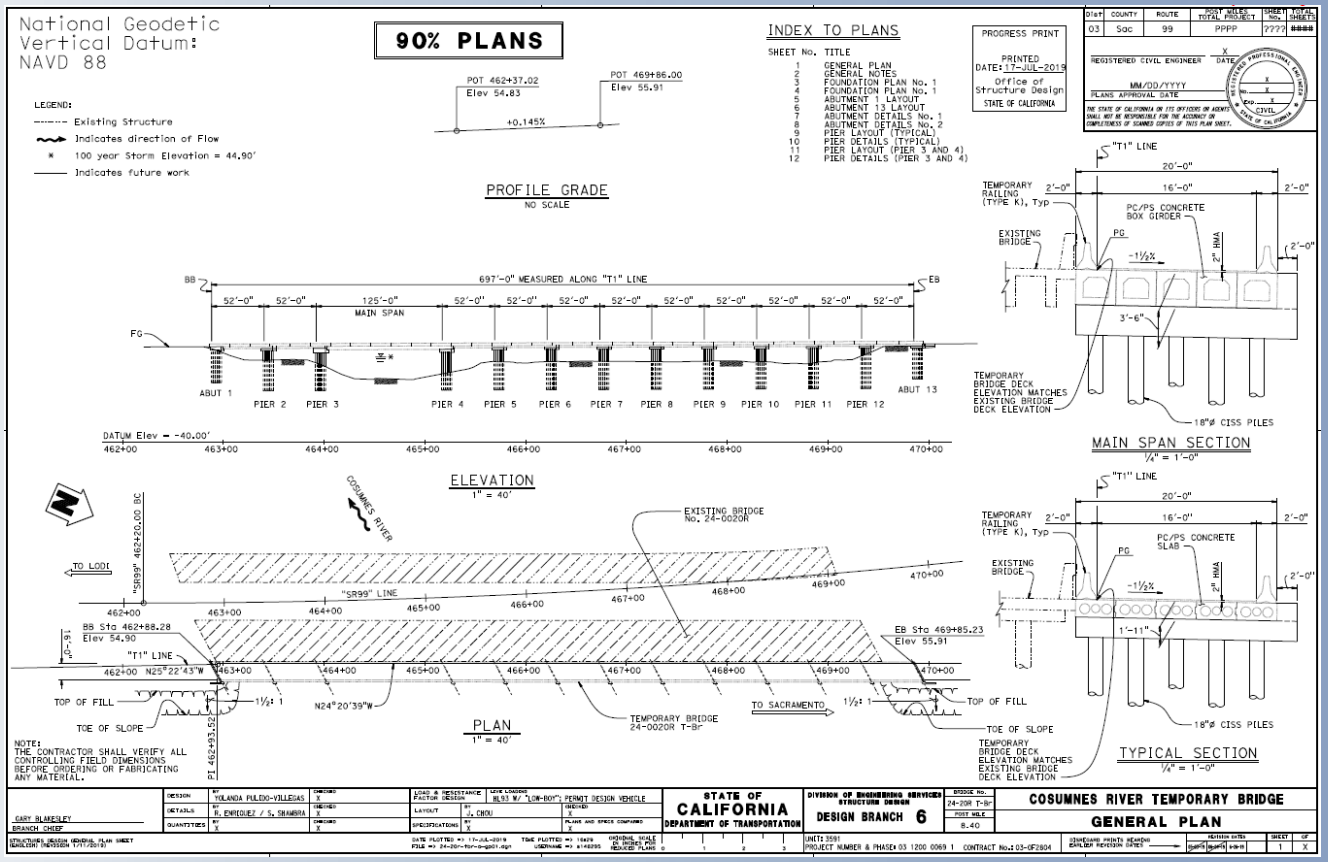
PILE CUT-OFF ELEVATION

Support	Cut-off Elev
Abut 1	35.0
Pier 2	33.0
Pier 3	33.0
Pier 4	33.0
Pier 5	33.0
Pier 6	33.0
Abut 7	35.0

Drawings - Proposed Bridge (Cont.)



Drawings - Proposed Bridge (Cont.)



Drawings - Proposed Bridge (Cont.)

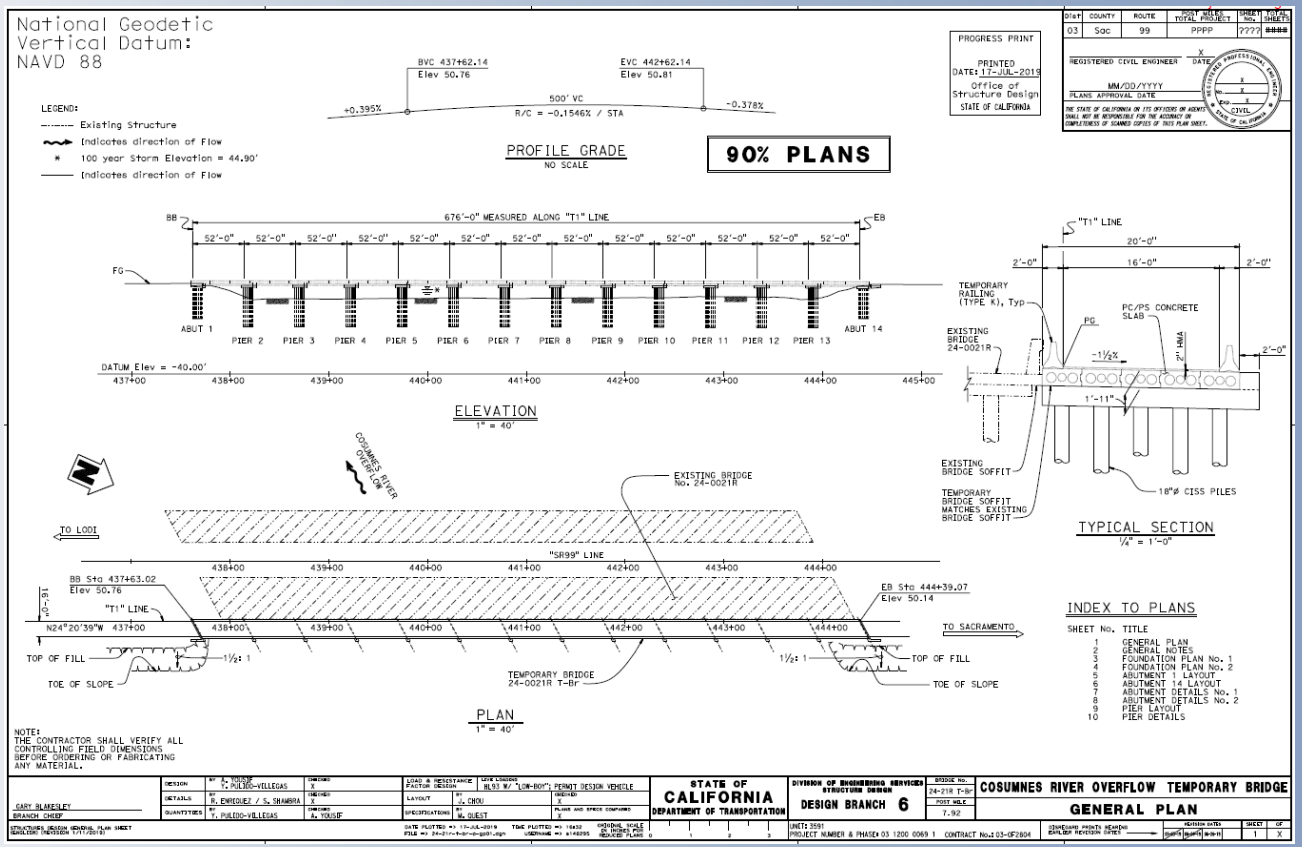


Table 1– Hydraulic Information

HEC-RAS River: main Reach: reach_5 Profile: FEMA

Reach	River Sta	Profile	Plan	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
reach_5	10399.81	FEMA	01	81000.00	29.81	44.58	38.47	44.61	0.000162	1.12	63459.78	13267.37	0.09
reach_5	10399.81	FEMA	02	81000.00	29.81	44.58	38.47	44.61	0.000161	1.12	63510.60	13268.13	0.09
reach_5	10399.81	FEMA	01+temp	81000.00	29.81	44.61	38.47	44.63	0.000160	1.12	63736.74	13271.48	0.09
reach_5	10484.85	FEMA	01	81000.00	29.28	44.60	38.18	44.62	0.000122	1.00	70699.51	13807.71	0.08
reach_5	10484.85	FEMA	02	81000.00	29.28	44.61	38.18	44.63	0.000122	1.00	70752.34	13808.12	0.08
reach_5	10484.85	FEMA	01+temp	81000.00	29.28	44.63	38.18	44.65	0.000121	1.00	70987.30	13809.97	0.08
reach_5	10582.74	FEMA	01	81000.00	28.03	44.62	37.18	44.64	0.000111	1.07	76715.01	14114.64	0.08
reach_5	10582.74	FEMA	02	81000.00	28.03	44.62	37.18	44.64	0.000111	1.07	76771.51	14114.68	0.07
reach_5	10582.74	FEMA	01+temp	81000.00	28.03	44.64	37.18	44.66	0.000110	1.07	77022.42	14114.83	0.07
reach_5	10697.89	FEMA	01	81000.00	28.75	44.63	36.52	44.65	0.000098	1.03	79978.63	14189.54	0.07
reach_5	10697.89	FEMA	02	81000.00	28.75	44.64	36.52	44.65	0.000098	1.02	80035.24	14190.00	0.07
reach_5	10697.89	FEMA	01+temp	81000.00	28.75	44.66	36.52	44.67	0.000097	1.02	80286.84	14192.07	0.07
reach_5	10819.66	FEMA	01	81000.00	27.90	44.65	35.87	44.66	0.000088	0.98	84607.98	14268.84	0.07
reach_5	10819.66	FEMA	02	81000.00	27.90	44.65	35.87	44.67	0.000088	0.97	84668.39	14268.92	0.07
reach_5	10819.66	FEMA	01+temp	81000.00	27.90	44.67	35.87	44.69	0.000087	0.97	84936.70	14269.26	0.07
reach_5	10976.11	FEMA	01	81000.00	28.06	44.66	35.05	44.67	0.000077	0.93	88347.02	14490.56	0.06
reach_5	10976.11	FEMA	02	81000.00	28.06	44.67	35.05	44.68	0.000077	0.93	88409.87	14490.61	0.06
reach_5	10976.11	FEMA	01+temp	81000.00	28.06	44.69	35.05	44.70	0.000076	0.93	88688.98	14490.81	0.06
reach_5	11241.99	FEMA	01	81000.00	28.27	44.68	36.09	44.69	0.000075	0.89	91031.95	14624.57	0.06
reach_5	11241.99	FEMA	02	81000.00	28.27	44.69	36.09	44.70	0.000075	0.89	91094.75	14624.61	0.06
reach_5	11241.99	FEMA	01+temp	81000.00	28.27	44.71	36.09	44.72	0.000074	0.89	91374.00	14624.75	0.06
reach_5	11624.10	FEMA	01	81000.00	23.59	44.71	34.98	44.72	0.000072	0.88	93115.94	14962.07	0.06
reach_5	11624.10	FEMA	02	81000.00	23.59	44.71	34.98	44.73	0.000072	0.88	93179.89	14962.11	0.06
reach_5	11624.10	FEMA	01+temp	81000.00	23.59	44.73	34.98	44.75	0.000071	0.88	93464.16	14962.30	0.06
reach_5	11958.70	FEMA	01	81000.00	28.91	44.74	35.90	44.75	0.000119	1.06	76548.16	13759.36	0.08
reach_5	11958.70	FEMA	02	81000.00	28.91	44.74	35.90	44.76	0.000119	1.06	76603.82	13760.85	0.08
reach_5	11958.70	FEMA	01+temp	81000.00	28.91	44.76	35.90	44.78	0.000118	1.05	76851.09	13767.38	0.08

Existing Bridge = Short ID 01
Proposed Bridge = Short ID 02
Temporary Bridge = Short ID 01+temp

Table 1– Hydraulic Information (Cont.)

HEC-RAS River: main Reach: reach_5 Profile: FEMA

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_5	12317.60	FEMA	01	81000.00	28.52	44.79	38.25	44.83	0.000316	1.52	53349.71	13240.82	0.12
reach_5	12317.60	FEMA	02	81000.00	28.52	44.79	38.25	44.83	0.000316	1.52	53395.84	13243.33	0.12
reach_5	12317.60	FEMA	01+temp	81000.00	28.52	44.81	38.25	44.85	0.000312	1.51	53601.02	13254.50	0.12
reach_5	12674.99	FEMA	01	81000.00	31.28	44.91	38.71	44.96	0.000394	1.63	49665.54	12938.00	0.13
reach_5	12674.99	FEMA	02	81000.00	31.28	44.92	38.71	44.96	0.000393	1.63	49706.91	12939.88	0.13
reach_5	12674.99	FEMA	01+temp	81000.00	31.28	44.93	38.71	44.98	0.000388	1.62	49890.97	12948.25	0.13
reach_5	13129.82	FEMA	01	81000.00	22.88	45.05	35.56	45.08	0.000182	1.29	62826.98	13219.77	0.09
reach_5	13129.82	FEMA	02	81000.00	22.88	45.05	35.56	45.08	0.000181	1.29	62865.93	13220.84	0.09
reach_5	13129.82	FEMA	01+temp	81000.00	22.88	45.07	35.56	45.09	0.000180	1.29	63039.28	13225.61	0.09
reach_5	13502.94	FEMA	01	81000.00	24.94	45.16	38.60	45.20	0.000407	1.41	51839.90	12035.64	0.13
reach_5	13502.94	FEMA	02	81000.00	24.94	45.16	38.60	45.20	0.000406	1.41	51880.36	12041.05	0.13
reach_5	13502.94	FEMA	01+temp	81000.00	24.94	45.18	38.72	45.22	0.000403	1.41	52059.50	12058.82	0.13
reach_5	13887.86	FEMA	01	81000.00	31.36	45.51	41.01	45.58	0.001013	1.64	39034.15	11393.16	0.19
reach_5	13887.86	FEMA	02	81000.00	31.36	45.51	41.01	45.59	0.001011	1.64	39063.75	11395.62	0.19
reach_5	13887.86	FEMA	01+temp	81000.00	31.36	45.52	41.01	45.60	0.001002	1.64	39193.68	11409.78	0.18
reach_5	14326.09	FEMA	01	81000.00	35.65	46.57	45.35	46.94	0.009315	4.89	16580.69	5671.06	0.50
reach_5	14326.09	FEMA	02	81000.00	35.65	46.57	45.35	46.94	0.009312	4.88	16582.61	5671.27	0.50
reach_5	14326.09	FEMA	01+temp	81000.00	35.65	46.58	45.35	46.95	0.009296	4.88	16592.56	5672.35	0.50

Existing Bridge = Short ID 01
Proposed Bridge = Short ID 02
Temporary Bridge = Short ID 01+temp

HEC-RAS Work Map