

LOCATION HYDRAULIC STUDY

EA 06-0V1100

KIN-41-PM 31.6/33.1

October 30, 2019

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- A. Technical Information For Location Hydraulic Study
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- E. Retrofit Project- Final Hydraulic Report 8-18-15
- F. Planning Study Plans 10-30-19

1.0 INTRODUCTION

1.1 Purpose and Scope

The State Route 41 bridge at the Kings River near the town of Stratford will be replaced. The project is deemed needed due to structural reasons, even after recent reinforcements have been made.

1.2 Project Description

The proposed bridge will be replaced, and remain along the same alignment as the existing bridge. An incremental precast slab bridge will be used.

All elevations will be based on new surveys datum different than As-Builts. The proposed bridge profile is expected to remain the same as the existing bridge profile. The bridge soffit elevations of the existing and proposed bridges are 195.94ft and 195.15ft respectively. The water surface elevation for the existing and proposed bridges will not change, and remain at 187.13ft. The proposed bridge will be approximately 330ft long, 43.5ft wide, and 4.5ft depth (2ft deck depth and 2.5ft bent cap depth). It will have 8 spans with 2ft diameter CISS piles.

The existing bridge is approximately 3.25ft deep (1.16ft deck depth and 2.09ft bent cap depth), 260ft long, 46ft wide, and has 12 spans. Bridge trestles may be placed on both sides of the existing bridge during construction. Trestles will minimize impact to the flow of water underneath the bridge. Although the existing bridge has scuppers along eastern and western sides, the proposed bridge will not have any scuppers. Bridge deck drains will carry deck water to each bridge corner, then downdrains will carry water toward the river. Rock Slope Protection may be used at downdrain outlets.

1.3 Project Background

The existing bridge had some reinforcement work recently done due to structural reasons. Additional work is deemed needed despite that. Two options were considered, to either improve the existing bridge more extensively, or to replace it completely. Re-alignments of the proposed bridge were also considered in addition to the original alignment, a western alignment and an eastern alignment. The decision was to replace the bridge using the same alignment.

2.0 SITE CHARACTERISTICS

2.1 Climate

The nearest larger town to the project site with significant climate

information is Lemoore, California. Lemoore is approximately eight miles towards the north. Lemoore terrain is similar to the project site, quite flat with no mountains. There is no snow in the vicinity. There are also no high winds.

Lemoore has an annual high temperature of 77.8 degrees Fahrenheit, occurring around July and August. Monthly average high temperatures during these months are just shy of 100 degrees Fahrenheit. The annual low temperature is 46.8 degrees Fahrenheit, occurring around December and January. The monthly low temperatures during these months are 34 and 36 degrees Fahrenheit respectively.

The least amounts of monthly rainfall occur in June, July, and August. Rainfall during these months are far below 0.25 inch. The most monthly rainfalls occur from January to March, averaging around 1.5 inches. December rainfall is a little below 1.0 inch.

2.2 Topography

Besides the very small town of Stratford, the surrounding land is all used for farming. The terrain is relatively flat. There are larger hills far away to the west, southwest, and south.

The project bridge crosses over the Kings River, which feeds into farmland irrigation canals as well as to Tulare Lake. The lake is normally dry and has no significant water.

The Watermaster for Kings River Water Association (KRWA) has much information about water flow and use in the area. He commented that the period from May 1 to August 31 may have 700cfs to 800cfs of water flowing under the bridge, depending on rain. Empire 1 weir upstream of the bridge, with four diversions, is said to allocate water going to the bridge. Empire 2 weir downstream of the bridge is said to have four allocations of its own, Blakeley Canal, Tulare Lake, Kings River 2, and Crabtree. The Watermaster said Crabtree has small flow and is only approximately 20cfs. He stated some farmers use drip irrigation methods, so any turbidity during construction may affect them. Farmers are noted to regularly pump ground water to the surface. KRWA administers water rights. Its hydrographers also record water flow volumes at each of the downstream Empire 2 weir releases. The Watermaster, however, is reluctant to disclose water flow volumes at the Empire 2 weirs despite Caltrans requests. He did mention that some ground subsidence has occurred, though no subsidence measurements are known to have been taken.

The main source of water for the Kings River is the Pine Flat Lake dam, approximately 50 miles away. Water distribution for the Kings River is quite extensive. There are over 25 jurisdictions and water recipient entities. The Kings River water volume at the bridge is very high during the peak farm irrigation season of "coordinated" water use from May 1 to September 15. Farmers also continue to use "uncoordinated" water after September 15. The lowest water flow for the year is generally from September through December, after the peak irrigation season and before the larger rainfalls.

Water is always ponded year-round at the bridge. This is due to the downstream Empire 2 weirs holding back water. The maximum depth of ponded water is regulated by releasing water downstream. The minimum ponding water depth is not regulated, thus seepage into the ground and evaporation are the only contributors to the water level going down.

Army Corp Of Engineers and Kings River Conservancy District (KRCD) are involved in determining flood release times and volumes during heavy rains. KRCD jurisdiction is only west of the bridge.

2.3 Designated Floodplains

The project bridge vicinity is in FEMA Flood Insurance Rate Map (FIRM) *Zone A*. This zone is expected to be inundated during the 100year flood, with no flood elevations determined. On the west side of State Route 41, from the project bridge up to approximately 1.0 mile northeast, some buildings and farmland are currently expected to be inundated. On the east side of State Route 41, up to approximately 1.0 mile northeast of the project bridge, some buildings and farmland are also currently expected to be inundated. The bridge is higher than the connecting roadways. There is no history of the bridge overtopping.

The Kings River is also under the jurisdiction of the Central Valley Flood Protection Board (CVFPB), and a normal permit is required for bridge work. CVFPB construction window restricts work from November 1 to July 15 of each year. Any work within this restricted window will need a Variance Permit. CVFPB designates 100yr design water flow for the bridge as 3,200 fps with 2.0ft minimum freeboard. Kings River Conservation District is the Local Maintaining Agency for reviewing CVFPB permit applications.

The 100yr storm water surface elevation is approximately 187.13ft for both the proposed and existing bridges. The soffit elevations for the proposed bridge and the existing bridge are 195.15ft and 195.94ft respectively. Freeboard from the soffit for the proposed bridge is

8.02ft, while it is 8.81ft for the existing bridge. Minimum freeboard of 2.0ft is met for the proposed bridge. There are no drift issues.

3.0 PROJECT CONCLUSIONS

3.1 Risk Assessment

The risk of the project on the 100yr floodplain is considered low after construction. The use of bridge trestles will minimize the impact of waterflow under the bridge during construction. The proposed bridge, even though longer and deeper, will not significantly impact the Kings River. This is due to the larger, but fewer, piers being in the water. Minimum freeboard will be met. No additional buildings or farmland will be affected.

3.2 Summary

The scope of the project is bridge replacement. Although the proposed bridge is longer and deeper than the existing bridge, the risk to the 100yr flood plain is low. There is no expected significant impact to the Kings River water flow elevation. The minimum freeboard will still be met. No additional buildings or farmland will be affected.

Study Prepared by:

A handwritten signature in blue ink that reads "Powell Yang". The signature is written in a cursive, flowing style.

Powell Yang, PE

4.0 REFERENCES

1. Technical Information For Location Hydraulic Study
2. Floodplain Evaluations Report Summary
3. Flood Insurance Rate Map (FIRM)
4. <https://www.usclimatedata.com>
5. Central Valley Flood Protection Board Freeboard & Design Water Flow Requirement Email 2017
6. Retrofit Project- Final Hydraulic Report 8-18-15
7. Planning Study Plans 10-30-19

Technical Information For Location Hydraulic Study

Dist. 6 Co. KIN Rte. 41
EA. 06-0V1100 Bridge Number. 45-0007

Floodplain Description:

The project area comprises FEMA Flood Insurance Rate Map (FIRM) Zone A. The scope of the project involves bridge replacement. The project should pose no significant impact on the flood zone.

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

The existing bridge will be replaced. It is approximately 3.25ft deep (1.16ft deck and 2.09ft bent cap), 260ft long, 46 ft wide, and has 12 spans. The existing bridge has scuppers at both east and west sides. It was also recently reinforced. The existing bridge piers will be removed at least 3 ft below the bottom of the river.

The proposed bridge will be incremental precast with approximately a 4.5ft depth (2ft deck and 2.5ft bent cap), 330ft long, 43.5ft wide, and have 8 spans. It will have larger piers of 2ft diameter, but fewer of them. The proposed bridge deck water will go to deck drains, get piped to the four corners, and ultimately go into the river via downdrains. The proposed bridge profile will not be changed from the existing bridge profile. The proposed soffit elevation will be 195.15ft while the existing elevation is 195.94ft, having respective freeboards of 8.02ft and 8.81ft. The required minimum freeboard is 2ft.

2. ADT:

Current 10,800 Projected 13,900

3. Hydraulic Data:

Base Flood

Q100= 3,200 cfs WSE100= 187.13 ft

The flood of record, if greater than Q100

Q= cfs WSE= ft

Are NFIP maps available?

Yes x No

Are NFIP studies available?

Yes No x

4. Is the highway location alternative within a regulatory floodway? Yes No
 x

FLOODPLAIN EVALUATIONS REPORT SUMMARY

Dist. 6 Co. FRE Rte. 41 PM. 31.6/33.1

Project No. EA 06-0V110 Bridge No. 45-0007

Limit:

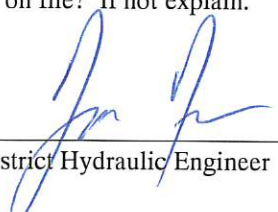
The bridge replacement project scope will only involve the bridge and the approach roadway transitions. The detour, however will involve over 30 miles of total length towards the west. The detour will utilize Interstate 5, Avenal Cutoff Road, and State Route 198.

Floodplain Description:

The project area comprises FEMA Flood Insurance Rate Map (FIRM) Zone A. The scope of the project involves bridge replacement. The project should pose no significant impact on the flood zone.

- | | YES/NO |
|--|------------|
| 1. Is the proposed action a longitudinal encroachment of a floodplain? | <u>No</u> |
| 2. Are the risks associated with the implementation of the proposed action significant? | <u>No</u> |
| 3. Will the proposed action support probable incompatible floodplain development? | <u>No</u> |
| 4. Are there any significant impacts on the natural and beneficial floodplain values? | <u>No</u> |
| 5. Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain value? If yes, explain. | <u>No</u> |
| 6. Does the proposed action constitute a significant floodplain encroachment as defined in 23 CFR, Section 650.105(q)? | <u>No</u> |
| 7. Are Location Hydraulic Studies that document the above answers on file? If not explain. | <u>YES</u> |

PREPARED BY:


District Hydraulic Engineer

10/30/19
Date


District Environmental Branch Chief

Date


District Project Engineer

10/30/19
Date

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The projection used in the preparation of this map was California State Plane, Zone IV. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NNGS12
National Geodetic Survey, SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit their website at <http://www.ngs.noaa.gov/>.

Base map information shown on this FIRM was derived from multiple sources. This information was compiled from the National Geodetic Survey, 2005; Kings County Planning Agency, 2006; and U.S. Geological Survey, 1989. Additional information was photogrammetrically compiled at a scale of 1:12,000 from aerial photography dated 2004.

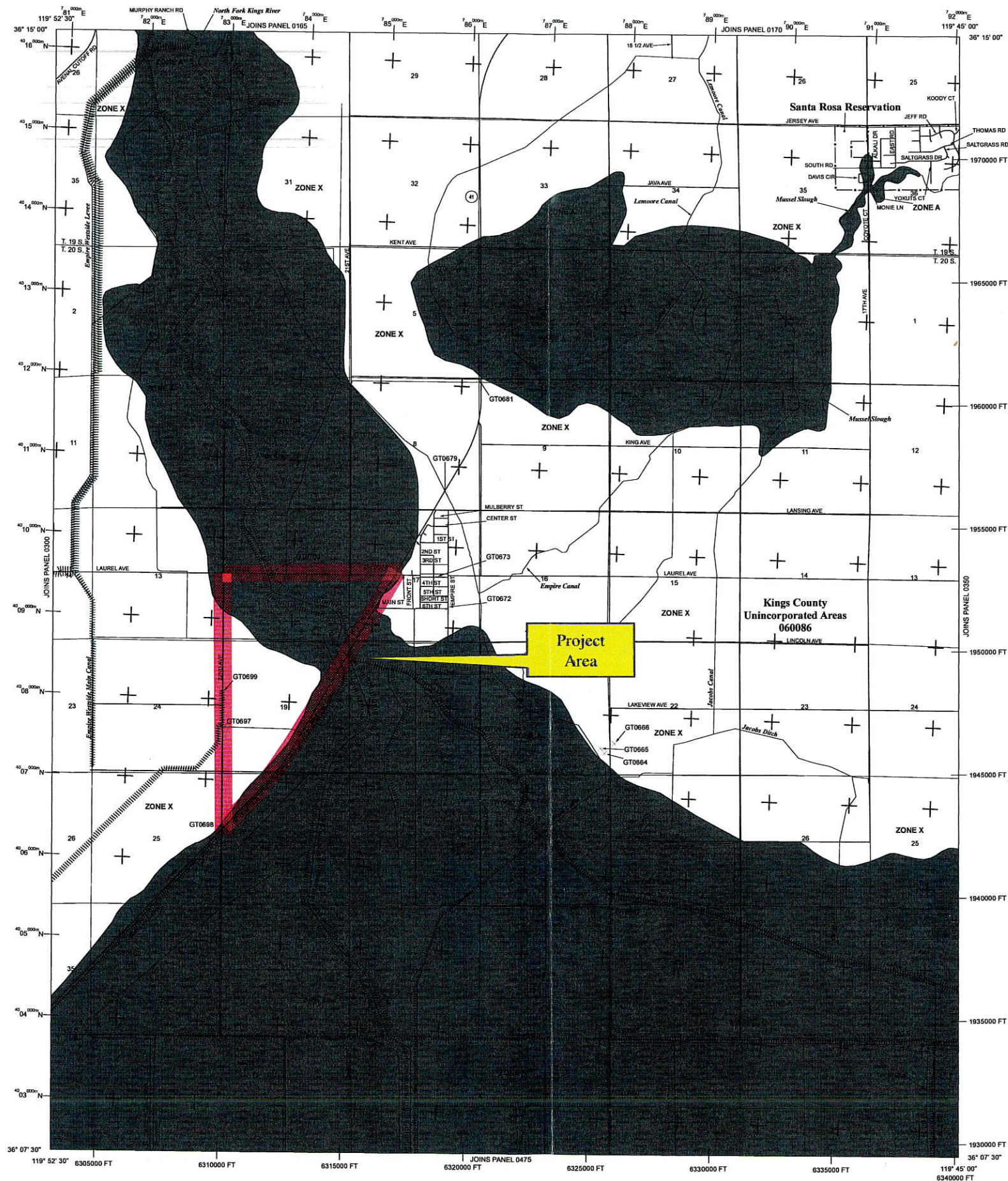
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the FEMA Map Service Center at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and their website at <http://www.msc.fema.gov/>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/>.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AD, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AD** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently destroyed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 1000-meter Universal Transverse Mercator grid values, zone 10 and 11
- 5000-foot grid ticks: California State Plane coordinate system, zone IV (FIPSZONE 0404), Lambert Conformal Conic Projection
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- 914.5 River Mile

MAP REPOSITORIES

Refer to Map Repositories list on Map Index.

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP PANEL

JUNE 16, 2009

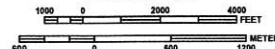
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 2000'



PANEL 0325C

FIRM
FLOOD INSURANCE RATE MAP
KINGS COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 325 OF 875

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:	NUMBER	PANEL	SUFFIX
COMMUNITY	060086	0325	C
KINGS COUNTY			

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06031C0325C

EFFECTIVE DATE
JUNE 16, 2009



Federal Emergency Management Agency

Yang, Powell@DOT

From: Fisher, Tom E@DOT
Sent: Wednesday, February 01, 2017 10:26 AM
To: Yang, Powell@DOT
Subject: FW: Kings River at Route 41

Update on design flow please send to structures hydraulics

From: Wellman-Barbree, Ilene@DWR [mailto:Ilene.Wellman-Barbree@water.ca.gov]
Sent: Wednesday, February 01, 2017 10:23 AM
To: Fisher, Tom E@DOT <tom.fisher@dot.ca.gov>
Cc: Yang, Powell@DOT <powell.yang@dot.ca.gov>
Subject: RE: Kings River at Route 41

Hi

The design flow for that area is actually 3,200 cfs. Sorry for any confusion. The freeboard requirement of 2 feet is still applicable.

Ilene

From: Fisher, Tom E@DOT [mailto:tom.fisher@dot.ca.gov]
Sent: Tuesday, January 31, 2017 9:11 AM
To: Wellman-Barbree, Ilene@DWR
Cc: Yang, Powell@DOT
Subject: RE: Kings River at Route 41

Thanks so much. We will use 5500 cfs as the design flow.

From: Wellman-Barbree, Ilene@DWR [mailto:Ilene.Wellman-Barbree@water.ca.gov]
Sent: Monday, January 30, 2017 4:06 PM
To: Fisher, Tom E@DOT <tom.fisher@dot.ca.gov>
Cc: Yang, Powell@DOT <powell.yang@dot.ca.gov>
Subject: RE: Kings River at Route 41

Hi Tom-

I looked at the O&M manual for Kings River and determined a flow of 5,500 cfs in that area. This makes it a minor stream so 2 feet of freeboard is the requirement for the bridge.

Ilene

From: Fisher, Tom E@DOT [mailto:tom.fisher@dot.ca.gov]
Sent: Friday, January 27, 2017 11:50 AM
To: Wellman-Barbree, Ilene@DWR
Cc: Yang, Powell@DOT
Subject: Kings River at Route 41

Ilene,

Division of Engineering Services
Structure Design Services
Structure Hydraulics and Hydrology
Final Hydraulic Report

Kings River Bridge

Located on Route 41 over South Fork Kings River in the County of Kings

Bridge Number 45-0007

06-KIN-41-PM 32.26

August 18, 2015

Project 0612000110

PREPARED 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

Ronald L. McGaugh
REGISTERED ENGINEER

REGISTRATION NUMBER C 61217



for assessed or calculated scour conditions; field review indicates action is required to protect exposed foundations." The proposed improvements will not lengthen or widen the structure.

Flood History:

There is no history of the bridge overtopping. This structure crosses an irrigation canal managed by the Kings River Conservation District. This canal is primarily used for irrigation purposes, but has an agreement with the US Army Corps of Engineers for emergency use for flood purposes.

Basin:

In the vicinity of our project the South Fork Kings River 4½ miles below Empire No. 1 Weir, meanders in a predominantly southerly direction. This manmade channel was constructed between 1890 and 1915. There are no points of diversion in this reach. High groundwater insures that the channel is generally pooled. The river goes down to Empire Weir No. 2 which is a mile southwest of Stratford (immediately below State Route 41). Our project is just upstream of Empire Weir No 2 along route 41 as shown in Figure 1. Empire Weir No 2 is the limit of our studies for this project.

Streambed:

The bridge has 20 to 27 degrees of hydraulic skew. For the natural channel bottom the Log of Test Borings for the existing structure show sand to silty sand to silty clay. For our study portion of the canal the reach is straight with non- leveed manmade channel as shown in Figure 2.

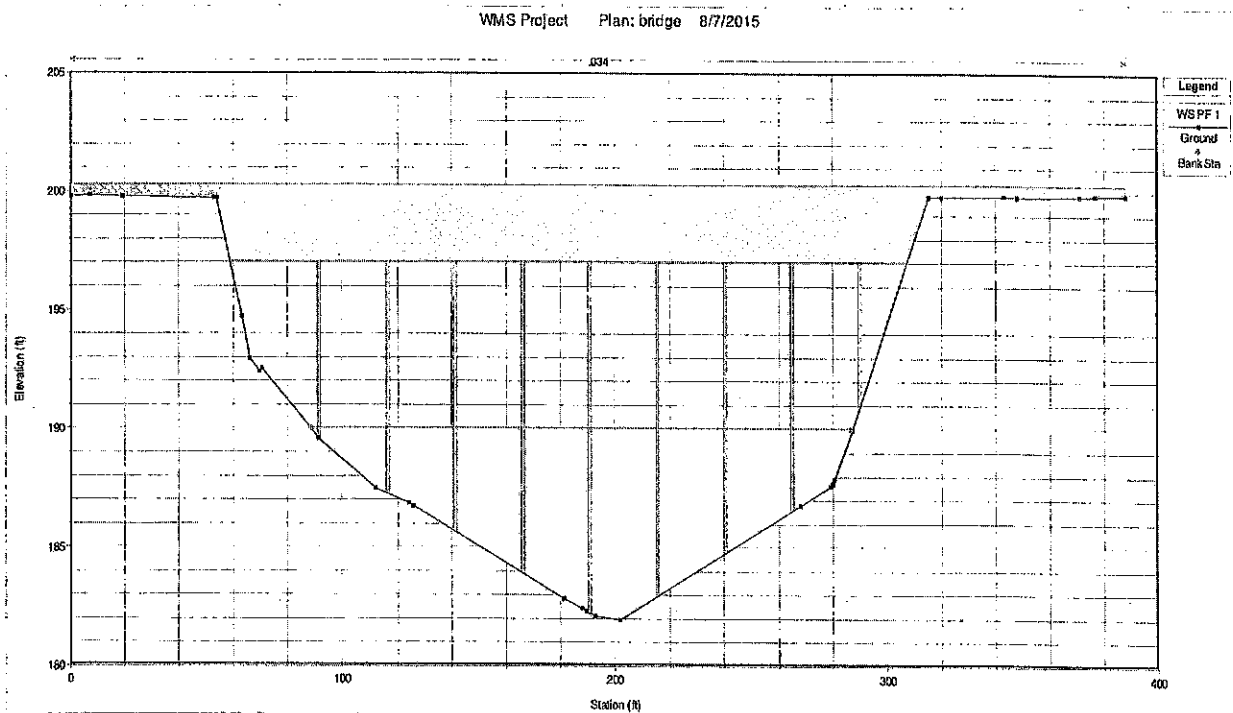


Figure 2

Approximately 500 feet downstream of the bridge there are a series of flow control structures. These flow structures do not determine the depth of flow through the bridge site. The existing

Water Surface Elevations:

The retrofit does not change any substructure elements so no change in water surface elevations will occur		Water Surface Elevation (ft.)	Soffit (ft.)	Freeboard (ft.) from existing bent cap
Existing Structure and retrofitted structure	$Q_{ultimate}$ 6000 cfs	191.63	196.82	5.19
	Q_{100} (3200 cfs)	190.03	196.82	6.79

These water surface elevations are based on the existing ground and assume no changes to the original ground of the channels. The proposed structure causes no significant rise in water surface elevations. The lowest calculated chords of the proposed bridges are used for the freeboard calculations.

Scour:

Historically there is no contraction, abutment, or mitigation scour concerns. Local pier scour is based on 1.5 ft. wide pier columns. Scour calculations are based on the flow of 6000 cfs. There are no migration concerns for this crossing.

Table 1 Proposed scour based on the $Q_{ultimate}$ 6000 cfs

	Abut 1	Bent 2	Bent 3	Bent 4	Bent 5	Bent 6
Scour depth	0	2.20	5.91	3.66	6.46	3.57
Ground elevation	192.02	187.32	183.22	181.82	181.82	182.12
Scour elevation	192.02	185.12	177.31	178.16	175.36	178.55

	Bent 7	Bent 8	Bent 9	Bent 10	Abut 11
Scour depth	5.81	2.87	4.27	1.81	0
Ground elevation	183.52	185.22	183.62	189.22	192.92
Scour elevation	177.71	182.35	182.35	187.41	192.92

All scour depths are measured from the existing grade at column locations.

Hydraulic / Hydrologic Summary Table

Design $Q_{ultimate}$ Discharge 6000 (cfs)	Design Q_{100} Discharge 3200 (cfs)
slope 0.002 ft./ft.	slope 0.002 ft./ft.
Maximum Velocity 5.5 ft./s	Maximum Velocity 3.74 ft./s
Maximum Scour Depth 6.46 ft.	Maximum Scour Depth 5.68 ft.
Maximum Scour elevation 175.36 ft.	Maximum Scour elevation 176.14 ft.
Freeboard minimum 5.12 ft.	Freeboard minimum 5.19 ft.
20 to 27 degree hydraulic bridge skew	20 to 27 degree hydraulic bridge skew
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. Addendums may be necessary as Foundation Reports are completed.	

Scour Data Table for $Q_{ultimate}$ 6000 cfs

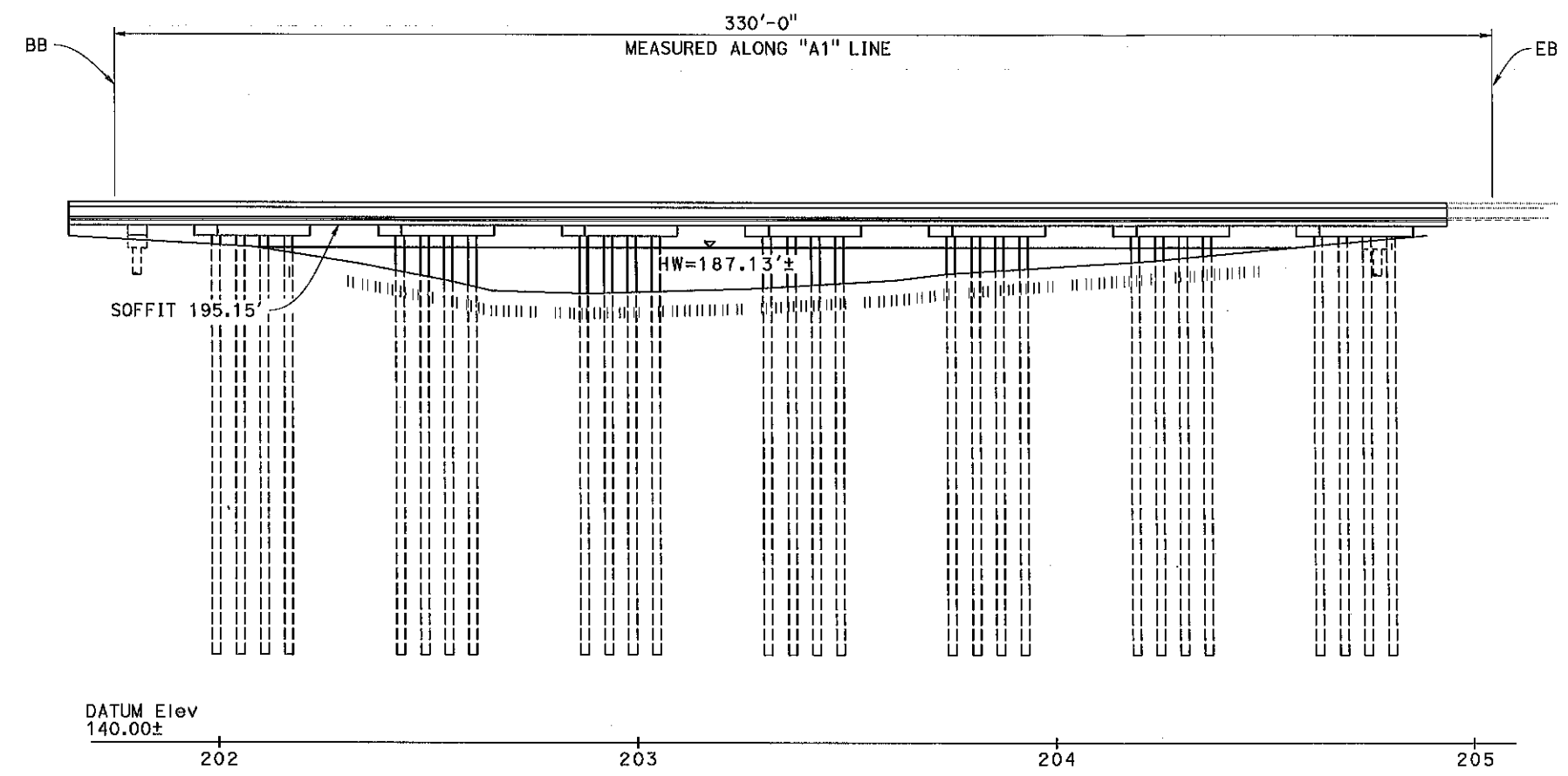
Support ##	Long term (Degradation and Contraction) Scour Elevation (ft.)	Short Term (Local) Scour Depth (ft.)
Abutment 1	192.02	0
Bent 2	185.12	2.20
Bent 3	177.31	5.91
Bent 4	178.16	3.66
Bent 5	175.36	6.46
Bent 6	178.55	3.57
Bent 7	177.71	5.81
Bent 8	182.35	2.87
Bent 9	182.35	4.27
Bent 10	187.14	1.61
Abutment 11	192.92	0

Scour Data Table for Q_{100} 3200 cfs

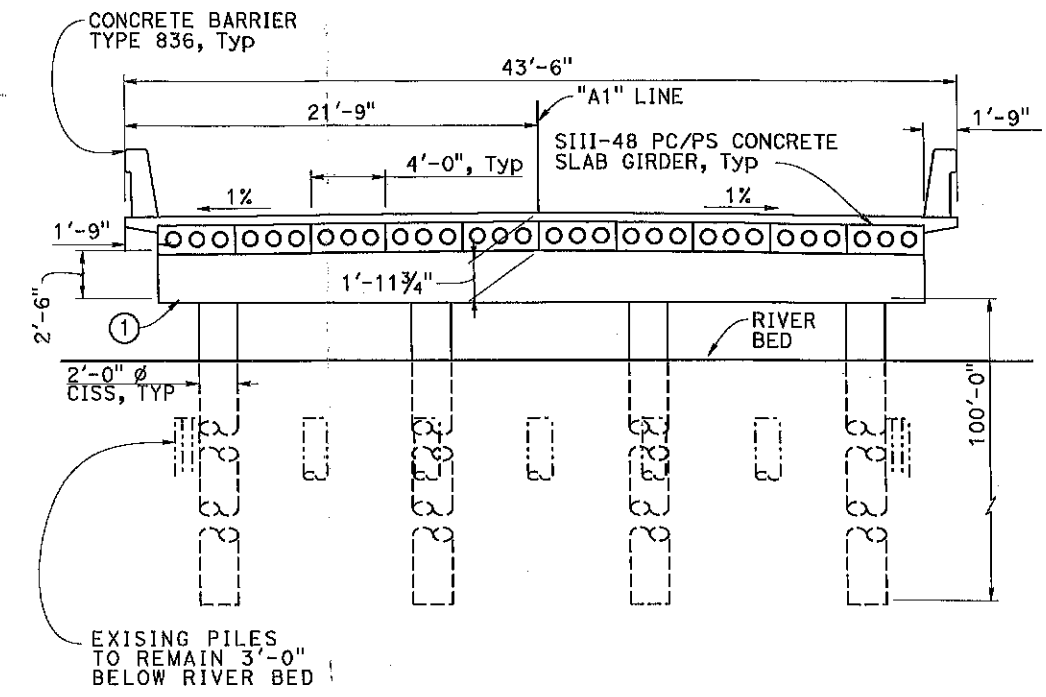
Support ##	Long term (Degradation and Contraction) Scour Elevation (ft.)	Short Term (Local) Scour Depth (ft.)
Abutment 1	192.02	0
Bent 2	186.43	0.89
Bent 3	178.22	5.00
Bent 4	178.60	3.22
Bent 5	176.14	5.68
Bent 6	179.00	3.21
Bent 7	178.64	4.88
Bent 8	183.00	2.22
Bent 9	183.94	2.68
Bent 10	189.22	0
Abutment 11	192.92	0

FEMA Requires 3' min Freeboard

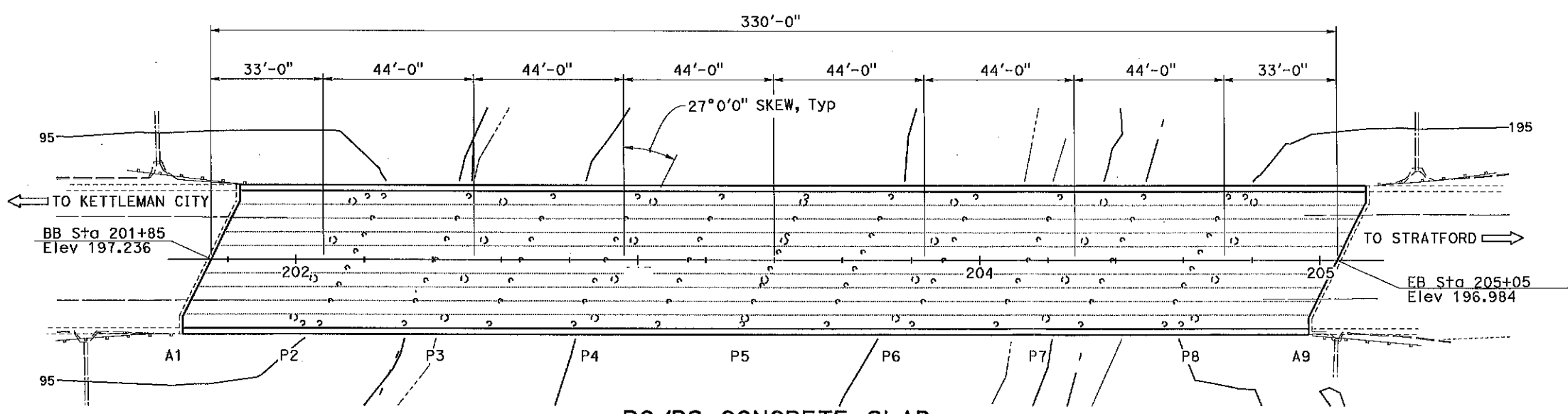
Dist	COUNTY	ROUTE	POST MILE
06	KIN	41	32.26



PC/PS CONCRETE SLAB GIRDER ELEVATION (REPLACE)
1" = 20'-0"



PC/PS CONCRETE SLAB GIRDER TYPICAL SECTION (REPLACE)
1" = 5'-0"



PC/PS CONCRETE SLAB GIRDER PLAN (REPLACE)
1" = 20'-0"

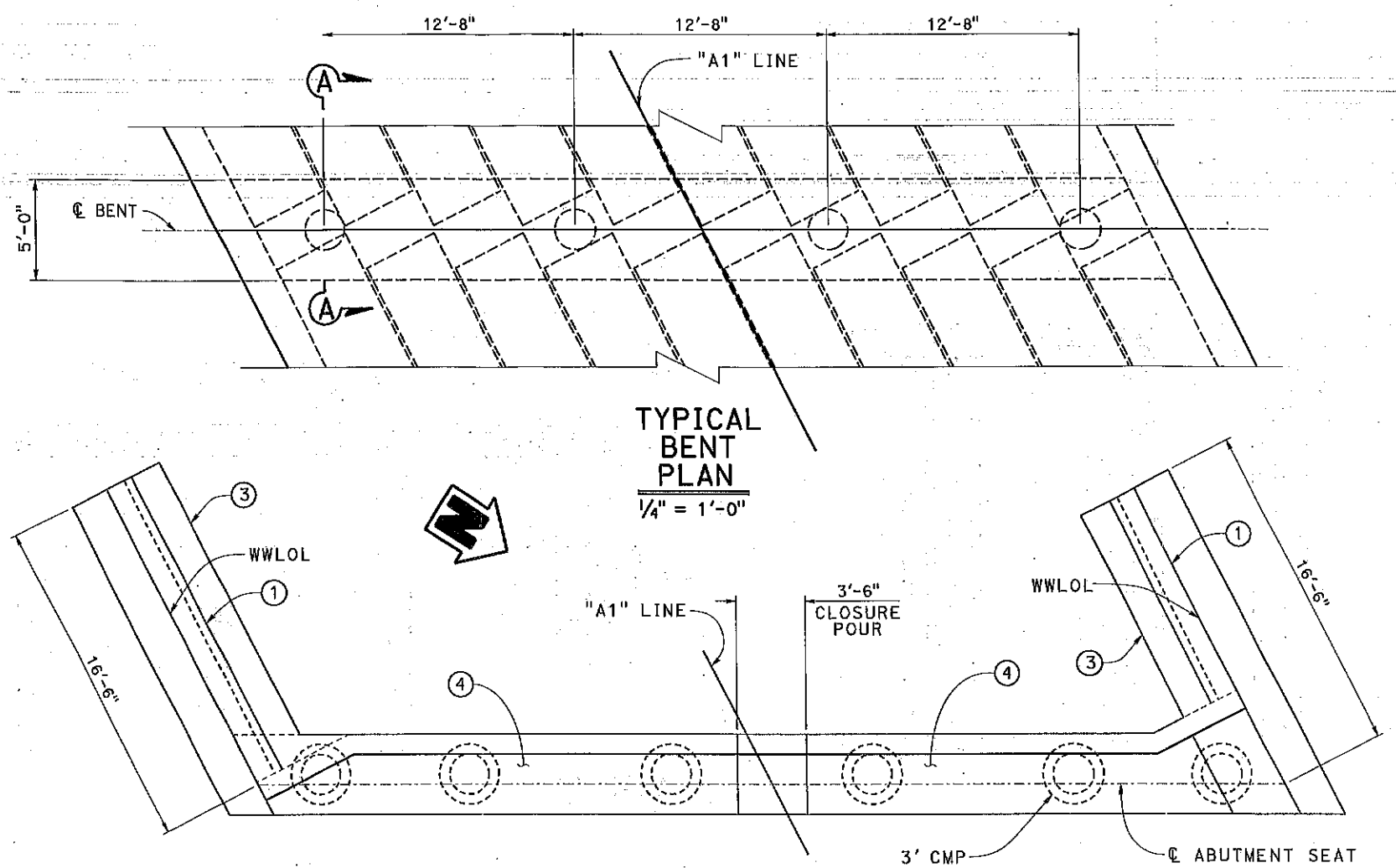
- NOTE:
- ① For Bent details see "SHEET 2 OF 4" sheet.
- LEGEND:
- Indicates New Construction
 - ~ Indicates High Water (HW) Level
 - Indicates Existing Pile
 - Indicates New Pile

ALTERNATIVE 2	
SHEET 1 OF 4	
PLANNING STUDY	
KINGS RIVER BRIDGE (REPLACE)	
UNIT: 36.04	BRIDGE No.: 45-0007
CONTRACT No.: 06-0V110K	PROJECT No. & PHASE: 0616000208

DESIGNED BY Anthony Logus	DATE 10-30-19
DRAWN BY E. Poleanscala	DATE 10-30-19
CHECKED BY Jose Higareda	DATE 10-30-19
APPROVED Traci Menard	DATE 10-30-19

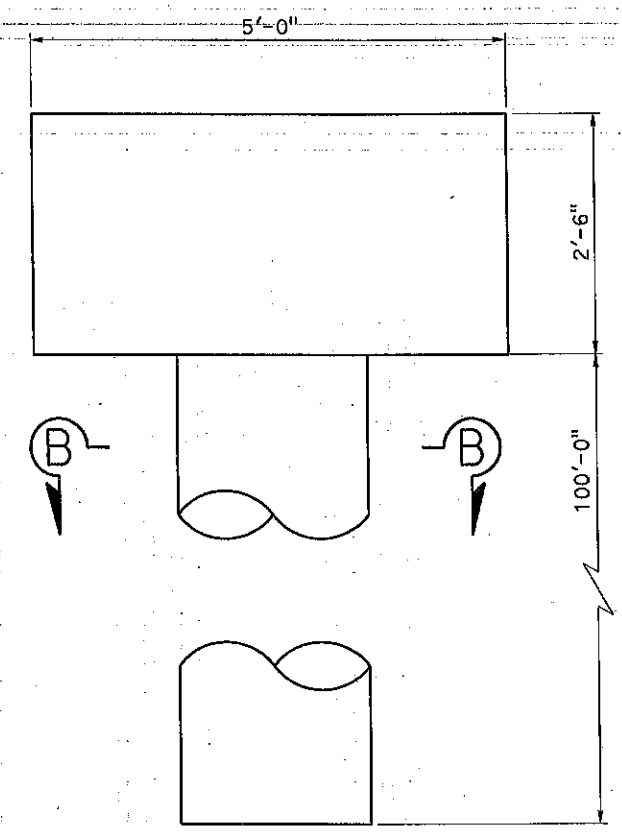
STRUCTURE DESIGN
DESIGN BRANCH
15

DIST	COUNTY	ROUTE	POST MILE
06	KIN	41	32.26

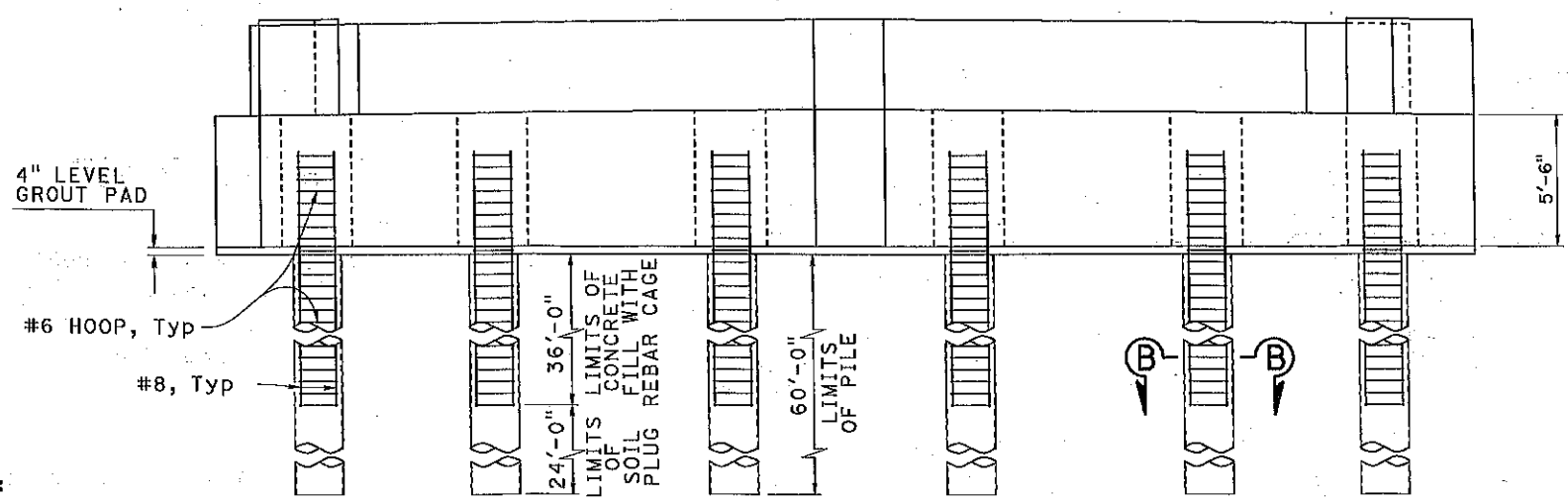


TYPICAL BENT PLAN
1/4" = 1'-0"

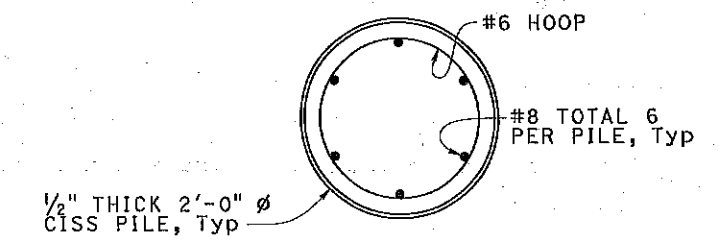
TYPICAL ABUTMENT PLAN
1/4" = 1'-0"



SECTION A-A
1" = 1'-0"



TYPICAL ABUTMENT ELEVATION
1/4" = 1'-0"



SECTION B-B
1" = 1'-0"

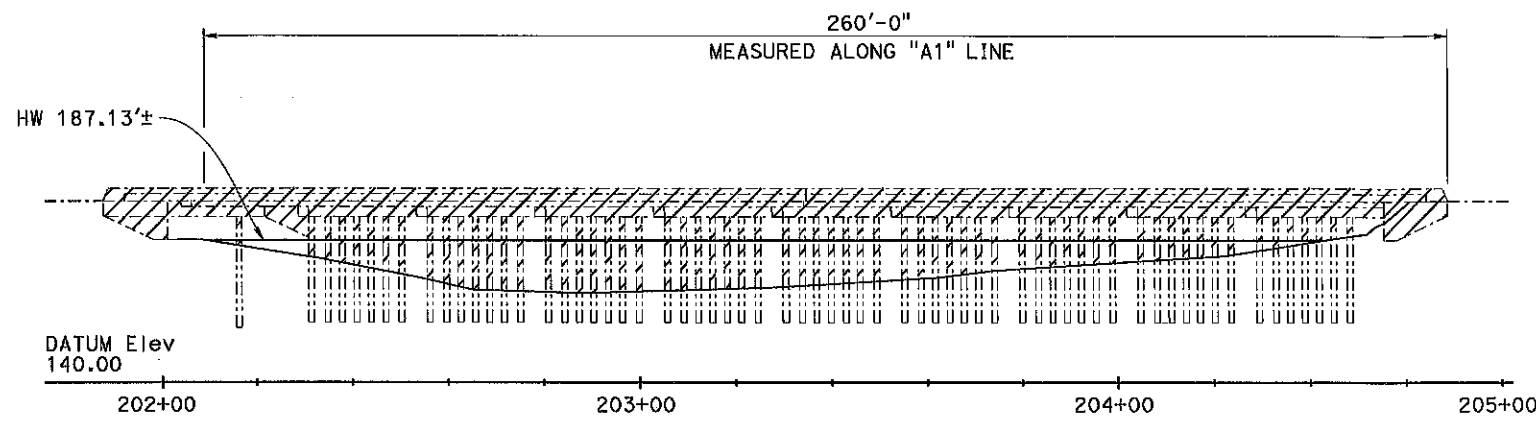
- NOTES:
- ① Indicates Cast in Place Wing Wall
 - ② Indicates Precast Bent
 - ③ Indicates Cast in Place
 - ④ Indicates Precast Abutment

DESIGNED BY Anthony Logus	DATE 10-25-19	STRUCTURE DESIGN
DRAWN BY E. Poleanscala	DATE 10-25-19	DESIGN BRANCH
CHECKED BY Jose Higareda	DATE 10-25-19	
APPROVED Traci Menard	DATE 10-25-19	

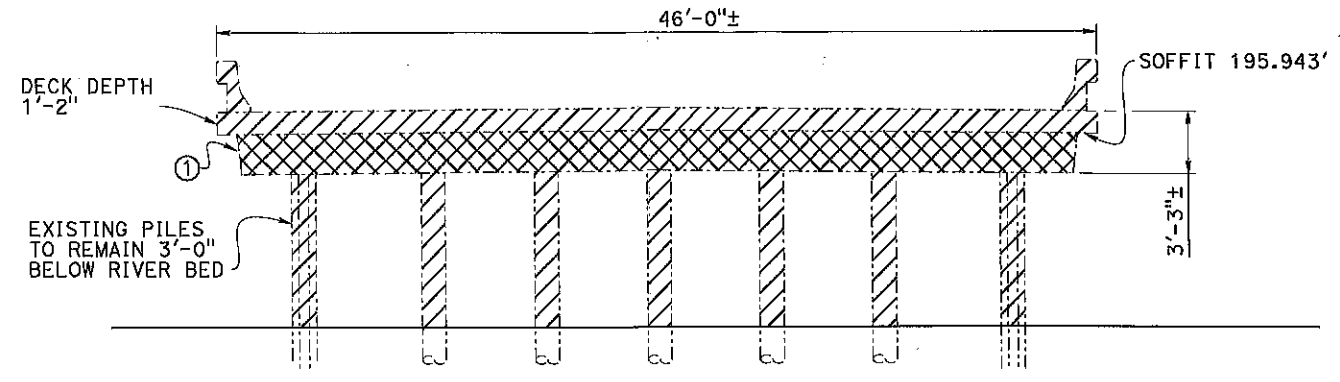
15

ALTERNATIVE 2	
SHEET 2 OF 4	
PLANNING STUDY	
KINGS RIVER BRIDGE (REPLACE)	
UNIT: 3604	BRIDGE No.: 45-0007
CONTRACT No.: 06-0V110K	PROJECT No. & PHASE: 0616000208

Dist	COUNTY	ROUTE	POST MILE
06	KIN	41	32.26

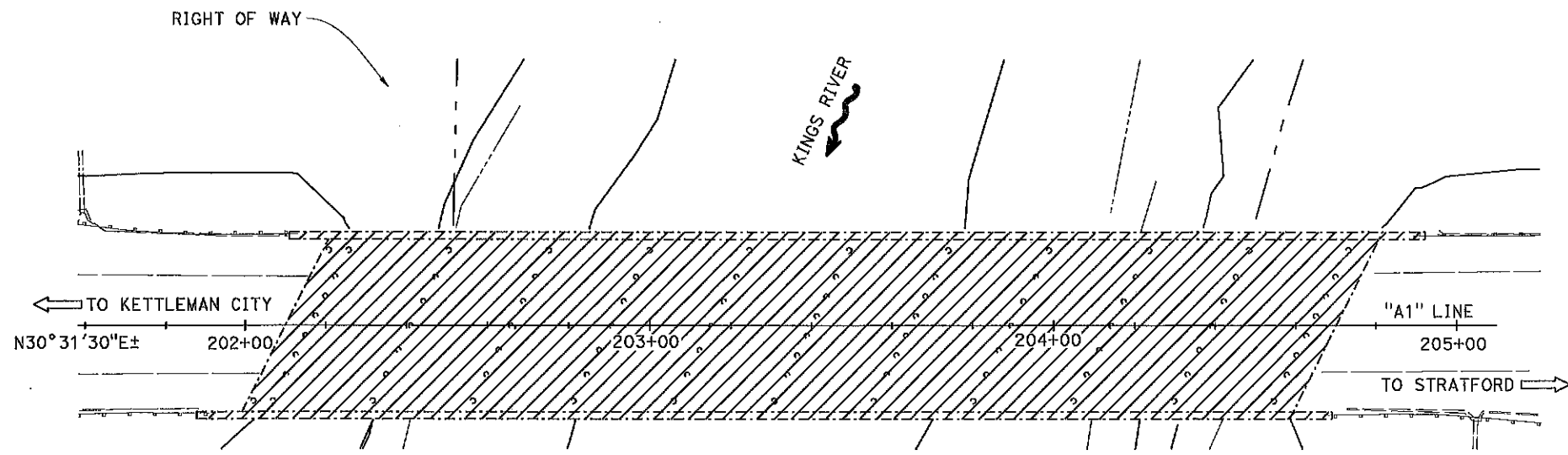


ELEVATION (REMOVAL)
1" = 20'-0"



TYPICAL SECTION (REMOVAL)
1" = 5'-0"

- NOTE:
- ① Remove Retrofit Steel MC18 x 58 both sides dropped cap with 1/2" Steel Bottom Plate all Bents before Bridge Removal.



PLAN (REMOVAL)
1" = 20'-0"

- LEGEND:
- Indicates Existing Structure
 - Indicates New Construction
 - ~ Indicates High Water (HW) Level
 - ▨ Indicates Bridge Removal
 - ▩ Indicates Removal of Retrofit Steel MC18 x 58 with 1/2" Steel Bottom Plate at each Drop Bent

DESIGNED BY Anthony Logus	DATE 10-30-19
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APPROVED Traci Menard	DATE 10-30-19

STRUCTURE DESIGN
DESIGN BRANCH
15

ALTERNATIVE 2	
SHEET 3 OF 4	
PLANNING STUDY	
KINGS RIVER BRIDGE (REPLACE)	
UNIT: 3604	BRIDGE No.: 45-0007
CONTRACT No.: 06-0V110K	PROJECT No. & PHASE: 0616000208

ASSUMPTIONS:

- ABC (Accelerated Bridge Construction) to be used.
1. Precast/Prestressed Slab Girders will be used as bridge type.
 2. The longest precast girder will be approximately 44 feet and can be trucked to job.
 3. CISS Piles will be used at bents.
 4. CISS Piles have been suggested by PFR.
 5. CISS Piles at bents will be extended to bottom of bent cap.
 6. Bent Caps will be cast-in-place.
 7. Precast/Prestress slab girders will be connected on each side of bent using extended prestress cables.
 8. Super Structure slab will be cast-in-place.
 9. Abutment will be precast with back wall with left and right sections with 3 foot closure pour between the two precast sections.
 10. Precast abutment sections will be placed on 4 inch level grout pad.
 11. Precast abutment will be placed on 2 foot dia driven ciss pile or 2 foot dia CIDH pile or possible driven H pile.
 13. There will be 3 piles per precast abutment side.
 14. Driven H-piles with timber will be used for working trestle platform.
 15. Construction of new structure will be difficult due to environmental concerns.
 16. All existing piles will be cut off at 3' below bottom of river bed.
 17. Some existing pile extensions will interfere with installation of new bent piles and have to be removed.
 18. Abutment wing wall could possibly be precast both, footing and wingwall.
 19. Traffic will be detoured around site during removal of exist bridge and construction of new bridge.
 20. Possible issue with drainage on bridge. The bridge is level therefore drainage will have to be placed under bridge overhang.
 21. No existing power lines or other utilities are expected to be moved.

DESIGNED BY	DATE
Anthony Logus	10-25-19
DRAWN BY	DATE
E. Poleanscala	10-25-19
CHECKED BY	DATE
Jose Higareda	10-25-19
APPROVED	DATE
Traci Menard	10-25-19

STRUCTURE DESIGN

DESIGN BRANCH

15

ALTERNATIVE 2

SHEET 4 OF 4

PLANNING STUDY

KINGS RIVER BRIDGE (REPLACE)

UNIT: 3604 BRIDGE No.: 45-0007

CONTRACT No.: 06-0V110K PROJECT No. & PHASE: 0616000208