INFORMATION HANDOUT

For Contract No. 08-383504
At 08-Riv-74-63.0

Identified by
Project ID 0800000638

WATER QUALITY

California Regional Water Quality Control Board

Santa Ana Region,
Board Order No. 2003-0017-DWQ

AGREEMENTS

California Department of Fish and Wildlife

Notification No. 1600-2013-0138-R6

MATERIALS INFORMATION

Foundation Report (FR) for Hurkey Creek Bridge (Replace)
Final Hydraulic Report.

January 30, 2014

Scott Quinnell
California Department of Transportation
464 4th Street, 6th floor, MS 822
San Bernardino, CA 92401

scott_quinnell@dot.ca.gov

CLEAN WATER ACT SECTION 401 WATER QUALITY STANDARDS CERTIFICATION FOR SR-74 HURKEY CREEK BRIDGE REPLACEMENT PROJECT, GARNER VALLEY, RIVERSIDE COUNTY (ACOE CORPS FILE NO. N/A) (SARWQCB PROJECT NO. 332013-15)

Dear Mr. Quinnell,

On September 18, 2013, we received an application for Clean Water Act Section 401 Water Quality Standards Certification (Water Quality Certification) from the California Department of Transportation for a project in Garner Valley, Riverside County. The project will replace the Hurkey Creek Bridge on State Route 74, located 3.7 miles east of its junction with State Route 243, near Mountain Center. The applicant has also submitted a filing fee of $1,228.00, which satisfies this project's fee requirement for obtaining a 401 Certification. This fee amount was determined using the Dredge and Fill Fee Calculator on the State Water Resources Control Board (SWRCB) web site, which is based on the iteration of California Code of Regulations, Division 3, Chapter 9, Article 1, section 2200 (a) (3) in effect when the application was submitted.

This letter responds to your request for certification that the proposed project, described in your application and summarized below, will comply with State water quality standards outlined in the Water Quality Control Plan for the Santa Ana River Basin (1995) (Basin Plan) and subsequent Basin Plan amendments:

Project Description: The project will take place between post miles 62.5 and 63.4 on SR-74. The proposed project will remove and replace the existing bridge, add four retaining walls, widen the roadway to two 12-foot wide lanes with 8-foot wide shoulders and install metal beam guardrails on both sides of the bridge. The new bridge design is for a structure 46 feet long by 40 feet wide, or 1,840 square feet. The channel length shaded by the bridge will increase by 19 feet. The area shaded by the bridge will be 1,168 square feet more than currently

exists. 294 square feet of this area will be newly created waters of the state.

The work will take place within Section 9 of Township 6 South, Range 3 East, of the U.S. Geological Survey *Idyllwild* 7.5 minute topographic quadrangle map (33° 40' 19.185" N/ -116° 40' 40.989" W).

Receiving water: Hurkey Creek, tributary to Lake Hemet

Fill area:

Temporary impact to Riparian Habitat	0.06 acre	73 linear feet
Temporary impact to Streambed Habitat	0.01 acre	21 linear feet

Dredge/Fill volume: N/A

Federal permit: U.S. Army Corps of Engineers Permit Nationwide No. 14

You have proposed to mitigate water quality impacts as described in your Water Quality Certification application. The proposed mitigation is summarized below:

Onsite Water Quality Standards Mitigation Proposed:

- Standard water quality-related best management practices (BMPs) will be employed during construction activities.
- The proposed project will add 294 square feet of streambed to Hurkey Creek that will be newly created waters of the state available for colonization of riparian species by natural recruitment.
- Areas of disturbed Riparian/Riverine habitat will be revegetated with a pallet of native plant species.
- Mature trees and shrubs carrying sustained impacts from project activities will be replaced at a 3:1 ratio as reflected in the project's mitigation proposal.

Offsite Water Quality Standards Mitigation Proposed:

- None.

Should the proposed project impact state- or federally-listed endangered species or their habitat, implementation of measures identified in consultation with U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife will ensure those impacts are mitigated to an acceptable level. Appropriate BMPs will be implemented to reduce the project's impacts to Waters of the State according to the requirements of Order No. 2012-0001-DWQ, the State Water Resources Control Board's permit for

discharges from Caltrans operations, maintenance and construction activities, and subsequent iterations thereof.

This Water Quality Certification is subject to the acquisition of all local, regional, state, and federal permits and approvals as required by law. Failure to meet any conditions contained herein, or any conditions contained in any other permit or approval for this project issued by the State of California, or any subdivision thereof, may result in appropriate enforcement action, including imposition of administrative civil liability.

The applicant has submitted a determination by CalTrans that the project is excluded from the requirements to prepare a National Environmental Protection Act (NEPA) environmental assessment or environmental impact study. CalTrans reports that the State has been assigned, and certifies that it has carried out, the responsibility to make this determination pursuant to NEPA Section 6004 Chapter 3, 23 United States Code, Section 326 and a Memorandum of Understanding (MOU) dated June 7, 2010, executed between the Federal Highway Administration and the State. The State has determined that the project is Categorically Exempt from NEPA under Title 23 Code of Federal Regulations Section 771.117(d)1 & 3, which state:

> *(1) Modernization of a highway by resurfacing, restoration, rehabilitation, reconstruction, adding shoulders, or adding auxiliary lanes.*
>
> *(3) Bridge rehabilitation, reconstruction or replacement or the construction of grade separation to replace existing at-grade railroad crossings.*

Similarly, Board staff has determined that the project qualifies for a Class 2 categorical exemption from the reporting provisions of the California Environmental Quality Act (CEQA), according to CEQA guidelines section 15302. This exemption states:

> "Class 2 consists of replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced."

Based on the mitigation proposed by the applicant, and the conditions set forth in this Certification, impacts to water quality will be reduced to a less than significant level and beneficial uses will be protected. The Regional Board independently finds that changes or alterations have been required in, or incorporated into the project, which avoid or mitigate impacts to water quality to a less than significant level.

This 401 Certification is contingent upon the execution of the following conditions:

1) The applicant must comply with the requirements of the applicable Clean Water Act section 404 permit.

2) Proposed mitigation shall be timely implemented.

3) All materials generated from construction activities associated with this project shall be managed appropriately. This shall include identifying all potential pollution sources within the scope of work of this project, and incorporating all necessary pollution prevention BMPs as they relate to each potential pollution source identified.

4) The project proponent shall utilize BMPs during project construction to minimize the controllable discharges of sediment and other wastes to drainage systems or other waters of the state and of the United States.

5) Substances resulting from project-related activities that could be harmful to aquatic life, including, but not limited to, petroleum lubricants and fuels, cured and uncured cements, epoxies, paints and other protective coating materials, portland cement concrete or asphalt concrete, and washings and cuttings thereof, shall not be discharged to soils or waters of the state. All waste concrete shall be removed.

6) Motorized equipment shall not be maintained or parked within or near any stream crossing, channel or lake margin in such a manner that petroleum products or other pollutants from the equipment may enter these areas under any flow conditions. Vehicles shall not be driven or equipment operated in waters of the state on-site, except as necessary to complete the proposed project. No equipment shall be operated in areas of flowing water.

7) This Water Quality Certification is subject to the acquisition of all local, regional, state, and federal permits and approvals as required by law. Failure to meet any conditions contained herein or any the conditions contained in any other permit or approval issued by the State of California or any subdivision thereof may result in the revocation of this Certification and civil or criminal liability.

8) Best management practices to stabilize disturbed soils must include the use of native plant species whenever feasible.

9) Construction de-watering discharges, including temporary stream diversions necessary for project construction may be regulated under Regional Board Order No. R8-2009-0003, General Waste Discharge Requirements for Discharges to Surface Waters that Pose an Insignificant (De Minimus) Threat to Water Quality. For more information, please review Order No. R8-2009-0003 at www.waterboards.ca.gov/santaana/

10) Applicant shall ensure that all fees associated with this project shall be paid to each respective agency prior to conducting any on-site construction activities.

Under California Water Code, Section 1058, and Pursuant to 23 CCR §3860, the following shall be included as conditions of all water quality certification actions:

(a) Every certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Section §13330 of the Water Code and Article 6 (commencing with Section 3867) of this Chapter.

(b) Certification is not intended and shall not be construed to apply to any activity involving a hydroelectric facility and requiring a FERC license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to Subsection §3855(b) of this Chapter and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

(c) Certification is conditioned upon total payment of any fee required under this Chapter and owed by the applicant.

If the above stated conditions are changed, any of the criteria or conditions as previously described are not met, or new information becomes available that indicates a water quality problem, the Regional Board may require the applicant to submit a report of waste discharge and obtain Waste Discharge Requirements.

In the event of any violation or threatened violation of the conditions of this certification, the holder of any permit or license subject to this certification shall be subject to any remedies, penalties, process or sanctions as provided for under state law. For purposes of section 401(d) of the Clean Water Act, the applicability of any state law authorizing remedies, penalties, process or sanctions for the violation or threatened violation constitutes a limitation necessary to assure compliance with the water quality standards and other pertinent requirements incorporated into this certification. Violations of the conditions of this certification may subject the applicant to civil liability pursuant to Water Code section 13350 and/or 13385.

This letter constitutes a Water Quality Standards Certification issued pursuant to Clean Water Act Section 401. I hereby certify that any discharge from the referenced project will comply with the applicable provisions of Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act, and with other applicable requirements of State law.

This discharge is also regulated under State Water Resources Control Board Order No. 2003-0017-DWQ (Order No. 2003-0017-DWQ), "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received Water Quality Certification" which requires compliance with all conditions of this Water Quality Standards Certification. Order No. 2003-0017-DWQ is available at: www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2003/wqo/wqo2003-0017.pdf

Should there be any questions, please contact Marc Brown at (951) 321-4584, or Mark Adelson at (951) 782-3234.

Sincerely,

Kurt V. Berchtold
Executive Officer

cc (via electronic mail):
CA Department of Transportation – Jason Bill – jason_bill@dot.ca.gov
U. S. Army Corps of Engineers, Los Angeles Office - Jason Lambert
CA Department of Fish and Wildlife – Joana Gibson
State Water Resources Control Board, Office of Chief Counsel-David Rice
State Water Resources Control Board DWQ -Water Quality Certification Unit
U.S. EPA -Supervisor of the Wetlands Regulatory Office WTR-8

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Inland Deserts Region
3602 Inland Empire Blvd., Suite C-220
Ontario, CA 91764
(909) 481-0167
www.wildlife.ca.gov

EDMUND G. BROWN, Jr., Governor
CHARLTON H. BONHAM, Director

January 2, 2014

Scott Quinnell
Department of Transportation
464 4th Street, 6th Floor, MS 822
San Bernardino, CA 92401

Subject: Notification of Lake or Streambed Alteration No. 1600-2013-0138-R6
SR-74 Hurkey Creek Bridge Replacement Project

Dear Ms. Quinnell:

The Department had until December 17, 2013 to submit a draft Lake or Streambed Alteration Agreement (Agreement) to you or inform you that an Agreement is not required. The Department did not meet that date. As a result, by law, you may now complete the project described in your notification without an Agreement.

Please note that pursuant to Fish and Game Code section 1602(a)(4)(D), if you proceed with this project, it must be the same as described and conducted in the same manner as specified in the notification and any modifications to that notification received by the Department in writing prior to December 17, 2013.This includes completing the project within the proposed term and seasonal work period and implementing all avoidance and mitigation measures to protect fish and wildlife resources specified in the notification. If the term proposed in your notification has expired, you will need to re-notify the Department before you may begin your project. Beginning or completing a project that differs in any way from the one described in the notification may constitute a violation of Fish and Game Code section 1602.

You have proposed to impact Hurkey Creek, tributary to Lake Hemet, at the State Route 74 crossing of Hurkey Creek, east of Lake Hemet Road and west of Pinecone Trail, in the Garner Valley area of Riverside County. Your project includes the demolition of an existing bridge, construction of a new bridge and four retaining walls, widening of the roadway to 12-foot lanes and 8-foot shoulders, and installation of metal beam guardrails on both sides of the bridge in each direction of SR-74 between postmile markers 62.5 and 63.4. The existing bridge will be widened and lengthened from 32 feet long, 21 feet wide to 46 feet long, 40 feet wide. The new bridge abutments will be moved away from the streambed 7 feet on both sides of the stream, creating an addition 294 square feet of streambed. The project will temporarily impact 0.07 acres of jurisdictional habitat including 0.06 acres of willow riparian habitat, and permanently impact approximately 1,168 square feet of streambed through permanent shading of the stream. You have proposed to replace all trees impacted at a 3:1 replacement to impact ratio; revegetate

all temporarily impacted areas; and redistribute collected duff after the completion of construction activities. Your proposed Project term is July 1, 2014 to June 30, 2019.

Also note that while you are entitled to complete the project without an Agreement, you are still responsible for complying with other applicable local, state, and federal laws. These include, but are not limited to, the state and federal Endangered Species Acts and Fish and Game Code sections 5650 (water pollution) and 5901 (fish passage).

Finally, if you decide to proceed with your project without an Agreement, you must have a copy of this letter and your notification with all attachments available at all times at the work site. If you have any questions regarding this matter, please contact Kimberly Freeburn-Marquez at (909) 945-3484 or Kim.Freeburn@wildlife.ca.gov.

Sincerely,

Jeff Brandt
Senior Environmental Scientist

cc: Kimberly Freeburn Marquez

ec: Jason Bill

State of California

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MATT HOLM
Branch 12 Chief – MS 9-3/3G
Division of Engineering Services
Office of Structure Design - South 2

Attn: Clarence Hensel

Date: September 3, 2013

File: 08-RIV-074-62.99
0800000638
EA 08-383501
Hurkey Creek Br (Replace)
Br. No. 56-0181

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 2 (MS #5)
Design Branch B

Subject: Foundation Report (FR) for Hurkey Creek Bridge (Replace)

This report presents the foundation recommendations for the proposed replacement Hurkey Creek Bridge (No. 56-0181) which will replace the existing Hurkey Creek Bridge (No. 56-0181). This report was developed in response to a request memorandum for a Foundation Report dated November 13, 2012 from the Office of Structure Design South 2 (OGDS2), Branch 12. The report is based on subsurface information gathered during the recent foundation investigation on January, February and July/August 2013 performed by our office, "As Built" information from a 1930 plan, local geologic maps, Final Hydraulic Report dated August 29, 2013, Seismic Design Recommendation dated February 15, 2013, General Plan and Foundation Plan dated July 16, 2013 and, Retaining Wall layout emailed on August 28, 2013 provided by OSDS2. All elevations referenced within this report and shown on the recent Log of Test Boring (LOTB) sheets are based on NGVD 1929 datum.

This Foundation Report supersedes the Preliminary Foundation Report for Hurkey Creek Bridge dated October 17, 2012.

Project Description

The existing 1930 bridge is located on Interstate Highway 74 at post mile 62.99 and near the town of Mountain Center, Riverside County. The existing bridge is a single span steel stringer structure with reinforced concrete deck, with abutments supported on steel "H" piles. The proposed replacement bridge consists of a single span, precast/pre-stressed concrete structure, which are approximately 46 ft long and 43.5 ft wide. The layout of the proposed bridge widening is shown on General Plan.

Site Geology, Field Investigation and Subsurface Conditions

The "Geologic Map of Hemet & Idyllwild" (2008) by Dibblee & Minch, shows that the bridge site is underlain by Quaternary alluvial fan gravel and sand over cretaceous granitic rock.

Due to the fact that no "As Built" LOTB or other historical subsurface information at the site exist, then a subsurface investigation was required. The subsurface conditions were explored in January 2013 by drilling three mud-rotary test borings RC-13-001 thru RC-13-003 near the proposed bridge abutments which extended to depths of 40.6, 25.7 and 24.6 ft, respectively. A track mounted drill rig CME 75 was used to drill boring RC-13-001, and a truck mounted Christensen CS 1000 was used to drill borings RC-13-002 and RC-13-003. Both rigs utilized fully cased, wire-line coring methods. Standard Penetration Tests were performed at regular intervals in the soil during subsurface investigations. Soil samples were collected for corrosion testing and particle size analysis. Information gathered from these borings indicated that soil over shallow rock exists at the site.

In February 2013, a supplemental investigation was necessary to determine the top of bedrock elevation near the abutments in order to determine if spread footings were feasible. Eight driven 1 inch diameter borings were advanced using a hand operated pneumatic hammer (wacker) with a closed-ended tip to probe down to the top of rock, then a sample was taken at the tip to verify rock was encountered. The top of rock elevation at the abutments ranges between 4336.5 through 4343.3 ft. During the January/February field investigation, the proposed retaining wall information and details were not known to the OGDS2. Therefore, no borings were drilled to investigate the subsurface conditions at the proposed RW locations.

In July/August 2013, another supplemental investigation was performed to determine the top of rock elevation near the retaining wall locations. Nineteen probes were performed at the proposed retaining wall locations and the top of rock elevation ranges between 4339.8 through 4344.7 ft.

The subsurface investigations revealed that the soils underlying the site consist of a loose to dense, silty sand with trace of fine gravel. The alluvium deposits extend to approximate depths of 3 to 12 ft (elev 4336 – 4345 ft). Below the alluvium deposits, intensely weathered to decomposed igneous rock (consisting of a very dense sand) was encountered to the maximum explored depth of 40.6 ft (elev 4313.3). For more details, refer to the LOTB sheets. During the field investigation, cobbles or boulders were not encountered in the borings; however, numerous cobbles and boulders were partially exposed in the side slopes of the roadway embankment at the proposed retaining wall and bridge support locations.

Groundwater

During the January/February field investigations, groundwater was measured in three borings near the creek at elevations ranging from 4344.5 to 4344.7 ft. In July/August field investigation, no surface water was flowing at the creek bed, however, at several boring locations within the channel perched ground water was noted on the drill rods approximately within 1 ft of the top of rock but was not measured due to the hole collapsing after the boring was completed. Groundwater is generally expected to be equal to the elevation of the water in the creek due to the permeable nature of subsurface soils. Groundwater elevations are subject to seasonal fluctuations and may be encountered at higher or lower elevations depending on current conditions.

Scour Potential

The bridge site spans a creek that has the potential for scour. The 1943 Supplementary Bridge Report discussed scour at upstream ends of both abutments and wing walls due to the 1943 storm event.

Based on the Revised Final Hydraulic Report dated August 29, 2013, the total scour is estimated to be 6.9 ft (elev 4337.1 ft) at the proposed bridge site. For details regarding the estimated scour, please contact Ginger Lu with Structure Hydraulics and Scour Mitigation at (916) 227-8230.

Corrosion Evaluation

Corrosion test results for the soil sample collected from boring RC-13-001 is shown below in Table 1. The soil sample tested is considered non-corrosive by current Caltrans standards.

Table 1. Corrosion Test Summary

Boring No.	SIC Number	Sample Depth (ft)	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
RC-13-001	C701581	0 - 13.9	14010	6.46	N/A	N/A

Note: Caltrans currently considers a site to be corrosive to foundation elements if one or more of the following conditions exist: chloride concentration is 500 ppm or greater, sulfate concentration is 2000 ppm or greater, or the pH is 5.5 or less.

Fault and Seismic Data

The structure site is potentially subject to ground motions from nearby earthquake sources during the design life of the new structure. For the deterministic procedure, the controlling fault for the site is the San Jacinto Fault (San Jacinto Valley Section, Fault ID: 356, strike-slip, dip=90°) with a maximum moment magnitude M_{max}=7.7, located approximately 0.06 miles southwest of the bridge site. For the probabilistic procedure, a response spectrum was obtained for the 5 % probability of exceedance in 50 years from the 2008 USGS Seismic Hazard Map. Based on the 2013 foundation investigation, the average shear wave velocity of the upper 100 ft is estimated as V_{S30}=360 m/s. For this site, the probabilistic response spectrum controls, with the corresponding peak ground acceleration (PGA) estimated to be 0.72g. Refer to the Seismic Design Recommendation dated February 15, 2012 for additional information.

Fault Rupture Potential

The bridge site is located outside Alquist-Priolo Earthquake Fault Zones for the Hot Springs fault, part of the San Jacinto fault zone. Also, the San Jacinto Fault is considered late Quaternary in age; therefore, it is too old to be considered a source of fault rupture.

Liquefaction Potential

Seismic Design Recommendation report has indicated that due to the presence of loose to dense sands below the groundwater table, the site is susceptible to liquefaction. The expected settlement from liquefaction is 2 inches for the near surface soils described earlier in this report. It recommended that the footing should be founded below the liquefiable layer. For complete details, please refer to the aforementioned report.

Foundation Recommendations

The following foundation recommendations are based upon a review of the 2013 subsurface investigations, "As-Built" information, the General Plan and the Foundation Plan dated July 16, 2013, foundation design information (per Memos to Designers 4-1, Attachment No. 2, April 2008) dated August 23, 2013 and RW layout information provided on August 28, 2013.

- **Abutments**

Spread footings are recommended for support of the proposed bridge abutments. Other foundation types were considered but not recommended due to the increased cost and/or constructability issues associated with them. The foundation design at the abutment locations was based on working stress design (WSD). It is recommended that the proposed Abutment 1 & Abutment 2 bottom of footings be founded on decomposed to intensely weathered igneous rock underlying the site. The Gross Allowable Soil Bearing Pressures to be used for design are listed below in Table 4.

The information shown in Table 2 and 3 are based on specific foundation design information provided to our office by the Office of Bridge Design South 2.

Table 2. Foundation Data

Support Location	Design Method	Finished Grade Elevation (ft)	Bottom of Footing Elevation (ft)	Footing Size (ft)		Permissible Settlement under Service Load (in)
				B	L	
Abut 1	WSD	4344.0	4335.1	11.5	54.9	1
Abut 2	WSD	4344.0	4335.1	11.5	54.9	1

Table 3. LRFD Service Limit State I

Support Location	Total Load				Permanent Load		
	Vertical Load (kip)	Effective Dimensions (ft)		Horizontal Load in Long. Direction (kip)	Vertical Load (kip)	Effective Dimensions (ft)	
		B'	L'			B'	L'
Abut 1	1854	10.99	54.9	575	1716	10.49	54.9
Abut 2	1854	10.99	54.9	575	1716	10.49	54.9

Table 4. Foundation Design Recommendations for Abutments 1 and 2

Support Location	Footing Size (ft)		Bottom of Footing Elevation (ft)	Minimum Footing Embedment Depth (ft)	WSD (LRFD Service I Limit State Load Combination)	
	B	L			Permissible Gross Contact Stress (ksf)	Allowable Gross Bearing Capacity (ksf))
Abut 1	11.5	54.9	4335.1	8.9	14.5	10.0
Abut 2	11.5	54.9	4335.1	8.9	14.5	10.0

Note: Permissible Gross Contact Stress and Allowable Gross Bearing Capacity values are based on the controlling effective footing dimension provided by Structure Design.

In Table 4 above, the spread footing recommendations for the support locations are based on the following design criteria:

1) The final designed spread footing will have an effective footing area (B' x L') such that the Gross Uniform Bearing Stress (q_o) does not exceed the recommended design value for the Permissible Gross Contact Stress (q_{pg}) for Service-I Limit State.

2) The final designed spread footing will have an effective footing area (B' x L') such that the Gross Uniform Bearing Stress (q_o) does not exceed the recommended design values for the Allowable Gross Bearing Capacity (q_{all}) for Service-I Limit State.

3) The Ultimate Gross Bearing Capacity, (q_{ult}), will equal or exceed 3 times the recommended Allowable Gross Bearing Capacity, (q_{all}).

4) The Abutment 1 & 2 bottom of footing elevations shall be situated on top of decomposed to intensely weathered igneous rock.

5) The spread footings are to be constructed at or below the recommended bottom of footing elevations and minimum footing embedment depths are maintained.

If any of the above loading conditions are changed, minimum footing widths or embedment depths are reduced, or bottom of footing elevations raised, the OGDS2 Branch B, is to be contacted for reevaluation.

- **Retaining Walls at Abutments 1 and 2 Right and Left Side**

Spread footings are recommended for the RW (Type 1 and 5) foundations as shown on RW layout. Based on the RW layout (provided on 8-28-13), the proposed retaining wall footings (except for two locations) are situated to be on unsuitable native soil, therefore, the unsuitable material will need to be sub-excavated down to the elevations shown in Tables 5, 6, 7 & 8, and will be replaced with newly placed structure backfill compacted to 95% relative compaction back up to the bottom of footing elevation. The other two retaining wall locations mentioned above are situated to be on rock.

The foundation design for the retaining wall was based on Load Resistance Factor Design (LRFD). The strength parameters of the newly placed structure backfill or the igneous rock at the proposed wall sites will meet or exceed the required design Permissible Net Contact Stress or Factored Gross Nominal Bearing Resistance for each wall type and wall height listed in the 2010 Standard Plans for the Type 1 and Type 5 retaining walls – loading case 1 (Sheet RSP B3-1A & RSP B3-4A).

Table 5: RW Spread Footing Recommendations at Abutment 1 Right Side

Wall Stationing	Footing Size (ft)		Design H (ft)	Wall Type	Bottom of Sub-excavation Elevation (ft)	Bottom of Footing Elev. (ft)
	B	L				
197+87.93 to 197+95.00	7.25	13.63	4	5	4349.0	4352.00
197+95.00 to 198+10.00	7.25	15.00	4	5	4349.0	4352.00
198+10.00 to 198+58.00	7.00	48.00	6	1	4347.7	4350.67
198+58.00 to 198+70.00	7.58	12.00	10	1	4342.0	4345.67
198+70.00 to 198+80.33	10.75	10.33	16	1	4339.5	4340.33

Table 6: RW Spread Footing Recommendations at Abutment 1 Left Side

Wall Stationing	Footing Size (ft)		Design H (ft)	Wall Type	Bottom of Sub-excavation Elevation (ft)	Bottom of Footing Elev. (ft)
	B	L				
197.70.00 to 198+42.00	7.00	72.00	6	1	4346.7	4349.67
198+42.00 to 198+51.00	8.33	9.00	12	1	4342.0	4344.87
198+51.00 to 198+59.72	10.75	8.72	16	1	N / A	4340.07

Table 7: RW Spread Footing Recommendations at Abutment 2 Right Side

Wall Stationing	Footing Size (ft)		Design H (ft)	Wall Type	Bottom of Sub-excavation Elevation (ft)	Bottom of Footing Elev. (ft)
	B	L				
199+40.28 to 199+55.00	10.75	14.72	16	1	4338.0	4340.20
199+55.00 to 199+70.00	7.58	15.00	10	1	4342.0	4345.28
199+70.00 to 199+80.00	7.00	10.00	6	1	4347.0	4350.03

Table 8: RW Spread Footing Recommendations at Abutment 2 Left Side

Wall Stationing	Footing Size (ft)		Design H (ft)	Wall Type	Bottom of Sub-excavation Elevation (ft)	Bottom of Footing Elev. (ft)
	B	L				
199+19.32 to 199+29.00	9.58	9.68	14	1	N / A	4341.11
199+29.00 to 199+40.00	7.25	11.00	8	1	4344.1	4347.11

The foundations recommendations of spread footings for the retaining walls listed in Tables 5 – 8 are based upon the following design criteria:

1. The final designed spread footing will have an effective footing area such that the Net Bearing Stress (q'_o) does not exceed the recommended design value for the Permissible Net Contact Stress (q_{pn}) for Service-I Limit State.

2. The final designed spread footing will have an effective footing area such that the Gross Uniform Bearing Stress (q_o) does not exceed the recommended design values for the Factored Gross Nominal Bearing Resistances (q_R) for Strength and Extreme Limit States. The calculated Factored Gross Nominal Bearing Resistances used bearing resistance factors of 0.45 and 1.0 for Strength and Extreme Limit States, respectively.

3. RW's are either Standard Type 1 or Type 5 as shown on the Revised 2010 Standard Plan RSP sheet B3-1A and B3-4A respectively for Loading Case 1.

4. At all retaining wall locations, newly placed structure backfill is to be compacted to 95% relative compaction and the limits shall conform to section 19-5.03B (retaining wall footing without pile foundations) of the Standard Specifications.

5. All spread footings shall be constructed at or below the recommended bottom of footing elevations as shown in the tables above.

If any of the above vertical embedment depths are reduced, the loading case changed, or wall heights increased, the OGDS2, Branch B is to be contacted for reevaluation.

General Notes:

1. All support locations are to be plotted on the Log of Test Borings, in plan view, as stated in "Memos to Designers" 4-2. The plotting of the support locations should be made prior to the foundation review.

2. Due to the possibility of groundwater being encountered during construction of the footings at the proposed abutment and the adjacent retaining wall locations (with a bottom of footing elevation of 4446 or lower), structure excavation Type "D" is recommended to be shown on the plans.

3. As-Built drawings show eight 8-32 H-piles at each existing abutment (total 16 piles) near the proposed footing elevation. It is recommended that all piles be cut-off at the top of rock and no lower than the top of footing elevation (Elev. 4337.1 ft). If the piles are left in place or not cut down to Elev. 4337.1, then excessive scour could occur during a historic storm event (i.e. 50 year flood).

Construction Considerations:

1. Due to the proximity of the abutment and retaining wall footings to Hurkey Creek, the contractor should anticipate the possibility that surface and/or ground water may be encountered during construction of the footings. Ground water elevations at this bridge site are subject to seasonal fluctuations and will be encountered at higher or lower elevations depending on conditions at time of construction. See the groundwater section of this report and the LOTB's for details.

2. During the subsurface investigation, numerous cobbles and boulders were partially exposed in the side slopes of the roadway embankment at the proposed retaining wall and abutment locations. The contractor should anticipate encountering scattered cobbles and boulders in the roadway embankment.

3. The Abutment 1 and Abutment 2 spread footings are to be founded on decomposed to intensely weathered igneous rock. Should the bottom of the footing excavation be disturbed, then the entire bottom of footing excavation (and shear key excavation) shall be extended down until undisturbed decomposed to intensely weathered rock is observed and approved by the Engineer, then backfilled with lean concrete back up to the bottom of footing elevation. Any disturbed decomposed to intensely weathered rock is not to be re-compacted.

4. The Abutment support footing excavations are to be inspected and approved by a representative of the OGDS2, Branch B. The inspections are to be made after the excavation has been completed down to the bottom of footing elevation listed in Table 4 and prior to placing any concrete in the excavations. The contractor is to allow seven (7) working days for the inspection to occur at each abutment footing excavation. The structures representative is to provide our office a one-week notification prior to beginning the seven-day contractor waiting period. For contact information please refer to the end of the report.

5. At six retaining wall locations (listed below in Table 9), the existing unsuitable soil below the proposed bottom of footing elevations shall be sub-excavated down to the elevations (shown on Table 5, 6, 7 & 8) and will be replaced with newly placed structure backfill compacted to 95% relative compaction. The limits of sub-excavation and replacement with structure backfill shall conform to section 19-5.03B (retaining wall footing without pile foundations) of the Standard Specifications. Prior to placing structure backfill, the native soils at the bottom of the excavation shall be compacted to 95% relative compaction at the six retaining wall locations listed in the table below.

Table 9: Ret. Wall Footings supported on Structure Backfill with Sub-Excavation into Native Soil

Retaining Wall Location	Retaining Wall Stationing
Abutment 1, Right Side	Sta. 197+87.93 to 197+95.00
Abutment 1, Right Side	Sta. 197+95.00 to 198+10.00
Abutment 1, Right Side	Sta. 198+10.00 to 198+58.00
Abutment 1, Left Side	Sta. 197.70.00 to 198+42.00
Abutment 2, Right Side	Sta. 199+70.00 to 199+80.00
Abutment 2, Left Side	Sta. 199+29.00 to 199+40.00

6. At 5 retaining wall locations (listed below in Table 10), the existing unsuitable soil below the proposed bottom of footing elevations shall be sub-excavated down to the elevations (shown on Table 5, 6 & 8) and will be replaced with newly placed structure backfill compacted to 95% relative compaction. At these retaining wall locations, the bottom of sub-excavation elevation listed in Table 5, 6 & 8 extends down to the decomposed to intensely weathered igneous rock, so that the structure backfill is to be placed on undisturbed decomposed to intensely weathered igneous rock.

Table 10: Retaining Wall Footings supported on Structure Backfill with Sub-Excavation into Rock

Retaining Wall Location	Retaining Wall Stationing
Abutment 1, Right Side	Sta. 198+58.00 to 198+70.00
Abutment 1, Right Side	Sta. 198+70.00 to 198+80.33
Abutment 1, Left Side	Sta. 198+42.00 to 198+51.00
Abutment 2, Right Side	Sta. 199+40.28 to 199+55.00
Abutment 2, Right Side	Sta. 199+55.00 to 199+70.00

7. At 2 retaining wall locations (listed below in Table 11), the bottom of footing elevation listed in Table 6 & 8 places the footing on undisturbed decomposed to intensely weathered igneous rock.

Table 11: Retaining Wall Footings supported on Rock

Retaining Wall Location	Retaining Wall Stationing
Abutment 1, Left Side	Sta. 198+51.00 to 198+59.72
Abutment 2, Left Side	Sta. 199+19.32 to 199+29.00

8. The excavations for the retaining wall footings listed in Tables 10 & Table 11 are to be inspected and approved by a representative of the OGDS2, Branch B to ensure the excavations are made in a manner that results in undisturbed rock at the bottom of the excavations. The inspections are to be made after the excavation has been completed down to the bottom of sub-excavation elevation listed in Table 5, 6 & 8 and prior to placing any structure backfill or concrete in the excavations. The contractor is to allow seven (7) working days for the inspection to occur at the retaining wall footing excavation locations listed in Tables 10 & 11. The structures representative is to provide our office a one-week notification prior to beginning the seven-day contractor waiting period. For contact information please refer to the end of the report.

This Foundation Report is based on specific project information regarding structure type and location that have been provided by the Office of Structure Design South 2. If any conceptual changes are made during final project design, the OGDS2, Branch B should review those changes to determine if this report is still applicable. Any questions regarding the above recommendations should be directed to the attention of Cipriano Manansala, (916-227-5399), Hector Valencia, (916-227-4555) or Mark DeSalvatore, (916-227-5391).

Prepared by: Date: 9-3-13

Cipriano Manansala
Transportation Engineer (Civil)
Office of Geotechnical Design-South 2
Design Branch B

Reviewed by: Date: 9-3-13

Hector Valencia, P.E. - Civil # 65257
Engineering Geologist
Office of Geotechnical Design-South 2
Design Branch B

cc: Timothy Wassil- District 8 Project Manager
Bruce Kean - District 8 Materials Engineer
Structure Construction - R.E Pending File
Ofelia Alcantara - Structures Office Engineer
Abbas Abghari - OGDS-2
Mark DeSalvatore – OGDS2 TH for MD.
Geotechnical Archive

State of California Department of Transportation
Division of Engineering Services
Office of Design & Technical Services

Structure Hydraulics

FINAL HYDRAULIC REPORT

Hurkey Creek Bridge Replacement

Located on State Route 74 in Riverside County

JOB:
Bridge No. 56-0181 Project ID: 0800000638

LOCATION:
08-RIV-74-PM 63

PREPARED BY Ginger Lu, PE# 71324

Structure Hydraulics & Scour Mitigation
June 12, 2013
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.

Hurkey Creek Bridge Replacement
Br. No. 56-0181
08-RIV-74-PM 63
Project ID: 08-00000638

Hydrology/Hydraulics Report

General:

Structure Design proposes a single-span concrete slab (PC/PS) structure on RC abutments to replace the existing structure at Post Mile (PM) 63 on State Route 74, outside of Garner Valley in Riverside County (Figure 1).

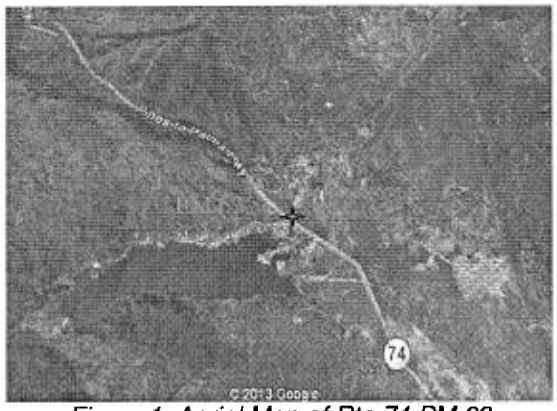

Figure 1: Aerial Map of Rte 74 PM 63

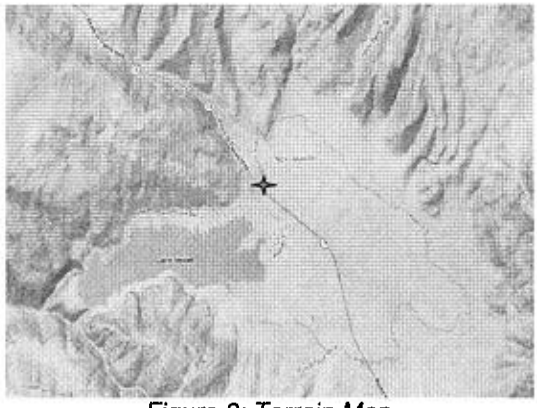
Figure 2: Terrain Map

The existing structure (Bridge No. 56-181) built in 1933 is a 32-ft long, 21-ft wide and single span steel stringer with CIP/RC deck on RC abutments on steel H piles. According to Caltrans bridge inspection logs, it has severe transverse cracks and spalling on the deck with moderate vertical cracks on abutment walls. The bridge opening has a flow capacity of roughly 1660 cubic ft per second (cfs), which is grossly under-designed for an approximately 3600-cfs carrying waterway. The bridge records also reflected that minor erosion incidents along the faces of the abutments and the bottom of the wingwalls were observed and backfills were done the following season. The existing bridge is currently coded a 8 (stable foundation for the assessed scour condition) in the NBIS Item 113.

The proposed structure on the existing roadway alignment will be a 46' long and 43.5' wide bridge. The foundation of the new abutments is spread footings with shear keys at the bottom face, which is designed to be about Elevation 4344.9' (NAVD 88). The new bridge opening will have a flow capacity of 2800 cfs, which still will be overtopped by a flow of 3600 cfs (waterway capacity).

The existing structure lies approximately 500' upstream of Lake Hemet on a high desert plateau with an average of Elevation 4360'. Lake Hemet is a drinking water reservoir equipped with service roads, camp grounds and facilities, which mostly are located between the existing structure and the lake.

In addition, the terrain upstream of the project site opens up and flattens on the south-east side of the structure (Figure 2), where part of the anticipated flow will conceivably drain towards the south-east corner and not return to the main channel.

All the calculated values in the report are in **vertical datum NAVD 88** and the datum conversion between NGVD 29 and NAVD 88 is 2.9'. This report makes reference to:

- General Plans (NGVD 29) provided on 5/28/13 by Office of Structure Design, Branch 12
- Photogrammetry DTM data (NAVD 1988) provided on 5/21/13 by Office of Photogrammetry/ Primary Investigations
- Draft LOTB report (NGVD 29) by Office of Geotech-South (5/9/2013)
- Caltrans Bridge Maintenance Records, field reviews, and As-Built plans.
- HEC-18, Evaluating Scour At Bridge 5th edition (April, 2012), published by Federal Highway Administration, US Department of Transportation
- Flood Insurance Study (FIS) for Riverside County published by Federal Emergency Management Agency (FEMA, 8/28/2008)

Basin:

The Hurkey Creek watershed is located on the western flank of the San Jacinto Mountains in west-central Riverside County. From the headwater at 6500-ft Elevation, Hurkey Creek flows southerly and enters Lake Hemet on the east at 4335' Elevation.

Using the Watershed Modeling System software (WMS version 9.1), this drainage area of Hurkey Creek near the project site was mapped to be 16.7 square miles (mi^2) with average annual precipitation of 24 inches, and the channel bed slope was estimated to be an average of 0.017 ft/ft. This high arid plain is mostly woodland with campgrounds near the lake.

Discharge:

No in-stream mining or logging activity is found on the record. Because the creek is a natural ungaged drainage basin located in a rural setting without significant storage basins upstream, National Streamflow Statistics Method (NSS) is used to approximate the 50-year and 100-year flood event, and the discharges in cubic feet per second (cfs) are tabulated in Table 1. According to a hydrology study done by District Hydraulics in 2011, a debris bulked flow of 9800 cfs was estimated for the project site.

Table 1 Hurkey Creek,
Drainage Area = 16.7 mi^2, Channel slope = 0.017 ft/ft

Flood Frequency	***50-year***	***100-year***	***Bulking***
Flow Rate, cfs	5400	7700	9800

Stage/Velocity:

Using a composite of the photogrammetry DTM with 10-meter DEM (NAVD 88), cross-sections of the channel are generated and exported into hydraulic analysis software - HEC-RAS (4.1.0). Figure 3 is a cross sectional of the channel just upstream of the planned location of the proposed bridge. The left side of the graph (up to station 6100) was from 10-meter DEM and the right of the graph from photogrammetry DTM data. By mere chance, the discharge can go either to the main channel (red circle on the right in Figure 3) or towards the east side lowland (left side of Figure 3).

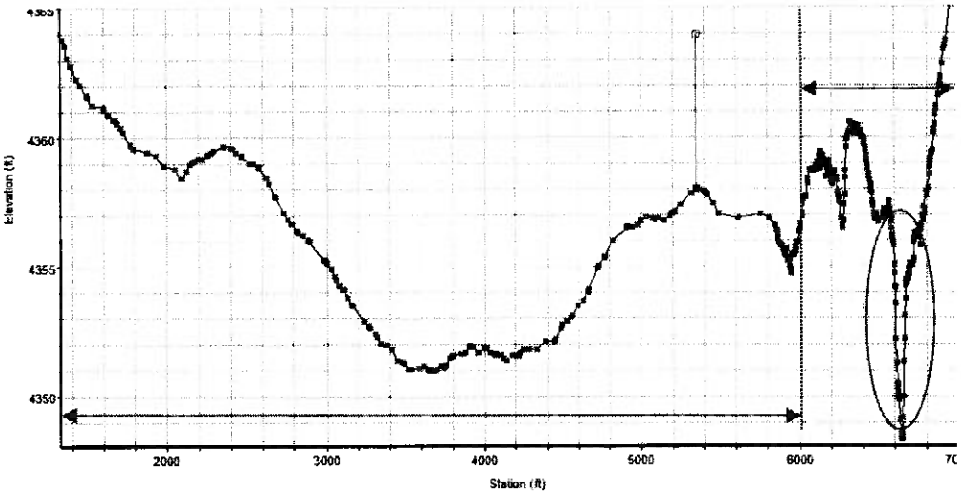

Figure 3: A Channel Cross-Section Upstream of the Bridge

Because not all the flow will reach the bridge opening, the maximum flood for the bridge is reduced and assumed to be 4,000 cfs (Q^*_{100}) and 3,000 cfs for Q^*_{50}. In Figure 4, the proposed bridge was placed as the grayed-out area leaving bridge opening in the middle.

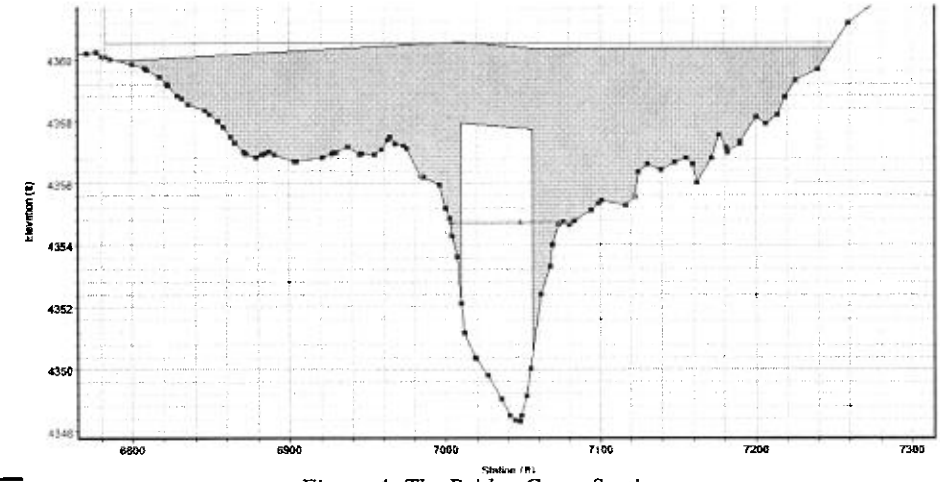

Figure 4: The Bridge Cross-Section

For the parameters used in HEC-RAS models, a roughness coefficient of 0.05 is assumed for the main channel and a channel slope of 0.017 ft/ft for the boundary condition as normal depth. Both the existing and proposed conditions will be under pressure flow and the following hydraulic results are produced in Table 2.

Table 2 Water Surface Elevation (WSE) & Averaged Velocity (AV)
Channel slope = 0.017 ft/ft

Bridge # 56-181 (NAVD88)	***Q^*_{50}* (3000 cfs)**		***Q^*_{100}* (4000 cfs)**	
	Existing	*Proposed*	*Existing*	*Proposed*
WSE, ft	4360.9	4357.0	4361.8	4360.5
A V, ft/s	12.9	8.5	14.1	11.4

Streambed/Drift:

Geotech South in 2013 drilled eleven test borings around the project site. The subsurface soil at Elevation 4346.9' (NAVD 88) and below was composed of moderately soft to intensely weathered igneous rock (granite) and some sand (medium to fine). On May 15 2013, Structure Hydraulics visited the Trans-Lab for the core samples from the site. The soil type is considered pliable and erodible.

District Hydraulics in 2011 participated in a hydrology investigation of the project and considered the project site to have high debris potential due to the dense vegetation in the channel.

There was a slight channel bed aggradation in bridges within 5-mile radius of the project site but appears to be stabilized. Lack of additional evidence of the streambed condition, no long-term degradation is concluded for the project site.

Summary & Recommendation:

- The total scour is the sum of long-term scour, contraction scour and local scour. In this case, the structure is designed to be overtopped, which is calculated as pressure flow scour (vertical contraction scour). Abutment scour similar to pier scour is considered a form of local scour. According to HEC-18, the pressure scour equation contains both local and contraction scour elements. In this case, the total scour depth is the pressure scour depth with zero long-term scour.

Table 5: Recommended Hydraulic Summary For the Proposed Structure (Br #56-0181)

Based on NAVD88	***Abutment 1***	***Abutment 2***
	Spread Footing	***Spread Footing***
Pressure Scour Depth (ft), Q_{100}	6.9	6.9
Long-term Degradation Depth (ft)	0	0
Total Scour Depth (ft), Q_{100}	6.9	6.9
Scour Elevation (ft), Q_{100}	4340.0	4340.0

- The total scour depth is calculated to be 6.9' and it should always be measured from channel thalweg. In this case, the scour elevation is at Elevation 4340.0', where all foundations should be below this elevation.

- Combining with relatively shallow channel slope, dense vegetation coverage, small channel capacity and presence of thalweg, the risk of thalweg migration is moderate. No man-made objects should be allowed to protrude above channel thalweg. Wingwall and retaining wall design is a necessary preventive measure against embankment and abutment wall erosion.

- Structure Hydraulics is concerned about the fracturing decomposed granite and precaution should be taken during removal of the existing footings and construction.

Hydrologic Summary *For the Proposed Structure on* ***NAVD88***			
Drainage Area: 16.7 mi^2			
Frequency	*Q^*_{50}*	*Q^*_{100}*	*Overtopping Flood/Flood of Record?*
Discharge	3000 cfs	4,000 cfs	>3600 cfs**
WSEL at Bridge	4360.1 ft	4360.5 ft	>4360.5 ft**

**The base flood and the design flood for the basin in this case are not the same as Q_{50} and Q_{100} here.*

***Any flow larger than 3600 cfs will be overtopping flow. Since roadway and bridge deck surface are frequently designed on different horizontal and vertical curves, any elevations lower than Elevation 4360.5' will be overtopped by Q_{100}.*

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.